# GOVT. HOLKAR (MODEL AUTONOMOUS) SCIENCE COLLEGE, INDORE

(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2017-18 TO 2021-22

## CRITERION –3

## Research, Innovations and Extension

**Metric No. : 3.4.4**

**Document Title:**

**List of Chapter/Book along with the link**

SURESH T SILAWAT

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तमसो मा ज्योतिर्गमय

# Chapter/Book along with the link
# Academic Year 2017–2022

## *Content*


| S. No. | Detail | Page Number |
|---|---|---|
| 1. | Number of books and chapters in edited volumes published per teacher during the Academic Year 2022-2017 | I-IVIII |
| 2. | Number of books and chapters in edited volumes published per teacher during the - 2022 | 1-176 |
| 3. | Number of books and chapters in edited volumes published per teacher during the - 2021 | 177-267 |
| 4. | Number of books and chapters in edited volumes published per teacher during the - 2020 | 268-422 |
| 5. | Number of books and chapters in edited volumes published per teacher during the - 2019 | 423-464 |
| 6. | Number of books and chapters in edited volumes published per teacher during the – 2018 | 465-509 |
| 7 | Number of books and chapters in edited volumes published per teacher during the - 2017 | 510-555 |

# Government Holkar (Model Autonomous) Science College, Indore (M.P.)
# Bhawarkuan, A.B. Road, Indore (M.P.) 452001

## Title: - List of Chapter/Book along with the links - 2017-2022

| Name of the teacher | Title of the book published | Title of the chapters published | Year of publication | ISBN number | Whether at the time of publication Affiliating Institution was same Yes/No | Name of the publisher | Download Document |
|---|---|---|---|---|---|---|---|
| Pradeep Sharma, Yougal K. Sharma | Adapting ICT to the NEP 2020 in Higher Education | Need of digital initiatives rural areas-challenges, Impact and objectives, | 2022 | 978-93-94954-16-8 | Yes | Himanshu Publications | Click_Here |
| Pradeep Sharma, Divya Rathod | Adapting ICT to the NEP 2020 in Higher Education | NEP 2020 and its effects on teaching pedagogy of ICT | 2022 | 978-93-94954-16-8 | Yes | Himanshu Publications | Click_Here |
| Pradeep Sharma, Yougal K. Sharma | Adapting ICT to the NEP 2020 in Higher Education | Use of Technology in Education | 2022 | 978-93-94954-16-8 | Yes | Himanshu Publications | Click_Here |

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|---|---|---|---|---|---|---|---|
| Vishnu Gadgil | A Monograph on Kawadia Pahad- A Columnar Trap Dyke. | | 2022 | 978-81-954731-7-5 | Yes | Indian National Trust for Art and Cultural Heritage (INTACH), Natural Heritage Division (NHD), New Delhi | Click Here |
| G. D. Gupta | Unified Physics(यूनिफाइड भौतिकी, बी. एसी. द्वितीय वर्ष, मेजर प्रश्नपत्र ) | | 2022 | | Yes | Navbodh Prakashan, Raipur (CG), India | Click Here |
| V. K. Sharma | मकड़िओं का अद्भुत संसार | | 2022 | 978-93-5491-312-9 | Yes | National Book Trust, India | Click Here |
| संतोष गहरवाल | प्राणीशास्त्र, बी. यस-सी. प्रथम वर्ष, प्रश्नपत्र - द्वितीय | | 2022 | 978-93-94032-89-7 | Yes | मध्यप्रदेश हिंदी ग्रन्थ अकादमी, भोपाल | Click Here |
| Tausheeh Abbasi | Mass Media & Communication Skills Generic English | | 2022 | 978-93-95802-23-9 | Yes | Madhya Pradesh Hindi Granth Academy, Bhopal | Click Here |
| Sanjeeda Iqbal | Science Spectrum, Vol-1, Issue-1 | Editor | 2022 | 978-81-95911300-8 | Yes | Govt. Holkar (Model, Autonomous) Science College, Indore | Click Here |

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|---|---|---|---|---|---|---|---|
| Tasneem Rangwala, Angurwala Bafna, Nagesh Vyas and Rohan Gupta | Science Spectrum, Vol-1, Issue-1 | Comparative Study of Routine Fertilizer v/s Soluble Silica Fertilization | 2022 | 978-81-95911300-8 | Yes | Govt. Holkar (Model, Autonomous) Science College, Indore | Click Here |
| Deepti Khare, Sanjay Vyas, Shweta Hardia, Anita Mukati, Anuja Sharma, Rashmi Sharma | Science Spectrum, Vol-1, Issue-1 | Biodiversity and Concentration Of Airbourne Fungi in Different Locations of Indore City | 2022 | 978-81-95911300-8 | Yes | Govt. Holkar (Model, Autonomous) Science College, Indore | Click Here |
| Vinay Dashore, V.V.S Murthy | Science Spectrum, Vol-1, Issue-1 | Review on Phase Change Materials For Energy Efficiency In Buildings | 2022 | 978-81-95911300-8 | Yes | Govt. Holkar (Model, Autonomous) Science College, Indore | Click Here |
| Reena Sastiya, N. K. Jain, S. M. A. Naqvi | Science Spectrum, Vol-1, Issue-1 | The Quantification of Microorganism in Soil of Potato Fields of Indore District of Madhya Pradesh | 2022 | 978-81-95911300-8 | Yes | Govt. Holkar (Model, Autonomous) Science College, Indore | Click Here |
| Megha Vishwakarma, Kiran Billore, R. K. Garg, Mahjabeen Qureshi, Ruchi Sharma | Science Spectrum, Vol-1, Issue-1 | Dna Barcoding of Fresh Water Fishes of Halali Reservoir To Resolve Ambiguity, Misidentification and Cryptic Diversity | 2022 | 978-81-95911300-8 | Yes | Govt. Holkar (Model, Autonomous) Science College, Indore | Click Here |

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|---|---|---|---|---|---|---|---|
| Anamika Jain, Bindya Sharma, Rakhi Mandloi | Science Spectrum, Vol-1, Issue-1 | Quantitative Analysis and Green Synthesis of Iron Oxide Nanoparticles Using Aqueous Extract of Neolamarckia Cadamba and Evaluation of Antioxidant Activity | 2022 | 978-81-95911300-8 | Yes | Govt. Holkar (Model, Autonomous) Science College, Indore | Click Here |
| Shagufta Khan, D. M. Kumawat | Science Spectrum, Vol-1, Issue-1 | Sustainable Waste Management in Cement Industry of Madhya Pradesh | 2022 | 978-81-95911300-8 | Yes | Govt. Holkar (Model, Autonomous) Science College, Indore | Click Here |
| Taiyaba Nimra Ansari, Sanjeeda Iqbal | Science Spectrum, Vol-1, Issue-1 | Optimization of Dyeing Condition for Eucalyptus Globulus Leaves Extract With Natural Mordants | 2022 | 978-81-95911300-8 | Yes | Govt. Holkar (Model, Autonomous) Science College, Indore | Click Here |
| V. K. Sharma | Science Spectrum, Vol-1, Issue-1 | Butterfly Diversity at Holkar Science College, Indore (M.P.) | 2022 | 978-81-95911300-8 | Yes | Govt. Holkar (Model, Autonomous) Science College, Indore | Click Here |
| किसलय पंचोली | प्रेरणा समकालीन लेखन के लिए | नोकरी की छतरी | 2022 | 24559482 | Yes | प्रेरणा प्रकाशन, भोपाल | Click Here |
| किसलय पंचोली | सेतु | कहानी: फेसबुक पोस्ट | 2022 | 2475-1359 | Yes | सेतु: साहित्य, कला और संस्कृति का एक द्विभाषी जर्नल (पिट्सबर्ग, यूएसए) | Click Here |
| किसलय पंचोली | ई-अभिव्यक्ति, साहित्य एवं कला विमर्श | पंगत और 'चाँद-थाली' | 2022 | | Yes | www.e-abhivyakti.com | Click Here |

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|---|---|---|---|---|---|---|---|
| Dharmendra Jat | उद्यान विज्ञान | | 2022 | 978-81-951268-8-0 | Yes | Ganga Publication, Indore | Click Here |
| Dharmendra Jat | हॉर्टिकल्चर Horticulture | | 2022 | 978817677487-1 | Yes | Shiva Prakashan, Indore, M.P. | Click Here |
| Dharmendra Jat , Ankita Jat | बीज प्रौद्योगिकी-III | | 2022 | 978817677509-6 | Yes | Shiva Prakashan, Indore, M.P. | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | रोबोटिक कैप्सूल: दिलाएगा इंजेक्शन से निजात | 2022 | MPHIN/2007/20200 | Yes | एकलव्य | Click |
| Sanjeeda Iqbal, Taiyaba Nimra Ansari | Sustainable Practices in the Textile Industry (DOI: https://doi.org/10.1002/9781119818915) | Extraction and Application of Natural Dyes (DOI: https://doi.org/10.1002/9781119818915.ch1 | 2021 | 978-11-19818-88-5 | Yes | Wiley Blackwell | Click Here |
| Mewada S.; Gautam S.S.; Sharma P. | Artificial Bee Colony-Based Approach for Privacy Preservation of Medical Data | Research Anthology on Privatizing and Securing Data (https://www.igi-global.com/gateway/book/274988) | 2021 | 978-17-99889-54-0 | Yes | IGI Global | Click Here |
| Netram Kaurav, R. C. Dixit, G. D. Gupta | National Conference on Physics and Chemistry of Materials | Preface: National Conference on Physics and Chemistry of Materials (Editors: NCPCM 2020) | 2021 | 0094-243X | Yes | AIP Publishing, USA | Click Here |

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|---|---|---|---|---|---|---|---|
| | (NCPCM 2020) | | | | | | |
| Bijendra Rai | RP Unified Chemistry (रसायन, प्रथम वर्ष ) | | 2021 | 978-93-80560-13-7 | Yes | Ram Prasad and Sons, Hamidiya Road, Bhopal | Click Here |
| G. D. Gupta | Unified Physics(यूनिफाइड भौतिकी, बी. एसी. प्रथम वर्ष, प्रथम प्रश्नपत्र ) | | 2021 | | Yes | Navbodh Prakashan, Raipur (CG), India | Click Here |
| G. D. Gupta | Unified Physics(यूनिफाइड भौतिकी, बी. एसी. प्रथम वर्ष, द्वितीय प्रश्नपत्र ) | | 2021 | | Yes | Navbodh Prakashan, Raipur (CG), India | Click Here |
| Dr. Pradeep Sharma, Shivlal mewada, Divya Rathod | River of object oriented programming language using C++ | | 2021 | 978-81-951268-1-1 | Yes | Ganga Publishers And Distributer | Click_Here |
| Shivlal Mewada, Sarita Sharma | River of C Programming Language | | 2021 | 978-93-90707-88-1 | Yes | Kavya Publications | Click_Here |

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|---|---|---|---|---|---|---|---|
| Gautam, Divya Rathore | | | | | | | |
| Shailesh Chaure | Perspective in Natural Resource Management : Watershed based Approach | QGIS-Based Drastic Modelling for Assessing Groundwater Vulnerability in Dewas Watershed (Madhya Pradesh). | 2021 | 978-1-925823-94-3 | Yes | Central West Publishing Australia | Click Here |
| Dharmendra Jat | जैविक खेती प्रायोगिक कार्य पुस्तिका | | 2021 | 978817677502-9 | Yes | Shiva Prakashan, Indore, M.P. | Click Here |
| Dharmendra Jat, Ankita Jat | बीज प्रौद्योगिकी | | 2021 | 978817677291-7 | Yes | Shiva Prakashan, Indore, M.P. | Click Here |
| Verma R.; Sharma D.K.; Bisen P.S. | An Introduction to Medicinal Herbs | A Sustainable Approach for Cultivation of High Valued Herbs | 2021 | 978-1-68507-147-9 | Yes | Nova Science Publishers, Inc., USA | Click Here |
| Bijendra Rai | Analytical Chemistry | | 2021 | 978-93-85589-829 | Yes | Ram Prasad and Sons, Hamidiya Road, Bhopal | Click Here |
| किसलय पंचोली | सात्विक सत्य मेरे दैनिक विचार | | 2021 | doopin.in | Yes | YourQuote publishing | Click Here |
| किसलय पंचोली | विभोर स्वर में एक लघु स्वर | पाव रोटी | 2021 | 24559814 | Yes | Shivna Prakshan, Sehore | Click Here |
| किसलय पंचोली | कथा समवेत | आलमारी का एक खाना | 2021 | UPHIND/45880 | Yes | साक्षी प्रकाशन , सुलतानपुर, उत्तरप्रदेश | Click Here |

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| किसलय पंचोली | कोरोना काल जिंदगी जिंदाबाद | कोरोना- मेरे विचार | 2021 | 978-81-951368-0-3 | Yes | सृजन बिंब प्रकाशन, नागपुर | Click Here |
| Seemabati Sisidia | Flora of Central India (Indore Division) | | 2021 | 978-93-89832-32-7 | Yes | SCIENTIFIC PUBLISHERS | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | एक बच्चा-चोर जंतु: नैकेड मोल रैट | 2021 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | नरों को युद्ध करने पर मज़बूर करती मादाएं | 2021 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | ज़ेब्राफिश और रेटिना का इलाज | 2021 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | गर्भनाल में मिला माइक्रोप्लास्टिक | 2021 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | हाथी दांत से अफ्रीकी हाथी के वंशजों की कहानी | 2021 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| M. M. P. Shrivastava and Santosh Gaherwal | Diversified Research in life Science | Editors | 2020 | 978-31-947388-9-3 | Yes | Krishna Publication House, Gujrat | Click Here |
| M. M. P. Shrivastava | Diversified Research in life Science | Comparative study of Worm recovery in Nematospiroides dubius infected mice treated with dose concentrations of | 2020 | 978-31-947388-9-3 | Yes | Krishna Publication House, Gujrat | Click Here |

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|---|---|---|---|---|---|---|---|
| | | dormectin and ivermectin. | | | | | |
| Santosh Gaherwal | Diversified Research in life Science | Toxicological Impacts of Arsenic Trioxide Exposure on Haematoological and Biochemical Profile in Catfish, Clarias Batrachus | 2020 | 978-31-947388-9-3 | Yes | Krishna Publication House, Gujrat | Click Here |
| C.S. Shrivastava | Diversified Research in life Science | Evaluation of four sites of indore city in terms of avifaunal species Richness and Temporal Variation | 2020 | 978-31-947388-3-3 | Yes | Krishna Publication House, Gujrat | Click Here |
| Santosh Gaherwal | Diversified Research in life Science | Study of Ichthyofauna in Fish Fauna in Jetgarh Reservoir, Bhikangaon Tehsil, Khargone District (M.P.) | 2020 | 978-31-947388-3-3 | Yes | Krishna Publication House, Gujrat | Click Here |
| Amita Dagoankar | Diversified Research in life Science | Utility of Polynomial regressiopn in the analysis of water parameters | 2020 | 978-31-947388-9-3 | Yes | Krishna Publication House, Gujrat | Click Here |
| Vipul Keerti Sharma | Diversified Research in life Science | Facilitation of sustainable ecosystem for spider to innovative technologies. | 2020 | 978-31-947388-9-3 | Yes | Krishna Publication House, Gujrat | Click Here |

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| M.M.P. Shrivastava | Diversified Research in life Science | Studies on Zooplankton population as bioindicators of water pollution freom Vikram tirth sarovar Ujjain city, M.P. | 2020 | 978-31-947388-9-3 | Yes | Krishna Publication House, Gujrat | Click Here |
| M.M.P. Shrivastava | Diversified Research in life Science | Study of Navlakha Fish market at Indore, M.P. | 2020 | 978-31-947388-9-3 | Yes | Krishna Publication House, Gujrat | Click Here |
| Santosh Gaherwal | Diversified Research in life Science | Effect of Juvenile Hormone Analogue (Methoprene and Fenoxycarb) on Development of Silkworm Larvae and Silkl Production | 2020 | 978-31-94738-89-3 | Yes | Krishna Publication House, Gujrat | Click Here |
| Chitranjan Sharma | Introduction to Reliability, Safety and Hazard | Introduction to Reliability,Safety and Hazard | 2020 | 978-613-8-95161-2 | Yes | Scholars Press | Click Here |
| Sanjeeda Iqbal | Holkar Research Spectrum | Executive Editor | 2020 | 2454-5406 | Yes | Govt. Holkar Science College, Indore | Click Here |
| आबिदा शमीम कुरैशी | नर्मदा नदी की विविध मत्स्य प्रजातियाँ | | 2020 | 978-81-948038-3-6 | Yes | ऑरेंज बुक्स पुब्लिकेशन्स | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | ज़हर खाकर मोनार्क तितली कैसे ज़िंदा रहती है? | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | click Here |

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| विपुल कीर्ति शर्मा | स्रोत | वॉम्बेट की विष्ठा घनाकार क्यों होती है? | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | साढ़े पांच हज़ार वर्ष पुरानी चुईंगम | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | गंध और मस्तिष्क का रिश्ता | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | कोशिकाओं की खुदकुशी | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | क्या कोरोनावायरस के विरुद्ध झुंड प्रतिरक्षा संभव है? | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | क्या सफेद अफ्रीकी गैंडों का अस्तित्व बचेगा? | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | क्या कोविड-19 में मददगार होगा प्लाज़्मा उपचार? | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | आधा मस्तिष्क भी काम करता है! | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | क्या ध्रुवीय भालू विलुप्त हो जाएंगे? | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |

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| विपुल कीर्ति शर्मा | स्रोत | मच्छरों के युगल गीत | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | किराए की मधुमक्खियां | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | हाथियों की मृत्यु का कारण सायनोबैक्टीरिया! | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | कठफोड़वा में अखाड़ेबाज़ी | 2020 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| Bijendra Rai | RP Unified Chemistry (First Year) | | 2019 | 978-93-80560-15-1 | Yes | Ram Prasad and Sons, Hamidiya Road, Bhopal | Click Here |
| Chitnis Smiriti, Chitnis Uday And Nirgude Virendra | Various Aspect For Sustainable Development (https://publication.jrfindia.com/product/various-aspect-for-sustainable-development/) | Noise Level Near Educational Institutions At Indore, Madhyapradesh | 2019 | 978-93-88746-11-3 | Yes | JHERF, New Delhi | Click Here |

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|---|---|---|---|---|---|---|---|
| Ankesh Ahirwar and Vijay R. Chourey | Review on Touch DNA: An Emerging Deflective Tool in Criminal Investigation | Science Technology and Society | 2019 | 978-81-931424-2-7 | Yes | Indore Christan College, Indore | Click Here |
| Netram Kaurav, R. C. Dixit | Prof. Dinesh Varshney memorial National Conference on Physics and Chemistry of Materials | Preface: Prof. Dinesh Varshney memorial National Conference on Physics and Chemistry of Materials (Editors: NCPCM2018) | 2019 | 0094-243X | Yes | AIP Publishing, USA | Click Here |
| Kirti Yadav and Vijay R. Chourey | Science and Technology | Impact of Climate Change on Human Health: the Major Issue of 21st Century | 2019 | 978-81-931424-2-7 | Yes | Indore Christian College, Indore | Click Here |
| Dharmendra Jat , Ankita Jat | बीज प्रौद्योगिकी-II Beej Prodhyogiki -II | | 2019 | 9788176773 55-7 | Yes | Shiva Prakashan, Indore, M.P. | Click Here |
| M.M.P. Shrivastava | International Journal of Scientific Research in Biological Sciences | Editor-in-Chief | 2019 | 2347-7520 | Yes | ISROSET, Indore | Click Here |

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|---|---|---|---|---|---|---|---|
| Kislaya Pancholi | Indu Ki Slide (Hindi Edition) | | 2019 | B082PDYQZT | Yes | Kindle Edition | Click Here |
| अनामिका जैन | बी. एससी. रसायन (प्रथम वर्ष ) | क्या आप ठीक से कंघी कर पाते हैं | 2019 | 978-93-88925-96-9 | Yes | प्रगति प्रकाशन, मेरठ | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | क्या हमारे प्राइमेट रिश्तेदार भी वाचाल हैं? | 2019 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | पेंगुइंस की घटती आबादी | 2019 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | खतरे में है ओरांगुटान की नई प्रजाति | 2019 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | बिच्छू का ज़हर निकालने वाला रोबोट | 2019 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | ब्लैक विडो मकड़ी | 2019 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
| विपुल कीर्ति शर्मा | स्रोत | यदि आपके बच्चे सब्ज़ियां नहीं खाते | 2019 | MPHIN/2007/20200 | Yes | एकलव्य | Click Here |
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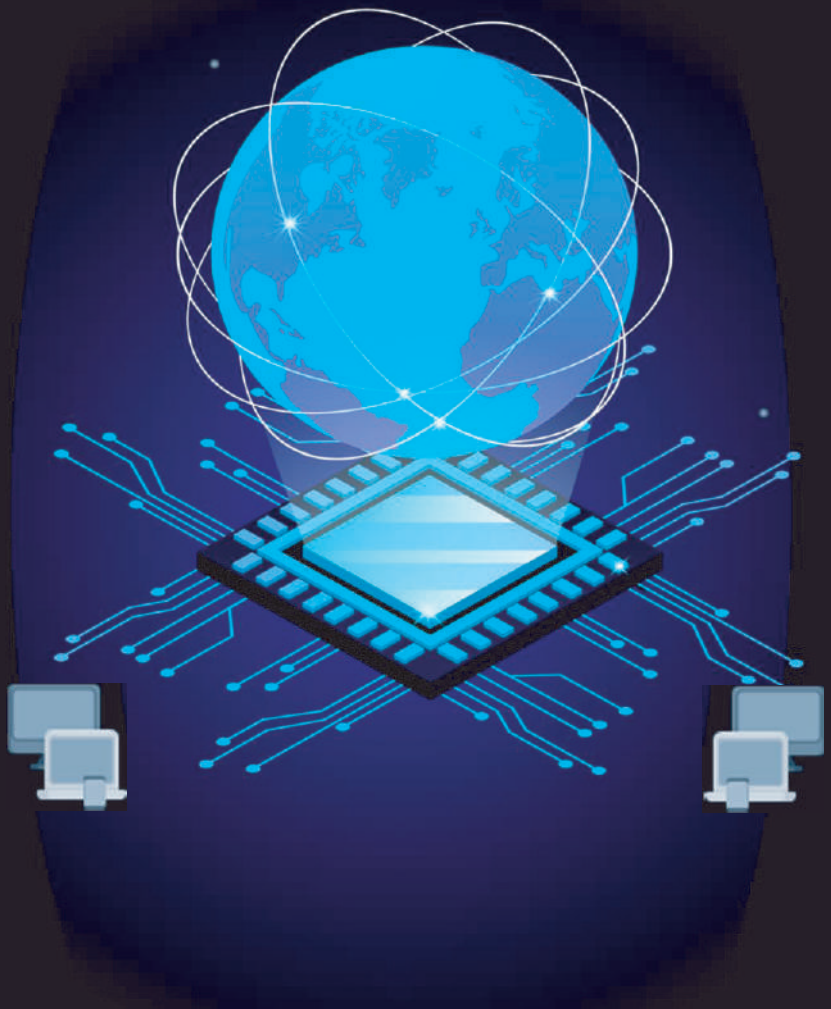
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# ADAPTING ICT TO THE NEP 2020 IN HIGHER EDUCATION




Editors

**Bindiya Tater & Kishor John**

Sub Editor

**Navaratan Bothra**




## About the book

NEP 2020 is one of the most important policies of the 21st Century. The policy is revolutionary and far-reaching in every aspect and its focus is on various facets of education including the integration of ICT. The policy signifies the role of Information and Communication Technology in aiding teachers, bridging language barriers, promote research and innovation, creating digital libraries, facilitating technology based platform for teacher training and administration of education. The policy envisages development of digital infrastructure, digital content and capacity building to supervise the e-education needs of both school and higher education. The plans to implement NEP are seen through Academic bank of Credit, National Research Foundation, CUCET Common Entrance Test, Technical Education in Regional Language, etc. The book highlights the problem, Challenges and prospects of implementing ICT in NEP 2020.The edited book consists of invited chapters from Eminent Academics, higher education institutions, experts in the IT Industry and technical field, and research scholars. The chapters cover almost every aspects of implementation of IT in HIEs in India. All Authors have given their fruitful suggestions and recommendation in the implementation of NEP 2020.The book will inspire Academicians, IT experts, IT Analysts, Developers, Researchers and Students and Young Generations. This Book will significantly contribute in adapting ICT to the NEP 2020 in Higher Education.

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# NEED OF DIGITAL INITIATIVE IN RURAL AREAS : CHALLENGES, IMPACT AND OBJECTIVES

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## ABSTRACT

The Indian economy is predominantly rural, with more than two-thirds of the population and employment concentrated in rural areas. Rural India contributes a considerable share of the overall net value added in various industries. Despite increasing urbanisation, it is anticipated that by 2050, more than half of India's population would still be rural, with 833 million people living in 640,867 villages (a population larger than rural China). The Government of India launched Digital India to bring high-speed internet to rural areas. PM Narendra Modi announced the commencement of the Digital India Mission on July 1, 2015, as a beneficiary of other government initiatives such as Make in India, Bharatmala, Sagarmala, Startup India, BharatNet, and Standup India.

The digital revolution has created numerous opportunities in India. The internet penetration rate in India is fairly high, prompting the need to digitally engage the country. Smart City, Make in India, and Digital India are just a few of the important projects that the Indian government is working on. In rural areas, internet penetration is expanding, but at a slower rate than in urban ones. The goal of this study is to learn about the strategies implemented by the Indian government to improve people's online self-efficacy in rural areas. The impact of digitalization on communities is investigated in this research. There is a tremendous need to teach rural India about digitalization in order to achieve a balance between urban and rural India, and its success pushes others to do so.

***Keywords: Digital India; Digital Rural Area; Internet; Online payment; online services.***

## INTRODUCTION

Rural India accounts for more than two-thirds of the population and employment in India. The Indian economy is booming. Initially, India was mostly recognised for its agricultural interests, but that has since changed dramatically. India has experienced continual breakthroughs and the revolution in information and communication technologies during the last ten years. In 2018, the number of internet users in India increased by 18 percent on an annual basis, with another 11 percent projected in 2019. In India, the smart phone

market has a lot of promise (Mukhopadhyay and Mandal, 2019). People use smart phones to carry out their daily activities. People are using their smart phones to access the internet, which is a major source of growth.

A few years ago, the Indian government launched a programme known as "Digital India." The program's main purpose was to make government services available in a digital and electronic manner. The Prime Minister of India, Narendra Modi, and the government of India launched it on July 1, 2015. The objective is to move on with the Digital India programme by strengthening digital and technological infrastructure, as well as streamlining and increasing internet speed at a faster rate. This program's major goal is to improve rural communities by making them more resource-oriented and digitally capable.

Rural areas began to acquire internet access to some extent as a result of the Indian government's programme, and people began to comprehend how digital technology and the internet function. Though the ambition of a robust Digital India is still lagging behind what the country's Prime Minister, Narendra Modi, envisioned, more effort needs to be done to enable rural and remote areas of the country become more technologically prepared. This can be done by either government or private organisations to assist individuals living in rural areas. Rural development is not limited to infrastructure and the internet; there are many other methods to use technology and digitization for rural development.

The increasing importance of technology, as well as digital empowerment and financial inclusion, has emerged as important drivers of a country's economic development and progress. India's digital empowerment has indeed been helped by the growing use of smartphones, cheaper data plans, and widely available digital services.

## OBJECTIVE OF THE STUDY

The goal of this research is to look into the impact of digitalization on villages. The goal of this research is to examine all of the changes brought about by Digital India projects in rural areas. The goal is to comprehend the importance of the Digital India initiative for rural India, as well as the various benefits that villagers receive as a result of it. This research will also look into the problems, impact, goals, and outcomes of Digital Rural India.

## RESEARCH METHODOLOGY

This document is conceptual in nature and is used to identify facts about the issue under investigation. The facts, execution, and effect of the Digital Rural India were studied using Repository data in this research. For the study, secondary data was gathered from a variety of publications, government websites, and media.

## DIGITAL RURAL INDIA

When technology is used effectively and efficiently, it can be beneficial in a variety of ways, including assisting people in improving their brains and influencing others. Rural and remote areas in our country, India, require major technical reforms not just to have access to resources and information, but also to comprehend how to put them to good use. Many times, there are insufficient resources available to persons living in rural areas, posing a host of problems for those who reside there. To complete digitalization, rural and remote areas of the country must first be digitised.

The question is whether or not rural areas will have access to the internet. What will humans do to create and use the internet? What additional digital options are there?

**To learn a new skill:** Talents and abilities are now more important than academic knowledge and textbooks. If the internet is available in the area, residents can learn new skills and begin planning their future. People can use a variety of resources, ranging from e-learning courses to a big number of books, to gain suitable and high ability in any area of their choice.

**To change their working style:** In rural areas, there is still a lot of manual labor. A lot of paperwork and manual labor is done, whether it be for local merchants or many small and medium firms in rural places. This consumes a considerable lot of time and cost, and the data is not secure. This laborious task and procedure must be automated in order to save time, money, and ensure the safety and security of the data. This can be accomplished by employing appropriate digitizing methods, such as software, to make the entire process quick and straightforward. If properly implemented, this programme has the potential to make a significant difference in the lives of those living in rural areas. Such items assist kids in their growth.

**Education is being digitized:** Education is one of the most crucial aspects of a person's development. Gone are the days when everything was taught just through books and historical data; today, practical information is particularly important. This can be accomplished in a variety of ways through digitizing education. In the classroom, the use of projectors and interactive sessions can lead to better knowledge and explanations. This helps students in understanding and learning information faster.

**In order to maintain safety and security:** People in any location can benefit from technology in terms of safety and security. Installing CCTV and ensuring sensory and alarm-based systems provide security and safety. These can be accomplished through intelligent and automated technologies that assist in the analysis of data and the generation of appropriate outcomes.

## DIGITAL RURAL INDIA'S CHALLENGES

Despite rural India's long-term growth and enormous economic potential, concerns such as digital poverty, a lack of infrastructure, illiteracy, and low skill development represent significant barriers to the rural sector's development.

## CONCLUSION

The Skill India programme (costing 1.13 lakh crores) was launched on July 3, 2015, with the objective of digitally enabling every resident of the country. Even if we have a plan in place and are preparing to go, it is often not easy to switch words on a white piece of paper into reality. The equilibrium amongst northern and southern India would've been restored with the digitization of villages. So because large majority of people reside in rural areas, it is critical to provide digital technology to rural India. Locals will benefit greatly from the opportunity using the web to process numerous services online. A village's digitalization can result in greater job opportunities and an improved level of living.

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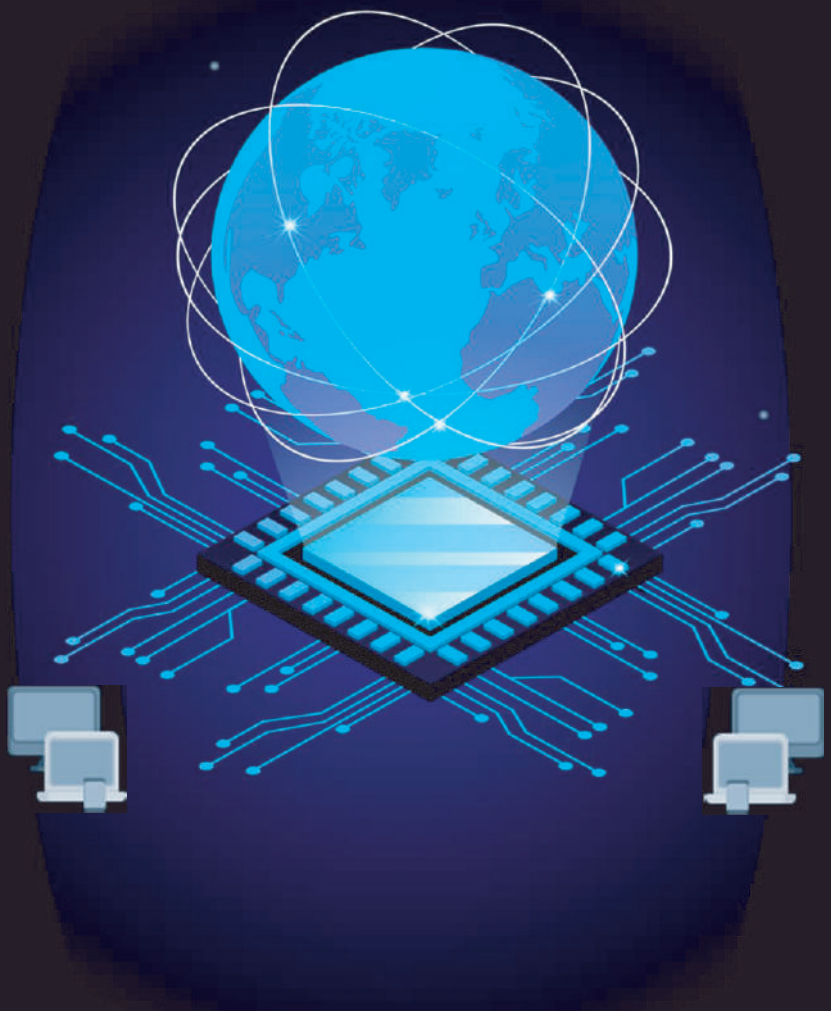
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of lecture on DD Madhya Pradesh and make necessary arrangements to attend classes in the community centres for those who have no TV sets.

As it is obvious from both the cases mentioned above, globalization and ICT interventions are considerably influencing higher education and have expanded its reach to rural, remote, and backward regions. The mentions details clearly exhibit that Indian Higher Education System has moving forward with ICT intervention in teaching-learning practices. However, the COVID-19 disclosed wide ICT infrastructural and skill gaps.

## CONCLUSION

Education is the core of humanity and the socio-economic advancement of societies. The ability to acquire knowledge and competence is an idiosyncratic attribute of human beings and their ability to use that competence for others' wellbeing is the foundation of a humanistic society. Transfer of knowledge is the base of the learning process, which is the most fundamental mechanism for ensuring sustainability and empowerment. It is significant to eliminate barriers to learning and provide equitable educational and vocational opportunities to all. Except for employability skills, the development of high-level cognitive and transferable skills such as critical thinking, problem-solving, and effective communication should also be emphasized. Technological intervention in academic operations has considerably enhanced the scope of teaching-learning at all levels. Technology-enhanced learning in HEIs propagates learners' ability to learn more effectively.

The use of ICTs has surprisingly transformed academic affairs whether teaching-learning or institutional governance. In the present world scenario, there is a need to be mindful on the relevance of higher education and the adequacy of ICT as a change agent towards making society and the environment sustainable. The adoption and integration of ICTs in higher education have a positive influence on academic affairs (teaching, learning, and research) and institutional governance as well. ICTs provide a conducive environment for teaching-learning practices with greater flexibility, motivation, and possibilities to learners and educators. HEIs and educators have widely accepted that ICT adoption and integration makes teaching-learning interactive, improves learner engagement and curiosity, reduces teacher-centric teaching-learning transaction and promotes interaction among learners and educators. It is also a fact that educators' competence/competencies are significant to the practical integration of ICTs with teaching-learning. Finally, based on mentioned account, it can be concluded that this study established a positive and significantly strong role of ICTs in higher education including the attainment of sustainable development goals for education i.e. SDG4.

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# NEP 2020 AND ITS EFFECTS ON TEACHING PEDAGOGY OF ICT

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## ABSTRACT

Education is a self-improvement process. It gives basic information, develops thinking and judgement abilities, and generally prepares one or others. It has a significant impact on both our professional and personal development. It has no age restrictions; anyone of any age can obtain an education at any time. The National Education Policy 2020 is the first education policy of the twenty-first century. The goal of this policy is to create a digital India, which means that everyone should use technology to improve themselves. This Policy proposes updating and restructuring all aspects of the educational structure, including policy and regulatory. Using ICT technologies, every student, whether from a rural or a metropolis may develop themselves in any field. ICT technologies enable to engage students in all conceivable ways by listening, watching, and participating online, creating multimodal education, and increasing retention. We can apply digital images, sounds, and videos to make learning easier and more engaging for people of all ages, and they also enable to explain the concept of any given topic or subjects. Students can choose the material, the teacher, the tools, and the way they study according on their convenience, budget, and requirements. Students can use the digital library to read appropriate content based on their requirements.

***Keyword: ICT tools, NEP 2020, Student, and education, pedagogy, teaching.***

## INTRODUCTION

### NEP 2020

The NEP 2020 is the first education policy of the twenty-first century, and it succeeds the National Policy on Education (NPE) of 1986, which is 34 years old. This policy, which is based on the foundational pillars of Connectivity, Fairness, Reliability, Accessibility, and Responsibility, aims to transform India into a dynamic expertise society and global knowledge superpower by making school and college education more comprehensive, versatile, holistic approach, suited to 21st-century needs, and aimed at bringing out the unique skills of each student. To develop implementation plans for each aspect of the NEP, the government plans to form subject-specific committees with members from relevant ministries at both the federal and state levels. Multiple bodies,

including the HRD Ministry, state Education Departments, school boards, NCERT, Central Advisory Board of Education, and National Testing Agency, will be listed in the plans.

## PURPOSE OF NEP 2020

The purpose of this policy's that no one would be forced to learn any particular language, and that the medium of teaching will not be changed from English to any regional language. The NEP's language policy is intended to be a broad guideline and advisory in nature, with states, institutions, and schools deciding how to apply it.

## INFORMATION AND COMMUNICATION TECHNOLOGY

The use of digitalization to facilitate, improve, and promote the transmission of information is known as information and communication technology (ICT) in education. ICT has been shown in studies around the world to improve student learning and teaching methods. The use of information and communication technology (ICT) has become an integral part of the teaching-learning process. It has switched from blackboards to whiteboards and adopted the use of a digital smart board in the classroom. The world has altered because of Covid-19. Due to the lockdown, everyone is working online from home. Students, instructors, and everyone else is working hard to keep learning going.

Information and communications technology (ICT) allows communication services and the connectivity of telecommunications such as telephone service, cell phones, and machines, as well as the required business software, web services, data transfer, and audio - visual that allows users can utilise digital technology to access, save, transfer, and alter data.

### 1. COMPONENTS OF ICT

The following are the components of information and communication technology:

**Table 1 Components of ICT**

| S. No. | Components | Description |
|---|---|---|
| 1 | Hardware | Hardware is the physical device that interacts with data. Hardware also includes computer-related peripherals such as keyboards, external disc drives, and routers. |
| 2 | Software | This is collection of program to perform particular task. |
| 3 | Data | Raw material of database. |
| 4 | Database/information | Collection of inter-related data. |

| S. No. | Components | Description |
|---|---|---|
| 5 | Internet/Telecommunication | The hardware device joins to establish a network. Connections can be made using wires, such as Ethernet cables or network cables (fiber optics), or wirelessly, via Wi-Fi. |
| 6 | Human resources and procedures | The people required to manage the system and the procedures they must follow in order for the knowledge in the large databases to be accessible |

## 2. ICT Tools

Computers, laptops, printers, scanners, software applications, data projectors, and interactive teaching boxes are examples of ICT tools.The following are examples of ICT tools

**Table 2 ICT Tools**

| S.No. | Literacy ICT Tools | Description |
|---|---|---|
| 1 | Computers | The literacy-rich environment stresses the value of speaking, reading, and writing in all students' learning. A 'print-rich' learning environment is made possible by computers. |
| 2 | Internet | Students may easily learn reading skills in their own language and the language of their friends with the help of the internet. |
| 3 | Blogs/Web log | A blog is a website or section of a website that offers often updated information on one or more topics .Blogs are an excellent way for students to connect and communicate using an online word processing program. |
| 4 | Emails | Emails are the finest way to improve your internet literacy abilities. Students are required to monitor their email accounts for notifications from teaching and professional services personnel. |
| 5 | Web Searching | Web searching is art or skill to search information. |
| 6 | Google Slides | Google Slides is a presentation application used for creating online presentation. It is same as Microsoft power point. |
| 7 | Word processing | Word processing refers to the process of producing or modifying a document with a word processor such as Microsoft Word, Google Docs, or OpenOffice Writer. |
| 8 | Drawing and graphics programs | It keeps an image in vector graphics format, allowing all components of the image to be separated, manipulated, and resized independently of one another. |

## EFFECT ON TEACHING PEDAGOGY OF ICT

ICT is an abbreviation for Information and Communication Technology. ICT is widely available and necessary for playing a meaningful role in transforming and modernizing education system and learning methods. It contains any device that can store, recover, execute, or transmit digital information. It enables communication by using the web (internet), wireless connectivity (mobile hotspot, cellular modem, Wi-Fi), and other modern communications.

Because of COVID -19, schools around the world are closed. As a result, students are absent from school or college and are not getting an education. ICT Tools gave a solution to this difficulty. Education is replaced by online teaching learning or e-learning using these techniques. Teachers and students are connected online.

There are various types of learning using ICT Tools

1. **Computer based teaching learning or Electronic learning (Offline with computer)**

This is a form of e-learning that combines conventional teaching with the use of computers. Electronic-learning is a learning approach that is based on structured instruction but uses electronic resources. Structure, topic material, and information regarding educational resources were represented in digital form. Data, information, and software may be included, if they are required for its application in the learning process.

Resources of electronic learning provided by ICT Tools

1. Monitor or display screen or computer
2. Projector
3. Downloaded videos
4. PPT presentations
5. Micro-soft word

2. **Computer based learning with internet (online) or Online teaching learning or E-learning or Distance learning**

Online teaching learning is a new education method developed by information and communication technology (ICT). Online teaching learning (also known as e-learning) was first introduced in the 1990s with the creation of the internet and was used in distance learning. Students will learn completely in a virtual environment, with the help of online teaching and learning using ICT Tools. It connects students from all around the world with educational institutions.

Different Mode of online teaching learning.

**Various MHRD supported Resources of online teaching learning provided by ICT Tools**

**1. NPTEL**

E-learning is provided through online Web and Video courses in Engineering, Science, and Humanities. NPTEL's objective is to improve the standard of technical educational standards by offering free online course materials.

**2. SWAYAM Online courses**

The definition of SWAYAM is 'Self. At the time, the Ministry of Human Resource Development (M.H.R.D.) launched the SWAYAM initiative (now Ministry of Education). It is an open online course (MOOC) platform in India that provides free online education to all students. AICTE, UGC, CEC, NCERT, NIOS, IGNOU, IIMB, NITTTR, and NPTEL collaborate with SWAYAM.

**3. UG/PG MOOCs**

SWAYAM UG and PG (Non-Technology) archived courses learning material

**4. https://www.swayamprabha.gov.in/**

SWAYAM Prabha is a Ministry of Human Resources Development project to broadcast 32 High Quality Educational Channels via DTH (Direct to Home) across the length and width of the country 24 hours a day, seven days a week. The purpose of this organization provides Higher Education, School education (9-12 levels), Assist students (class 11th & 12th), and Curriculum-based courses to students.

**5. National Digital Library**

The National Digital Library of India is an initiative of the Government of India's Ministry of Education. The goal is to collect and combine material from various international and domestic digital libraries.

**6. Virtual Labs**

Virtual laboratories provide learners with an online lab experience. Learners can experiment with objects, machinery, and systems via virtual scientific lab. It gives the student a real-world experience.

**7. Spoken Tutorial**

The Spoken Tutorial initiative designed to educate and study a specific piece of Open and freely distributable software using a simple video tool.

**8. e-Yantra**

IIT Bomby created the e-yantra project to resolve real-world problems using an embedded system.

**9. Vidwan**

Vidwan is a database of scientists, researchers, and other faculty members that work in top academic institutions and other R & D organizations in India that are active in teaching and research. The Information and Library Network Centre created and maintains this database.

**10. Consortium for Educational Communication**

The CEC was created by the University Grants Commission of India. It was established with the goal of satisfying the needs of higher education via the use of information and communication technologies.

**11. FOSSEE (Free and Open Software in Education)**

The FOSSEE project is part of the Ministry of Education's (MoE) National Mission on Education via Information and Communication Technology (ICT). We want to lessen educational institutions' reliance on free technology. We promote the adoption of FLOSS tools through a variety of actions.

**12. e-ShodhSindhu**

e-ShodhSindhu was established to provide access to e-resources to Indian universities, academies, and centrally sponsored professional institutions.

**Other learning Resources**

**1. Coursera**

Coursera is an online learning platform that offers hundreds of courses, including professional certificate programs as well as bachelor's and master's degree programs.

**2. Udemy**

Udemy is an online learning platform that enables educators to create online courses on a variety of topics. They may build courses by uploading videos, PowerPoint presentations, Pdf files, voice, ZIP documents, and live lectures using Udemy's course construction tools. Online discussion boards allow instructors to interact and communicate with students.

**3. edx**

edx offers online university-level courses to students all around the world. It is a massive open online course (MOOC) provider founded by Harvard and MIT in the United States.

**4. Learning Space: the Open University**

This is an open university that offers students free online UG and PG degree. In addition, there are a variety of full-time postgraduate research students.

**5. Vidya Online**

PM e-Vidya Govt Online Learning Platform for Secondary and Higher Education Students. DIKSHA and NISTHA are the two PM e-vidya portals. Where, DIKSHA offers students internet access to NCERT, NIOS, and books. NISTHA is a training program for teachers.

**6. Khan Academy**

This ensures that students receive course information from the greatest professors in their respective fields. The classes assist you in understanding challenges in mathematics and science.

**Advantages of ICT Tools Based Learning**

1) Distance Learning-Students may attend classes from anywhere using these tools.
2) Interactive content-Images, music, and videos help make the learning process more interesting for students of all ages.
3) Clear concepts-facilitates students in understanding all aspects of a particular topic.
4) Increase retention-Using ICT tools, higher retention is achieved by listening, viewing, and interactive online instruction.
5) Useful for Different-abled students-Differentially abled students benefit from ICT tools and devices such as the digital braille, digital maps, voice to text converter, and audio system for hearing. Using this teaching methodology, all students have the same level of knowledge and skill.
6) Virtual lab environment-Virtual laboratory was used to provide practical assistance to students. Students can perform any experiment online.
7) Online management system-The online management system helps all participants in the teaching-learning process, including students, their parents, teachers, and administrators.
8) Remotely accessed- Digital library, online Text, online videos, contents of their institute, school, university remotely accessed by students.
9) Time saving-There is no need to physically attend class while using this technology. As a result, there is no need to waste time in travelling and getting ready.
10) Flexible and consistent-The resources are accessible at any time and from any location. With this learning style, all students received the same type of teaching.

**Disadvantages of ICT Tools Based Learning**

1) Less Security- With this technology, there are issues with data security and hacking.
2) Maintenance-requires energy, internet, and periodic maintenance.

3) Expensive-The cost of purchasing and maintaining any device is very expensive.
4) Required training-Teachers and students must receive proper training to use ICT technologies.
5) Distraction- Social media messages and notifications distract students and teachers in online classes.
6) Health issues-It is dangerous for health, particularly to one's eyes and posture.
7) Network problem- Due to network issues, ICT devices are not always accessible everywhere.
8) Dependency on battery-Some ICT devices are battery-powered. If your device is disabled (discharge), you won't be able to use it to join a live session or any online class.

**Blended Online Learning (Hybrid=online+traditional(f2f))**

Blended learning, sometimes known as "hybrid learning," is a combination of face-to-face and online learning activities. The blended online learning style is purely digital, with no or little teacher involvement, and occurs previously, though, or after a session. Mobile phones, PCs, and tablets can all be used by students to access material. Various institutions are currently utilizing this type of learning approach. Students are really pleased with this method of instruction. Because if a student has a difficulty about a topic that the teacher has taught them, they can easily access material at home using any device they have.

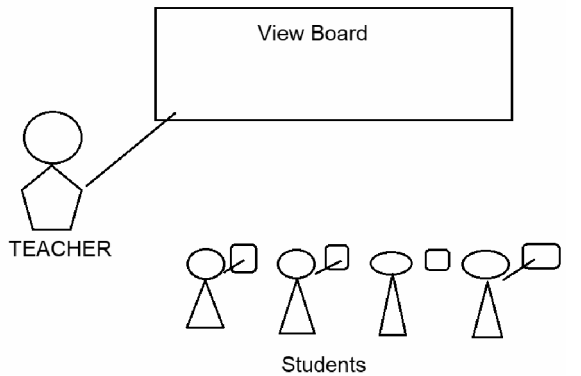



**Fig 3: Blended Learning Mode**

**Models of Blended learning**

**1. Rotational Model**

The teacher will switch between face-to-face and online learning in this mode. On the other hand, takes its name from the notion that students rotate

from one mode to another mode of education on a preset schedule. As a result, blended learning is provided in both the physical and virtual classrooms.

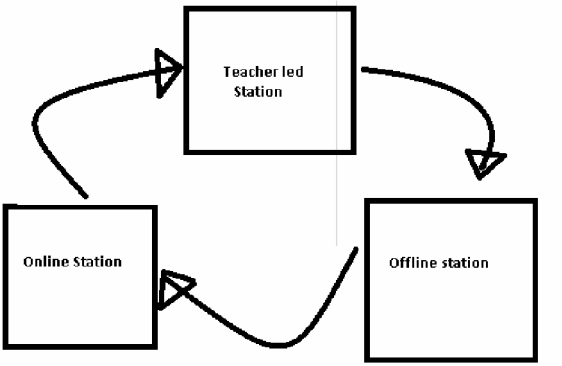



**Fig 4: Rotational Model**

**2. Flexible Course Model or Flex Blended Model**

The majority of information in the flex model is delivered online, yet in a typical classroom setting. Teachers lead students through the learning process and give one-on-one or small group assistance as needed. This paradigm allows for a great deal of flexibility in terms of pace and content.

**3. Self-blend Model**

A program in which students' study one or more courses totally online with an online instructor of record while continuing to get traditional brick-and-mortar education.

**4. Flipped Classroom Blended Learning**

The traditional learning experience is flipped in the flipped classroom. Lectures are sent as homework outside of class time, and class time is devoted for class discussion and interactive projects.




**Fig 5: Flipped Classroom**

**Advantages of Blended learning**

1) Make students a safe environment to study.
2) Enhance student interest
3) Understanding is improved by flipping the classroom.
4) Students have more control over their education.
5) Teacher time is spent effectively, using ICT Tools with traditional learning.
6) Students get access to worldwide resources and materials that are appropriate for their depth of understanding and interest.
7) Self-pacing decreases stress, improves enjoyment, and improves material retention for both slow and fast learners.
8) Using online learning, teachers can effortlessly keep track of their students.
9) Because it enhances face-to-face teaching methods, e-learning has the potential to increase the teaching quality.
10) Students are more prepared for the future.

**Disadvantages of Blended learning**

1) Knowledge of technology basics
2) Low motivation
3) It's possible that the infrastructure doesn't exist.
4) Every student will not be able to access technology, online learning can be challenging, if not impossible
5) Sometime students are negatively affected. Workload on the mind
6) If a teacher does not understand technology, he or she will be unable to communicate it properly.
7) It might be challenging to balance this time with present teaching duties.

## BASIC SKILLS TO USE ICT TOOLS FOR TEACHERS

1) Must have an ICT device of his/her choosing, such as a computer, laptop, mobile phone, or notepad.
2) Must have Gmail account for interaction.
3) The capacity to operate operating systems, access software programs, and control a device's basic tasks.
4) Ability to create data material or study material with confidence using word documents and PowerPoint presentations or other text editor.
5) Through the use of the internet and email, the capacity to communicate and connect with other ICT users.
6) Proper internet connectivity.

## BASIC SKILLS TO USE ICT TOOLS FOR STUDENTS

1) Must have an ICT device of his/her choosing, such as a computer, laptop, mobile phone, or notepad.
2) Must have Gmail account for interaction.
3) Proper internet connectivity.
4) Ability to use other software programs to create assignment.
5) Ability to communicate teacher and students of class using email and internet.

## CONCLUSION

The use of ICT technology in teaching and learning is improving learning capabilities in this research. This technology promotes both student and teacher development. Learning as well as other institution activities such as poster presentations, constructing models (science, agriculture models, etc.), and cultural activities such as dancing, singing, and acting, we can conclude that this technology helps students in their whole development.

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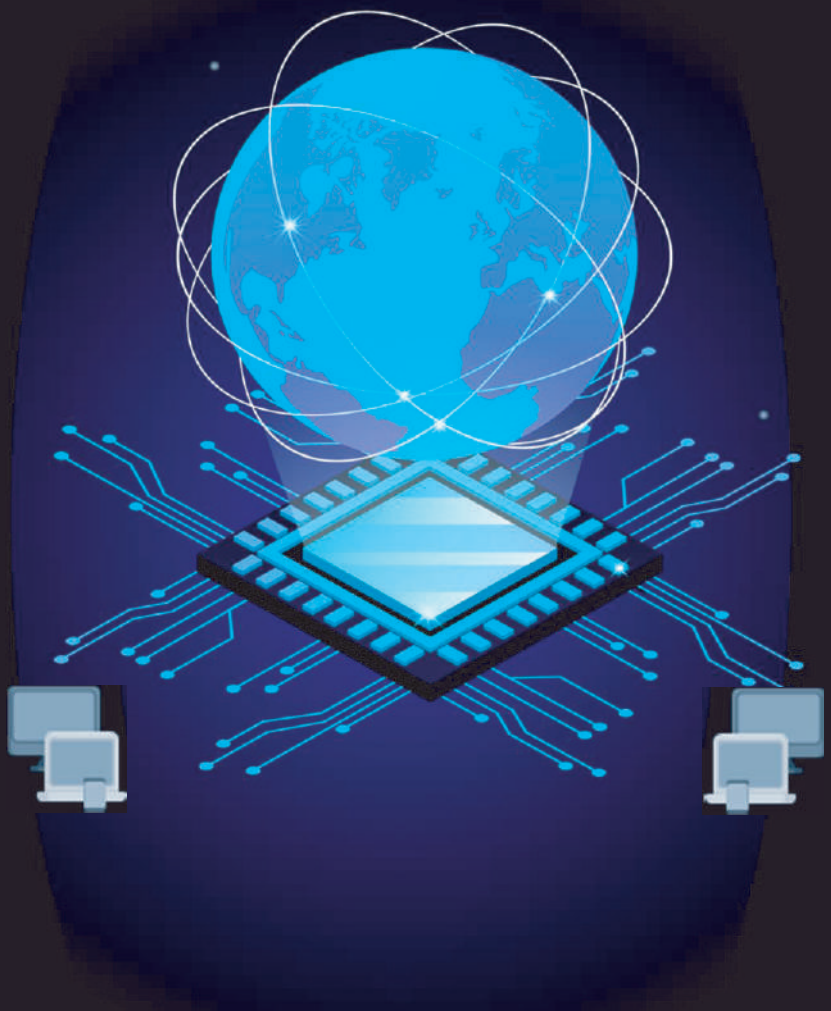
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# ADAPTING ICT TO THE NEP 2020 IN HIGHER EDUCATION




Editors

**Bindiya Tater & Kishor John**

Sub Editor

**Navaratan Bothra**




## About the book

NEP 2020 is one of the most important policies of the 21st Century. The policy is revolutionary and far-reaching in every aspect and its focus is on various facets of education including the integration of ICT. The policy signifies the role of Information and Communication Technology in aiding teachers, bridging language barriers, promote research and innovation, creating digital libraries, facilitating technology based platform for teacher training and administration of education. The policy envisages development of digital infrastructure, digital content and capacity building to supervise the e-education needs of both school and higher education. The plans to implement NEP are seen through Academic bank of Credit, National Research Foundation, CUCET Common Entrance Test, Technical Education in Regional Language, etc. The book highlights the problem, Challenges and prospects of implementing ICT in NEP 2020.The edited book consists of invited chapters from Eminent Academics, higher education institutions, experts in the IT Industry and technical field, and research scholars. The chapters cover almost every aspects of implementation of IT in HIEs in India. All Authors have given their fruitful suggestions and recommendation in the implementation of NEP 2020.The book will inspire Academicians, IT experts, IT Analysts, Developers, Researchers and Students and Young Generations. This Book will significantly contribute in adapting ICT to the NEP 2020 in Higher Education.

**"Only a generation of readers will spawn a generation of writers".**

*-Steven Spielberg*

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# USE OF TECHNOLOGY IN EDUCATION

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## ABSTRACT

The word 'technology' comes from greek word 'technologia,' wherein the 'tech' refers to arts, crafts, skills, and so on, and 'logy' refers to a user's interest in the subject. Colleges and colleges have a history of racing to adopt new technology before it has been proven useful in the class. Higher education has experimented with technological advancements like the blackboard and the personal computer throughout history. Some technologies are becoming intimately associated with higher education. Others, such as the slide rule and the 16-millimeter movie projector, have been thrown out in favour of more sophisticated or cost-effective technologies.

The key technologies that are transforming higher education are computers and telecommunications. Electronic mail, fax machines, the World Wide Web, CDROMs, and commercially generated simulations and courseware are all transforming the daily operations and expanding the missions of schools and universities as a result of advancements in each of these sectors.

People's thinking processes has changed over the course of the usage of technology in higher education. Students gain from a dynamic and collaborative learning experience when technology is integrated into the curriculum. For instance, digital learning platforms and interactive multimedia are now helping in the enhancement of classroom engagement and educational outcomes. An interactive learning feature includes quizzes and simulations.

***Keywords: ICT, Higher Education, UGC, Computers, smart class***

## INTRODUCTION

The use of technology elevates the academic threshold while also making it more approachable. Education has never been easier because today's easy access to the Internet. This has raised the standard; students no longer have to wait for their teacher to finish their topic; instead, they may use a variety of educational apps and platforms to read anything they need on the web. Personal computers, laptops, and cell phones are all readily available nowadays.

For those who are short on time, especially those who are employed, the use of technology in education is an advantage. When you work and want to

learn a new skill to help you improve or upgrade your work, you can easily engage in online courses.

During the corona pandemic, schools and colleges were closed for more than six months, and education was only available via the internet. Students are saved from going illiterate for a year thanks to technology that made education possible even during Corona.

There are smart classes available everywhere that pique the interest of the students and encourage them to study.

Colleges have to reconsider their teaching methods just after COVID-19 pandemic. As a result, new technologies, greater use of existing online platforms, and novel classroom strategies have all become "the new normal." The purpose of this study is to discover how students in higher education view technology's new role in the classroom. Is technology overkill jeopardizing the possible benefits of mixed delivery? Two seminar respondents to fill in an experiment. In the context of technology use, the research makes a substantial contribution to constructivism.

The medium of instruction has changed over time; in the beginning, there was no book or copy, as well as the students learned whatever the teacher taught in class. After several time had passed, paper and pen were invented, and this process continued to the stage where technology is now present in every home. Technology's acceptance in higher education has been slow and painful, despite its promise. There are numerous barriers to technology-based breakthroughs within colleges and universities. Because of academic traditions such as the faculty-centered lecture, many academics are hesitant to use alternative instructional tactics such as the computer or telecommunication devices. Many technical applications will be out of grasp for many institutions with scarce funds. Many colleges used cash that's been left over at the end of semester.

Every area of higher education has indeed been affected by technological advancements in the 1980s and 1990s. Academic administration as well as the instructional process have indeed been greatly affected by latest tech. Technology, however, is most likely altering the teaching and learning process the most when compared to other college and university activities including such student services, housing, and administration.

Professors have traditionally used a large portion of their class time to communicate material to students through lectures and the following discussion. This was especially true in first-year classrooms when students lacked a foundation in the core concepts and principles of an area. In this day and age of advanced technology, this training method appears to be outdated and ineffective. Computers, particularly web-based resources, can transmit fundamental knowledge quicker for much less money than humans. Instructors, for example, must use the web to do what it does best, as according Gregory Farrington. This involves giving pupils information in different ways 24 hours a

day, seven days a week. Students can access teaching materials when they want and come right back to it as much as they need.

Educating oneself refers to the process of acquiring knowledge. It's a never-ending process, yet it's mainly used by students. Even though there is no apparent learning age, this word is most closely associated with students and education children. When we use technology in education, it becomes more interesting and convenient.

## OBJECTIVE OF THE STUDY

The goal of this research is to examine through into employment of technology in education. This study aims to look into the use of technology in education and to point out all of positives and negatives.

## RESEARCH METHODOLOGY

This chapter is conceptual in nature and is used to identify facts about subject under study. The facts and execution of the research are based on Repository data. For the study, secondary data was gathered from a variety of journals, government sites, and magazines.

## GROWTH OF TECHNOLOGY IN INDIA

In several parts of Indian higher education, the usage of information and communications technology (ICTs) is fast rising. Audio-visual aids, radio, and television have all been employed in the past to help education and information distribution in the name of national progress. Satellite was initially employed in higher education during the Satellite Instructional Television Experiment (SITE), which ran from 1975 to 1976. This resulted in the establishment of studios at the Central Institute of Educational Technology (CIET) and the State Institute of Educational Technology (SIET) for the creation and transmission of school-based projects, as well as the launch of the University Grants Commission's (UGC) nationwide classroom, with the Consortium for Educational Communication (CEC) as the nodal office, and the establishment of educational media resource centres (EMRCs) and audio-visual resource centres.

Fundamental structural reforms have brought about by technology, and these changes might well be critical in improving productivity. Technology infuses classrooms with digital learning tools, such as computers and hand-held devices, to support both teaching and learning; it expands course offerings, experiences, and learning materials; it supports learning 24 hours a day, seven days a week; it begins to develop 21st-century skills; and it increases student engagement and motivation and creates 21st-century skills; and it speeds up learning. Technology has the ability to revolutionise education by introducing a new sort of connected learning model. This paradigm connects teachers and

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- Published more than 11 research papers in peer-reviewed journals
- Presented and published more than 15 research papers at various national and international conferences.

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**Research Profile**

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- Including this published four books in Library and Information Science
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- Published more than 20 research papers in peer-reviewed journals
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**Misc. Contributions**

- Participated in several MDP, EDP, FDP and Short Term training programmes for IT, NAAC, Research Methodology, Entrepreneurship & Innovation, UGC HRDFIP and NEP2020
- Coordinate Two Research Chairs (Veer Putra Maharana Pratap Shodh Peeth and Ahimsa, Harmony and Jain Heritage Chair) at Dr. BR Ambedkar University of Social Sciences, Mhow MP

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# A Monograph on

# Kawadia Pahad

## A Columnar Trap Dyke

Madhya Pradesh



Dr. Narendra Joshi & Dr. Vishnu Gadgil

Indian National Trust for Art and Cultural Heritage

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This publication includes detailed research on Columnar trap dyke, mentioning the existence of several columnar trap structures in the world and in India. Publication also highlights the amazingly stacked geometrical columns of basalt at **Kawadia Pahad**, located in Dewas District, Madhya Pradesh, is a significant link explaining geological evolution in the Indian landmass while engaging the layman with its varied and unusual visual features. It can be a pioneer geotourism site in Madhya Pradesh.

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Navbodh
म. प्र. संस्करण

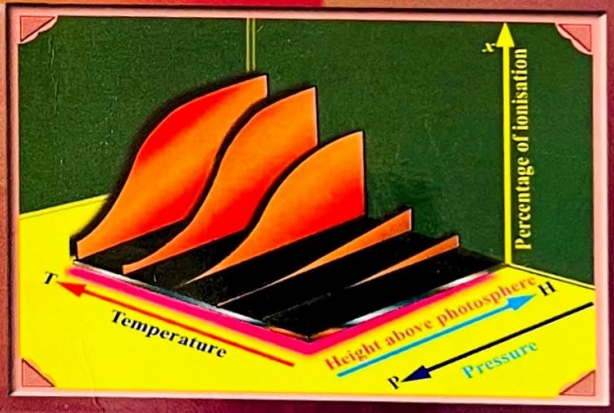
MAJOR

# नवबोध यूनीफाइड भौतिकी

स्नातक द्वितीय वर्ष



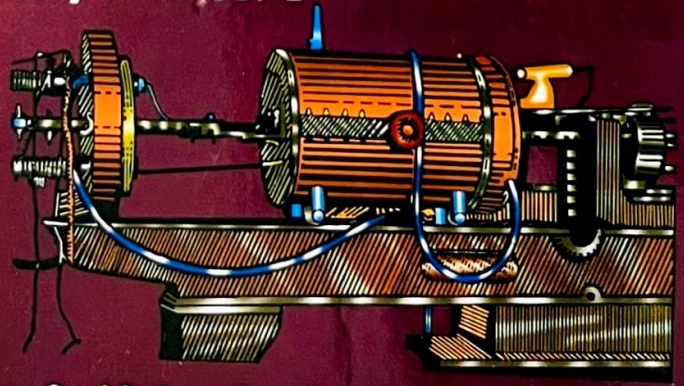
Meghnad Saha
(1893-1956)
Pioneer of Modern Astrophysics




## SAHA'S IONISATION FORMULA

$$Ca \rightleftharpoons Ca^{+} + e^{-} - U \longrightarrow (1)$$

$$\log_{10}\left(\frac{x^2}{1-x^2}\right)P = \frac{U}{4{\cdot}517\,T} + 2{\cdot}5\,\log_{10}T - 6{\cdot}5 \longrightarrow (2)$$



डॉ. साहा द्वारा डिजाइन की गई निर्वात भट्टी का चित्र इसके हिस्सों को अलग करके प्रयोग के समय फिर से जोड़ा जा सकता है। इसमें बहुत जल्दी ढाई हजार डिग्री सेल्सियस का तापमान उत्पन्न किया जा सकता है।

# मेघनाद साहा (1893-1956)

## ( नाभिकीय वैज्ञानिक—प्रथम लोक सभा में )



मेघनाद साहा भारत के महान् वैज्ञानिक तथा यशस्वी शिक्षकों में गिने जाते हैं। वे उच्चकोटि के वैज्ञानिक थे भारत देश के गौरवशाली पुत्र थे। वे केवल भारत के ही सुप्रसिद्ध वैज्ञानिक नहीं थे बल्कि उनकी गिनती संसार के वैज्ञानिकों में होती है।

मेघनाद साहा का जन्म 6 अक्टूबर, सन् 1893 को पूर्वी बंगाल (वर्तमान बांग्लादेश) के ढाका जिले शेबड़ाताली (सेयोड़ातली) नामक एक छोटे से गाँव में हुआ था। उनका जन्म बहुत ही गरीब परिवार में हुआ था त अपने माता-पिता की पाँचवीं सन्तान थे। उनके पिता जगन्नाथ साहा अपने गाँव में पंसारी की एक साधारण दुक चलाते थे। उनकी आमदनी बहुत ही कम थी, किन्तु उनकी माता भुवनेश्वरी देवी गृहकार्य में इतनी निपुण थीं कि घर किसी वस्तु का अभाव मालूम नहीं होने देती थीं। जगन्नाथ प्रसाद की आठ सन्तानें थीं।

मेघनाद की प्रारम्भिक शिक्षा उनके गाँव शेबड़ाताली की प्राथमिक पाठशाला में हुई। आर्थिक संकट गहन होने कारण पिता ने उनको दुकान पर ही बुला लिया। तब उन्हें अपने पिता के साथ दुकान का काम भी करना पड़ता थ उनके पास विलक्षण बुद्धि थी जिसे देखकर उनके प्राध्यापक चकित रह गए। वह जो पढ़ते, उन्हें याद हो जाए इसलिए उनके आचार्यों के आग्रह पर उनके बड़े भाई जयनाथ ने सिमुलिया के डॉक्टर श्री अनंत कुमार दास से मिलव मेघनाद के ठहरने का प्रबन्ध करा दिया जिससे वे पुनः पढ़ाई की ओर लौटे। इस कृपा के लिए मेघनाद ने डॉक्टर दास को जीवन-भर कृतज्ञता के साथ याद रखा।

सन् 1905 में मेघनाद साहा 13 वर्ष से भी कम आयु में ढाका के कॉलेजिएट स्कूल में भर्ती हुए और उन्होंने अपनी पढ़ाई इतनी अच्छी तरह से की कि उन फीस माफ हो गई और उन्हें छात्रवृत्ति भी मिली। इसी स्कूल से सन् 1909 में कलकत्ता विश्वविद्यालय की एंट्रेंस (मैट्रिकुलेशन) परीक्षा में सारे पूर्वी बंगाल में मेघन ने प्रथम श्रेणी में प्रथम स्थान प्राप्त किया।

सन् 1913 में उन्होंने कलकत्ता विश्वविद्यालय से गणित में बी.एस-सी. ऑनर्स प्रथम श्रेणी में द्वितीय स्थान सहित किया।

मेघनाद ने सन् 1915 में कलकत्ता विश्वविद्यालय से गणित में एम.एस-सी. परीक्षा प्रथम श्रेणी एवं द्वितीय स्थान सहित उत्तीर्ण की।

सन् 1923 में कलकत्ता विश्वविद्यालय के उपकुलपति प्रो. आशुतोष मुखर्जी ने मेघनाद साहा को विश्वविद्यालय के गणित विभाग में प्रवक्ता नियुक्त किया।

कलकत्ता विश्वविद्यालय में स्नातकोत्तर कक्षा के छात्रों को भौतिकी पढ़ाने के साथ-साथ मेघनाद साहा जर्मन भाषा का भी अध्ययन करते रहे। इसका यह ला हुआ कि सन् 1917 में, साहा का 'मैक्सवेल स्ट्रेसेज' पर प्रथम शोधपूर्ण लेख विज्ञान की सर्वोच्च पत्रिका 'फिलॉसॉफिकल मैगजीन' में प्रकाशित हुआ। उस सम वह 24 वर्ष के थे।

इसके बाद तो मानो सिद्धियों और प्रशस्तियों के निधि-द्वार साहा के लिए खुलते चले गए। मेघनाद साहा पहले वैज्ञानिक थे जिन्होंने एक बहुत सूक्ष्मग्राह उपकरण बनाया और प्रयोग द्वारा दिखलाया कि जब प्रकाश किसी सूक्ष्म वस्तु पर पड़ती है, तब उस वस्तु पर दाब पड़ता है। उन्होंने उस दाब को नापा, जिससे प्रकाश दाब का सिद्धान्त सिद्ध हो सका। सन् 1918 में इस कार्य तथा विकिरण दाब की विद्युत् चुम्बकीय सिद्धान्त पर लिखे शोध-प्रबन्ध के सम्मान में कलक विश्वविद्यालय ने मेघनाद साहा को डी.एस.सी. की उपाधि प्रदान की।

सन् 1920 में साहा एक वर्ष जर्मनी में रहे। यह वह समय था जब वह आइन्स्टीन, प्लैन्क, सोमरफील्ड और अपने युग के बहुत से महान् यूरोपीय भौति वैज्ञानिकों के सम्पर्क में आए और फिर उनके साथ जीवन भर इस सम्पर्क को बनाए रखा।

सन् 1923 में साहा ने कलकत्ता छोड़ दिया और इलाहाबाद विश्वविद्यालय में भौतिकी विभाग में अध्यक्ष पद ग्रहण कर लिया और 15 वर्ष तक उस पद क गौरवान्वित करते हुए अपने खोज-कार्यों द्वारा विज्ञान-व्योम को चकाचौंध करते रहे।

इसी बीच 1927 ई. में डॉ. साहा रॉयल सोसाइटी के फैलो (एफ.आर.एस.) चुने गए, सन् 1935 में रॉयल सोसाइटी ने दो हजार रुपए उन्हें अनुसंधान के लि उपकरण और औजार खरीदने के लिए दिए। इससे वे तापीय आयनन पर प्रयोगों में प्रगति कर सके। इसके साथ ही उन्होंने एक नई दिशा में आयनमंडल पर अनुसंधा प्रारम्भ किया।

इलाहाबाद में पंद्रह वर्ष तक कार्य करने के पश्चात् सन् 1938 में डॉ. मेघनाद साहा कलकत्ता विश्वविद्यालय में भौतिकी की तारकनाथ पालित पीठिका प प्रोफेसर नियुक्त होकर लौटे।

डॉ. साहा के प्रयत्नों के फलस्वरूप सन् 1950 में कलकत्ता विश्वविद्यालय के 'युनिवर्सिटी कॉलेज ऑफ साइंस' के अहाते में प्रसिद्ध 'इंस्टीट्यूट ऑफ न्यूक्लियर फिजिक्स' की स्थापना हुई, जिसका नाम बाद में 'साहा इंस्टीट्यूट ऑफ न्यूक्लियर फिजिक्स' रखा गया।

सन् 1920 में डॉ. साहा ने ज्योतिष शास्त्र की महान् खोज की। उसमें उन्होंने बड़ी ख्याति पाई। उनकी यह महत्वपूर्ण खोज अथवा देन तारकीय वर्णक्रम (स्टेल स्पेक्ट्रम) से सम्बन्धित थी। उनका सिद्धान्त साहा-समीकरण के नाम से विख्यात हुआ जिसको बीसवीं शताब्दी में विज्ञान के क्षेत्र में भारत की ओर से एक बहुमूल योगदान माना जाता है।

डॉ. साहा प्रथम व्यक्ति थे जिन्होंने रदरफोर्ड और बोर के सिद्धान्तों का उपयोग तारकीय वर्णक्रमों का भेद जानने के लिए किया। उन्होंने तारों के वर्णक्रमों के स्रोत का प्राकृतिक स्पष्टीकरण प्रस्तुत करके इनकी जटिलताओं का स्पष्ट चित्र सामने रखा। तारकीय वर्णक्रम के आदिस्रोत के सम्बन्ध में उनका स्पष्टीकरण वास्त

उच्च शिक्षा विभाग मध्यप्रदेश शासन द्वारा राष्ट्रीय शिक्षा नीति के परिप्रेक्ष्य में
स्नातक द्वितीय वर्ष, सत्र 2022-23 के लिए जारी पाठ्यक्रम पर आधारित

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स्नातक द्वितीय वर्ष

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# विषय-सूची


***प्राक्कथन*** vii

1. क्या होती हैं मकड़ियाँ 1
2. कब धरती पर आई मकड़ियाँ 8
3. एमेशिया 13
4. ब्लैकविडो 18
5. स्वर्ण जाल बुनने वाली जॉइंट वुड स्पाइडर-नेफिला 25
6. टेरेन्ट्युला और उनका विष दोहन 31
7. डरावनी वुल्फ मकड़ियाँ 34
8. गोताखोर आर्जिरोनेटा 40
9. समूहवासी, सामाजिक और बस्तीवासी मकड़ियाँ 44
10. निशानेबाज मकड़ियाँ 51
11. क्रेब-स्पाइडर, थोमेसिस 56
12. मकड़ियों के भ्रामक संदेश 61
13. एरेकनोफोबिया यानी मकड़ी का डर 66

14. क्या हमें मकड़ियों को मार डालना चाहिए? 68

15. मकड़ियाँ अपने ही जाल में क्यों नहीं फँसतीं? 71

16. कीट नियंत्रण में मकड़ियों की भूमिका 74

17. मकड़ी के जीन ने खोले उलझे रहस्य 78

18. मकड़ियों का डी.एन.ए. बारकोडिंग 88

19. स्पाइडरमैन की परिकल्पना 93

20. मकड़ी के जीन से बने ट्रांसजेनिक रेशम कीट 98

21. मकड़ी और बिच्छू का रिश्तेदार-कूकड़बिच्छू या सोलीफ्यूज 105

22. मकड़ियों के रिश्तेदार और रक्त चूसने वाले टिक 112

# प्राणीशास्त्र

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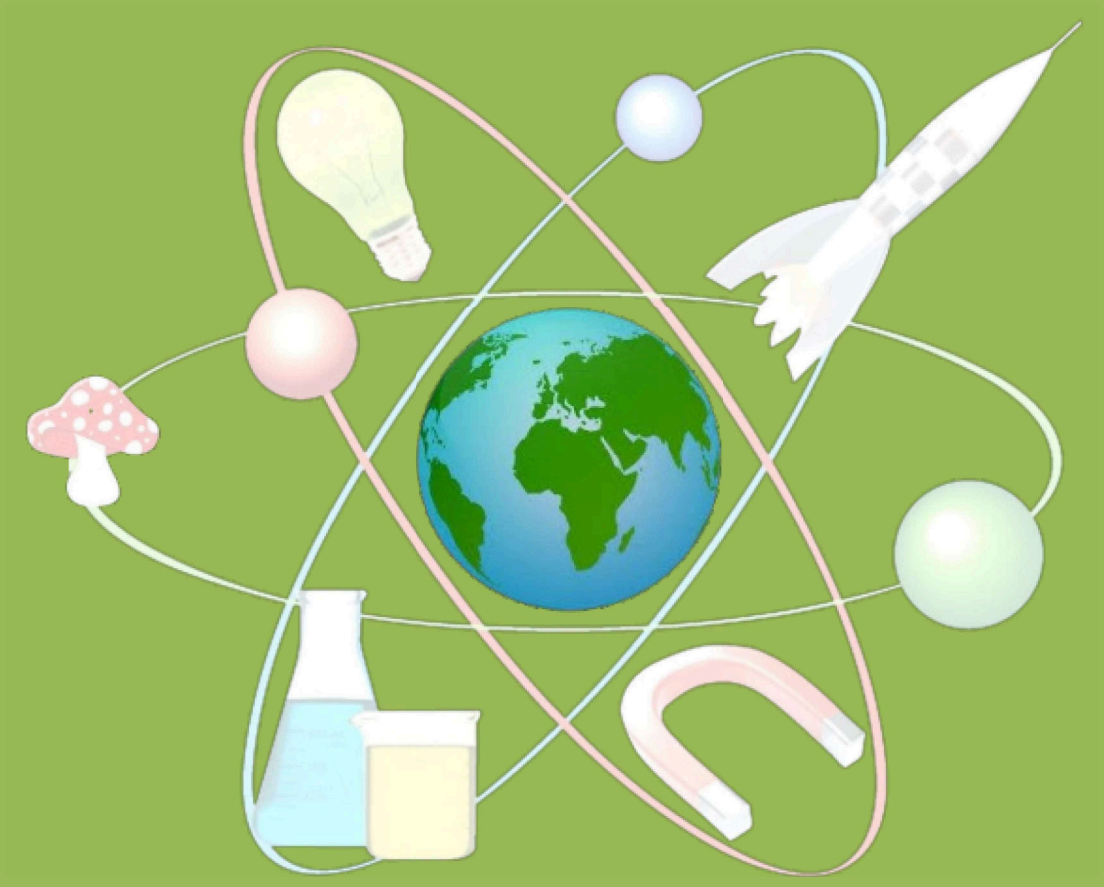
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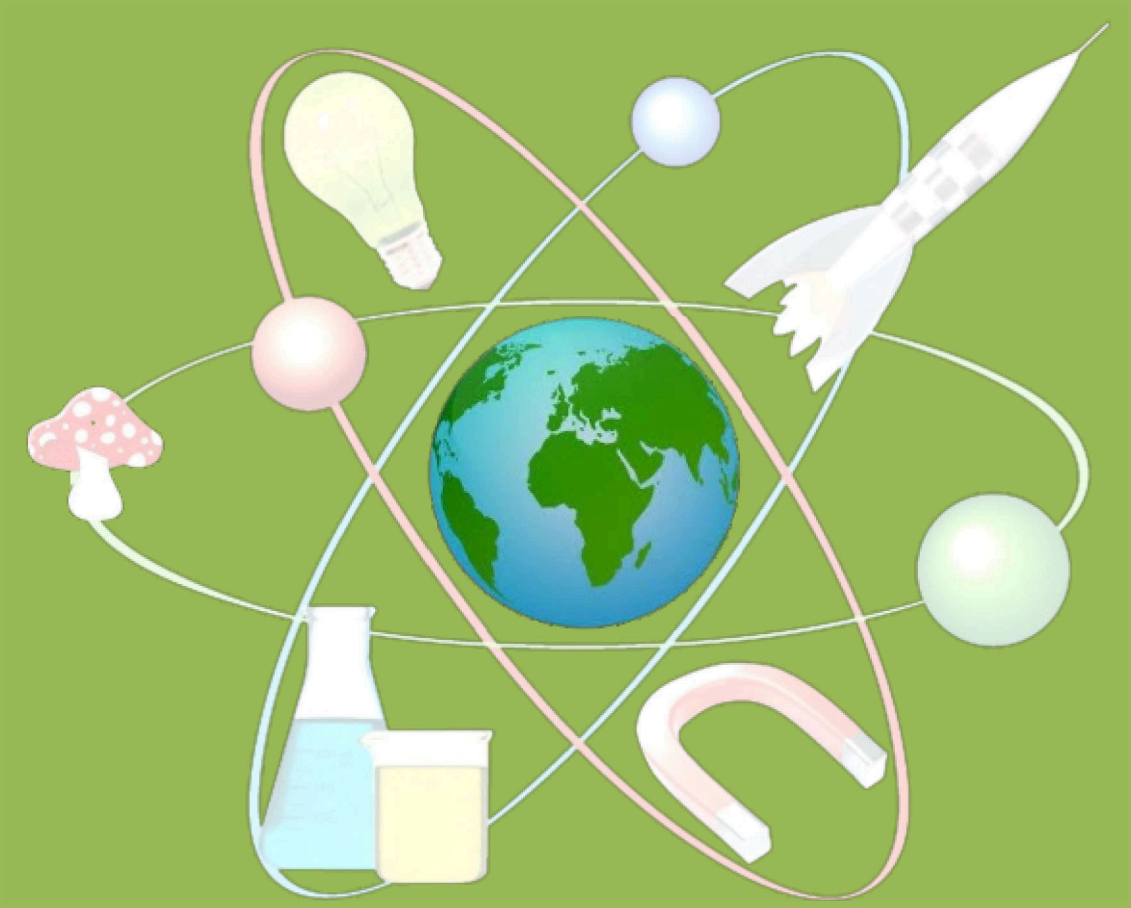
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# CONTENTS


| S. No. | Description | Page No. |
|---|---|---|
| 1. | COMPARATIVE STUDY OF ROUTINE FERTILIZER V/S SOLUBLE SILICA FERTILIZATION<br>*Tasneem Rangwala, Angurbala Bafna, Nagesh Vyas and Rohan Gupta* | 1-6 |
| 2. | BIODIVERSITY AND CONCENTRATION OF AIRBORNE FUNGI IN DIFFERENT LOCATIONS OF INDORE CITY<br>*Deepti Khare, Sanjay Vyas, Shweta Hardia, Anita Mukati, Anuja Sharma and Rashmi Sharma* | 7-10 |
| 3. | REVIEW ON PHASE CHANGE MATERIALS FOR ENERGY EFFICIENCY IN BUILDINGS<br>*Vinay Dashore and V.V.S. Murty* | 11-21 |
| 4. | THE QUANTIFICATION OF MICROORGANISM IN SOIL OF POTATO FIELDS OF INDORE DISTRICT OF MADHYA PRADESH<br>*Reena Sastiya, N.K. Jain and S.M.A. Naqvi* | 22-27 |
| 5. | DNA BARCODING OF FRESHWATER FISHES OF HALALI RESERVOIR TO RESOLVE AMBIGUITY, MISIDENTIFICATION AND CRYPTIC DIVERSITY<br>*Megha vishwakarma, Kiran Billore, R.K Garg, Mahjabeen Qureshi and Ruchi Sharma* | 28-46 |
| 6. | QUANTITATIVE ANALYSIS AND GREEN SYNTHESIS OF IRON OXIDE NANOPARTICLES USING AQUEOUS EXTRACT OF *NEOLAMARCKIA CADAMBA* AND EVALUATION OF ANTIOXIDANT ACTIVITY<br>*Anamika Jain, Bindiya Sharma and Rakhi Mandloi* | 47-53 |
| 7. | SUSTAINABLE WASTE MANAGEMENT IN CEMENT INDUSTRY OF MADHYA PRADESH<br>*Shagufta Khan and D.M.Kumawat* | 54-58 |
| 8. | OPTIMIZATION OF DYEING CONDITION FOR *EUCALYPTUS GLOBULUS* LEAVES EXTRACT WITH NATURAL MORDANTS<br>*Taiyaba Nimra Ansari and Sanjeeda Iqbal* | 59-72 |
| 9. | BUTTERFLY DIVERSITY AT HOLKAR SCIENCE COLLEGE, INDORE (M.P.)<br>*V. K. Sharma* | 73-75 |

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# Comparative study of Routine fertilizer V/s Soluble Silica fertilization

*Tasneem Rangwala[1*], Angurbala Bafna[1], Nagesh Vyas[2] and Rohan Gupta[2]*

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**ABSTRACT :** Silicon is considered as a beneficial element which helps plants to overcome various biotic and abiotic stresses. The use of silicon for fertilization of plants may become important for farmers to get good quality and improve yield of crops in near future. Application of silicon is eco-friendly and can also be used in organic farming. The present research was undertaken to compare fertilization efficiency of silicon in the form of soluble silica with that of routine NPK fertilizers. Five treatments were designed for cultivation of banana viz Control (not supplied with any fertilizer), T1 (Routine NPK fertilizer), T2 (0.75 ml/L soluble silica), T3 (1 ml/L soluble silica) and T4 (1.25 ml/L soluble silica). Vegetative parameters of banana plant were positively affected by fertilization with soluble silica. Better results were obtained with use of soluble silica fertilizer than routine NPK fertilizer. Highest significant increase in the number of bananas in a single hand and the weight of a single hand was observed in T3 treatment (1ml/L soluble silica). Positive correlation was observed for weight of single hand of banana with pulp and peel ratio and number of banana in single hand. It was concluded from the present study that soluble silica could be used as a substitute of routine NPK fertilizer for improving yield.

**KEY WORDS :** Agribooster, banana, pulp to peel ratio, vegetative parameters.

## INTRODUCTION

Fertilizers have become an important factor which is used by farmers to increase yield and improve quality of product. Silicon though shows a remarkable role in the growth of plants but is not used as fertilizer. However silicon has shown to enhance growth and productivity. The second highest element in earth's crust after oxygen is silicon. Silicon is not considered among the essential elements required for healthy growth of plants but is found to impart resistance against various biotic and abiotic stress. Silicon is reported to improve tolerance of plants against drought stress by maintaining water balance and increasing photosynthesis (Melo *et al*., 2003). In modern agriculture, Si is well recognized as a useful nutrient for a number of crops including rice, and plays a significant role in the growth and development (de Camargo *et al.*, 2019). Many studies have reported the positive effects of Si on crop yield (Alovisi *et al.*, 2014; Emam *et al.*, 2014; Gholami and Falah 2013; Kim *et al.*, 2012).

One of the depositors of silicon is banana (Henriet *et al.*, 2006). In India, bananas are the second most principal fruit crop. Banana is a member of Musa species. Export potential of bananas is also good. It has high nutritive value, is easily digested and also cheaper than other fruits (Gopalan *et al.*, 1989). Grand Nain is the most popular variety of banana.

Increase in resistance of plants can help in better growth and productivity. Present study was conducted to compare the potential of silicon fertilization in the form of soluble silica with that of routine fertilizer in improving vegetative growth of bananas.

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## MATERIAL AND METHODS

Experiment was conducted in field situated at N-21 °21'33.2"-31.2" and E- 076 °16'31.4"-27.5" Ropni Vasaad Village, District Burhanpur (M.P.). Tissue culture explants of banana variety Grand nain were planted in rows 1.5 m apart and two plants were separated by the distance of 1.7 m. Single row contains 15 plants. Approx. 10 lit. of water was supplied to each plant through drenching. Five treatments were designed: Control (not supplied with any fertilizer), T1 (Routine NPK fertilizer), T2 (0.75 ml/L soluble silica), T3 (1 ml/L soluble silica) and T4 (1.25 ml/L soluble silica). Soluble silica and NPK fertilizer were given once in a month till harvesting of bananas. Vegetative parameters in terms of height of plants, no. of leaves and diameter of stem at height of 50 cm were recorded every month. Diameter of stem was recorded from 3rd month as before it height of plant was not 50 cm. Pulp to peel ratio, weight of single hand and number of bananas in single hand were determined after harvesting the banana. Method for determination of parameters was as follows:

1. Height of plant and diameter of stem: It was determined using measuring tape.
2. Pulp to peel ratio: It was determined after peeling bananas. Pulp and peel were weighed separately using electronic balance.
3. Weight of single hand: It was estimated using pan balance.

## OBSERVATION AND RESULT

Results were expressed in terms of mean ± SD and p value was calculated to test whether difference in mean between control and treatment is significant or not. Correlation coefficient was calculated using Pearson's method.



**Control** **T1** **T2** **T3** **T4**

Figure 1: Single hand of harvested banana from each treatment

**Table 1: Height of banana plants**

| Duration of visit | Control | T1 | T2 | T3 | T4 |
|---|---|---|---|---|---|
| 1st month | 6.33 ± 1.52 | 6.66 ± 3.05$^{NS}$ | 7.66 ± 0.76$^{N}$ | 6.93 ± 1.84$^{NS}$ | 7.5 ± 1.04$^{NS}$ |
| 2nd month | 17.16 ± 4.31 | 26.66 ± 3.51*$^{S}$ | 14.6 ± 1.63$^{NS}$ | 23.88 ± 4.83$^{NS}$ | 19.8 ± 0.72$^{NS}$ |
| 3rd month | 47.66 ± 6.80 | 60 ± 5.56$^{NS}$ | 59.66 ± 7.57$^{NS}$ | 66.3 ± 3.05$^{NS}$ | 51.33 ± 4.61$^{NS}$ |
| 4th month | 80.66 ± 4.5 | 90.33 ± 9.01$^{NS}$ | 85.66 ± 5.13$^{NS}$ | 93.33 ± 4.04$^{NS}$ | 82 ± 6.55$^{NS}$ |
| 5th month | 94.66 ± 5.5 | 111.33 ± 10.26$^{NS}$ | 84.3 ± 13.86$^{NS}$ | 110.6 ± 6.6* | 95.33 ± 3.78$^{NS}$ |
| 6th month | 124 ± 14.17 | 156 ± 10.39* | 122 ± 15.87$^{NS}$ | 158.3 ± 13.05* | 140.6 ± 11.3$^{NS}$ |
| 7th month | 172 ± 15.52 | 201.3 ± 13.05$^{NS}$ | 175.3 ± 6.42$^{NS}$ | 206.3 ± 6.65* | 193 ± 14.79$^{NS}$ |
| 8th month | 200.6 ±12.01 | 230.6 ± 31.37$^{NS}$ | 220.3 ± 6.11$^{NS}$ | 229.6 ± 6.65* | 228.6 ± 18.5$^{NS}$ |

$^{NS}$ indicates insignificant difference i.e. p value > 0.05, * indicate p value < 0.05 (significant difference)

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As shown in table 1, initial application of both routine fertilizer and soluble silica showed no significant change in height of banana plant. Significant increase in height of banana plant was observed from 5th month with 1ml/L of soluble silica treatment. Routine fertilizer causes significant increase in height of plant only at 2nd and 6th month.

**Table 2 : Number of leaves in banana plants**

| Duration of visit | Control | T1 | T2 | T3 | T4 |
|---|---|---|---|---|---|
| 1st month | 3 ± 1 | 4 ± 1 $^{NS}$ | 5.33 ± 0.57* | 6.33 ± 1.15* | 5.66 ± 0.57* |
| 2nd month | 8.66 ± 1.52 | 10 ± 1 $^{NS}$ | 8.33 ± 0.57 $^{NS}$ | 9.66 ± 0.57 $^{NS}$ | 9 ± 1 $^{NS}$ |
| 3rd month | 10.66 ± 1.15 | 11.33 ± 0.57$^{NS}$ | 11 ± 1 $^{NS}$ | 11.33 ± 0.57$^{NS}$ | 12.66 ± 0.57$^{NS}$ |
| 4th month | 12.33 ± 0.57 | 13 ± 1 $^{NS}$ | 12.66 ± 0.57$^{NS}$ | 13 ± 1 $^{NS}$ | 12.33 ± 0.57$^{NS}$ |
| 5th month | 13.33 ± 0.57 | 13.33 ± 0.57$^{NS}$ | 14 ± 1 $^{NS}$ | 13.33 ± 0.57$^{NS}$ | 14.33 ± 0.57$^{NS}$ |
| 6th month | 13.66 ± 0.57 | 15.33 ± 0.57* | 16.33 ± 0.57*** | 16.66 ± 0.57*** | 16.66 ± 0.57*** |
| 7th month | 14.66 ± 0.57 | 16 ± 1 $^{NS}$ | 16.33 ± 0.57* | 17.66 ± 1.15* | 17.33 ± 0.57* |
| 8th month | 15.33 ± 0.57 | 17 ± 1 $^{NS}$ | 16.33 ± 1.5 $^{NS}$ | 20 ± 1*** | 16 ± 1 $^{NS}$ |

$^{NS}$indicates insignificant difference i.e. p value > 0.05, * indicate p value < 0.05 (significant difference),

** indicate p value < 0.01 (highly significant difference, *** indicate p value < 0.001 (extremely significant difference).

After first treatment significant increase in number of leaves was observed with all soluble silica treatment (table 2). With 1ml/L of soluble silica fertilization, significant increase in number of leaves was observed from 6th month.

**Table 3 : Diameter of banana stem at height of 50 cm**

| Duration of visit | Control | T1 | T2 | T3 | T4 |
|---|---|---|---|---|---|
| 3rd month | 15 ± 1 | 19 ± 1*** | 15.3 ± 1.15 $^{NS}$ | 17 ± 2 $^{NS}$ | 17.33 ± 0.57* |
| 4th month | 22.33 ± 2.51 | 32 ± 2.64* | 25 ± 3 $^{NS}$ | 28 ± 5 $^{NS}$ | 27.3 ± 6.11 $^{NS}$ |
| 5th month | 27 ± 1 | 32.33 ± 1.52* | 33 ± 1** | 33 ± 4.35 $^{NS}$ | 32 ± 3.6 $^{NS}$ |
| 6th month | 31.66 ± 1.52 | 37 ± 4.35 $^{NS}$ | 44 ± 5.56* | 38.3 ± 3.05* | 38.6 ± 0.57*** |
| 7th month | 43 ± 1 | 59.33 ± 4.04*** | 60 ± 2.64*** | 60 ± 3.6*** | 60 ± 2*** |
| 8th month | 49 ± 2.64 | 64.66 ± 2.08*** | 61 ± 4.58* | 74.6 ± 5.31*** | 69.3 ± 2.51*** |
| 9th month | 53 ± 1 | 67.33 ± 1.5*** | 73 ± 6.24* | 85.66 ± 2.08*** | 81.6 ± 2.51*** |
| 10th month | 56.66 ± 1.52 | 72 ± 2*** | 83 ± 3.6*** | 92.3 ±1.52*** | 86 ±1*** |

$^{NS}$indicates insignificant difference i.e. p value > 0.05, * indicate p value < 0.05 (significant difference),

** indicate p value < 0.01 (highly significant difference, *** indicate p value < 0.001 (extremely significant difference).

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As shown in table 3 diameter of banana stem at 50 cm showed significant increase with all treatment when compared with control. Highest significant increase in diameter during all visits was observed with T3 treatment (1ml/L soluble silica)

**Table 4 : Parameters in Harvested banana**

| Treatment | Pulp to peel ratio | Weight of single hand (kg) | Number of banana in single hand |
|---|---|---|---|
| **Control** | 2.15 ± 0.12 | 1.76 ± 0.25 | 10.66± 0.57 |
| T1 | 2.25 ± 0.22 | 2.43 ± 0.15* | 13.66 ± 0.57** |
| T2 | 2.8 ± 0.14 ** | 2.63 ± 0.2* | 16 ± 1** |
| T3 | 2.77 ± 0.28 * | 2.73 ± 0.05** | 16.33 ± 0.57*** |
| T4 | 3.21± 0.24 ** | 2.6 ± 0.2* | 15.33 ± 0.57*** |

$^{NS}$indicates insignificant difference i.e. p value > 0.05, * indicate p value < 0.05 (significant difference), ** indicate p value < 0.01 (highly significant difference, *** indicate p value < 0.001 (extremely significant difference).

Highest significant increase in pulp to peel ratio of banana was observed with T4 treatment (1.25 ml/L soluble silica) as compared to control. Highest significant weight of single hand and number of banana in single hand was found with T3 treatment (1ml/L soluble silica) in comparison with control. All the three parameter of harvested banana showed significant increase with all the treatments as compared to control (Fig. 1).

**Table 5 : Correlation between parameters of harvested banana**

| | Pulp to peel ratio | Weight of single hand (kg) | Number of banana in single hand |
|---|---|---|---|
| Pulp to peel ratio | 1 | | |
| Weight of single hand (kg) | 0.73 | 1 | |
| Number of banana in single hand | 0.78 | 0.98 | 1 |

Weight of a single hand of banana showed positive correlation with pulp to peel ratio (r = 0.73) and number of bananas in single hand (r = 0.98) which suggest that these parameters increase simultaneously (table 5). Positive correlation was also observed between pulp to peel ratio and number of bananas in single hands.

## DISCUSSION

Although silica is not considered an essential element still it affects plant development positively. Soil contains a good amount of silicon but most of it is present in non utilisable form. Soluble silica fertilization causes significant increase in vegetative

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growth parameters in a much better way than routine NPK fertilizer. The increase was observed from the 6th month as before this period the area of leaves may be small which couldn't support much photosynthesis. In a study with peppers conducted in India in 2015–2016, foliar application of silicon (potassium silicate containing 18% Si) with zinc (0.2%) and boron (0.1%), regardless of the concentration of silicon in spraying (0.1, 0.2, and 0.4%), significantly increased plant height and biomass production both 45 days after planting and during fruit maturity (Satisha *et al.*, 2017). Pulp to peel ratio, weight of single hand of banana and no. of banana in single hand were found to increase significantly in all the treatments as compared to control. The reason behind this may be the strength and erectness that silica provides to the leaves which help to improve photosynthesis and will ultimately enhance productivity.

Hanumanthaiah (2015) also observed an increase in pulp to peel ratio in bananas treated with potassium silicate. Silica has been shown to improve uptake of nutrients from soil (Mo *et al.*, 2017). Enhanced uptake of other nutrients from soil may be the possible reason for improvement of vegetative growth of bananas. According to Yan *et al.*, 2018, Enhancement in growth and yield of crop on application of silicon based fertilizer is also dependent on organic matter and pH of soil as well as on dose and application rate of fertilizer. Use of silicon as fertilizer can result in high yield and better quality product in soil deprived of silicon such as in temperate and tropical regions (Meena *et al.*,2014). Silica applied either in soil or through foliar spray result in improved shelf life of banana (Hanumanthaiah *et al.*, 2015).Kadalli et al, 2017 observed using diatomaceous earth at a dose of 150 kg·ha$^{-1}$ with half the dose of the standard fertilizer (NPK + manure), the potato tuber yield was increased by 38.7% (24.3 Mg·ha$^{-1}$) compared to the control (17.5 Mg·ha$^{-1}$) and by 12.9% in relation to the full dose of standard fertilization (21.5 Mg·ha$^{-1}$).

## CONCLUSION

It can be concluded from the present study that soluble silica plays an important role in improving plant growth. Soluble silica should be included in fertilizer to get a good quality product and enhanced productivity. Most of the parameters showed highest increase in T3 treatment thus 1ml/lit concentration of soluble silica can be considered optimum for the best results.

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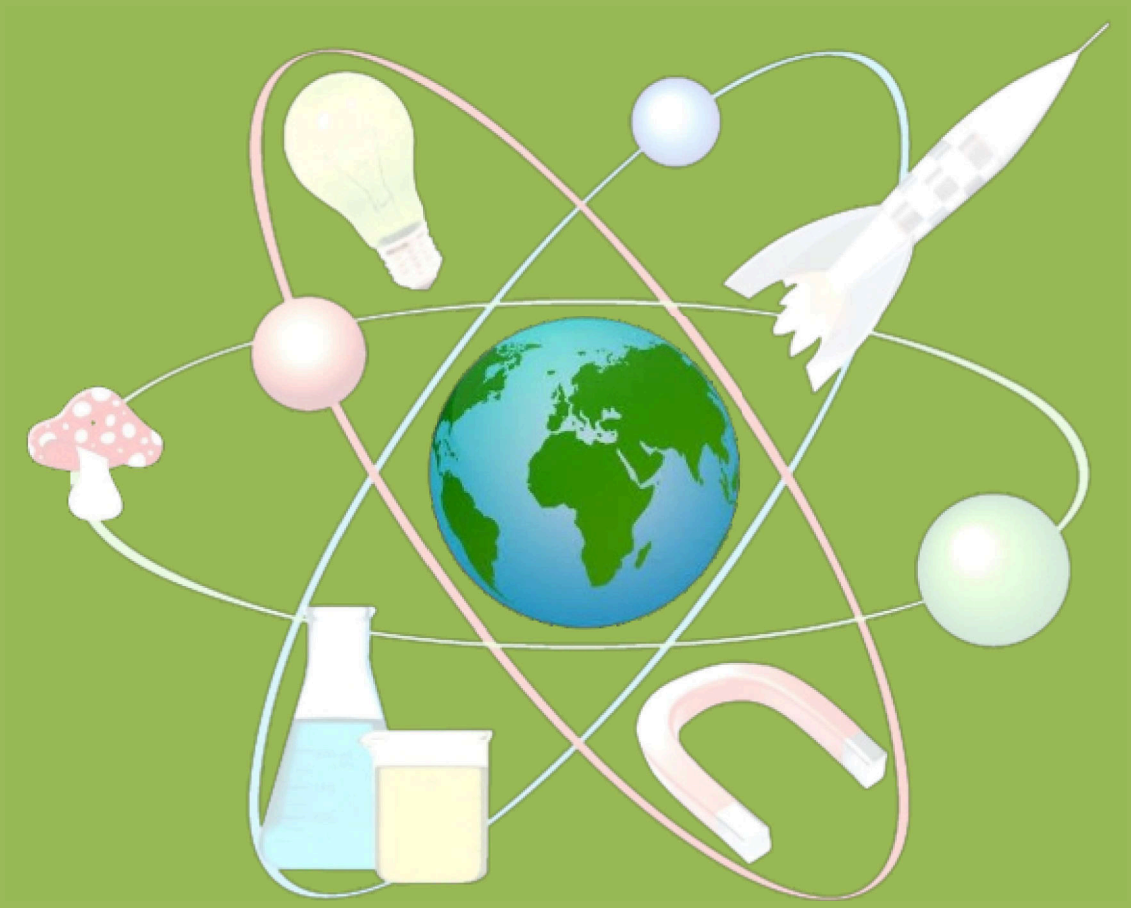
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61 / 555

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# CONTENTS


| S. No. | Description | Page No. |
|---|---|---|
| 1. | COMPARATIVE STUDY OF ROUTINE FERTILIZER V/S SOLUBLE SILICA FERTILIZATION<br>*Tasneem Rangwala, Angurbala Bafna, Nagesh Vyas and Rohan Gupta* | 1-6 |
| 2. | BIODIVERSITY AND CONCENTRATION OF AIRBORNE FUNGI IN DIFFERENT LOCATIONS OF INDORE CITY<br>*Deepti Khare, Sanjay Vyas, Shweta Hardia, Anita Mukati, Anuja Sharma and Rashmi Sharma* | 7-10 |
| 3. | REVIEW ON PHASE CHANGE MATERIALS FOR ENERGY EFFICIENCY IN BUILDINGS<br>*Vinay Dashore and V.V.S. Murty* | 11-21 |
| 4. | THE QUANTIFICATION OF MICROORGANISM IN SOIL OF POTATO FIELDS OF INDORE DISTRICT OF MADHYA PRADESH<br>*Reena Sastiya, N.K. Jain and S.M.A. Naqvi* | 22-27 |
| 5. | DNA BARCODING OF FRESHWATER FISHES OF HALALI RESERVOIR TO RESOLVE AMBIGUITY, MISIDENTIFICATION AND CRYPTIC DIVERSITY<br>*Megha vishwakarma, Kiran Billore, R.K Garg, Mahjabeen Qureshi and Ruchi Sharma* | 28-46 |
| 6. | QUANTITATIVE ANALYSIS AND GREEN SYNTHESIS OF IRON OXIDE NANOPARTICLES USING AQUEOUS EXTRACT OF *NEOLAMARCKIA CADAMBA* AND EVALUATION OF ANTIOXIDANT ACTIVITY<br>*Anamika Jain, Bindiya Sharma and Rakhi Mandloi* | 47-53 |
| 7. | SUSTAINABLE WASTE MANAGEMENT IN CEMENT INDUSTRY OF MADHYA PRADESH<br>*Shagufta Khan and D.M.Kumawat* | 54-58 |
| 8. | OPTIMIZATION OF DYEING CONDITION FOR *EUCALYPTUS GLOBULUS* LEAVES EXTRACT WITH NATURAL MORDANTS<br>*Taiyaba Nimra Ansari and Sanjeeda Iqbal* | 59-72 |
| 9. | BUTTERFLY DIVERSITY AT HOLKAR SCIENCE COLLEGE, INDORE (M.P.)<br>*V. K. Sharma* | 73-75 |

SCIENCE SPECTRUM VOL. (1) ISSUE (1) 2022 ISBN 97881-95911300-8

# Biodiversity and Concentration of Airborne Fungi in different locations of Indore city

*Deepti Khare*, Sanjay Vyas, Shweta Hardia, Anita Mukati, Anuja Sharma and Rashmi Sharma*

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**ABSTRACT :** The extramural investigation was undertaken to study the biodiversity of aeromycoflora of the Indore city. The investigation period was of three months i.e. December 2017- February 2018. Air sampling was done daily by using a settled plate method. A total of 155 fungal colonies and other types have been identified from the outdoor air. The total number of fungal spore types and other types trapped from extramural investigation were 423540/m3 from different locations of Indore. The dominant species were *Aspergillus* sp. (43.11%) and *Alternaria* sp. (38 %) followed by *Rhizopus* sp. contributed (10.4*%), Mucor* sp. (8.4%), *Penicillium* sp. (7.8%), *Candida* sp. (2.6%) and *Cladosporium* sp. (1.3%). Unidentified fungi also contributed about (12.4%). Fungal spores and pollen grains act as aeroallergens. The presence of aeroallergens can be of great significance because they can cause Asthma, Allergic rhinitis, Skin and other allergic disorders in humans. Plants are also affected by the occurrence of aeromycoflora. The airborne fungal spores show great variation in composition and concentration from place to place and time to time. Hence aeromycological study was carried out in different extramural locations of Indore city.

**KEY WORDS :** Outdoor location, *Aspergillus*, Allergens, Biological pollutants

## INTRODUCTION

The study of aeromycoflora of particular region provides the clear view about interaction of fungal spores in the form of disease on plants as well as occurrence of allergy in human being. If the specific fungal allergen is identified, the most effective therapy is specific hyposensitization, as complete avoidance is impossible [1]. So, it is of great clinical value to know the identity of the dominant airborne fungi in a particular area, as the fungal population varies from one place to another. Fungal spores are one of the dominant components in the air and on account of their dimensions (several micrometers), they are classed as bioaerosols[2]. Their occurrence is dependent on environmental conditions. The release of fungal spores in the atmosphere is dependent on the wind [3-5]. Size of fungal spores fascinates them to cover enormous distances with air currents [6]. Fungi live as saprophytes on organic material or as parasites (mainly plant pathogens), so the majority of fungal spores in the air outdoors come from farms, forest land and decomposing plant matter [7]. The report from all over the world now clearly showed that fungal spores play a significant role in the etiology of respiratory allergic disorders. When sensitive individual inhaled the aerial fungal spores, allergic symptoms are noticed. In order to identify the dominant fungi, an aeromycology investigation has been conducted in the atmosphere of Indore.

## MATERIAL AND METHOD

Present study was carried out in between the months of December 2017- February 2018.Total 12 outdoor locations were selected as sampling sites which includes Temple campus, crowded area, public places of Indore city. Air sampling of different locations was done by using passive sampling method

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(Settled plate method). Rose Bengal chloramphenicol agar medium containing plates were exposed for 30 minutes at the selected sampling sites and then incubated at 28$^0$C temperature for 5 to 7 days. Meteorological parameters affecting fungal distribution and diversity were also monitored. Different fungi were identified on the basis of colonial morphology and microscopic studies by using standard literature. Then the petri plates were brought into the laboratory and percentage frequency and percentage contribution of the total fungal flora were assessed [8].

% Frequency = (No. of observations in which a species appeared / Total no. of observations) X 100

% Contribution = Total No. of colonies of species in all the observations taken together / Total No. of colonies in all the species X 10.

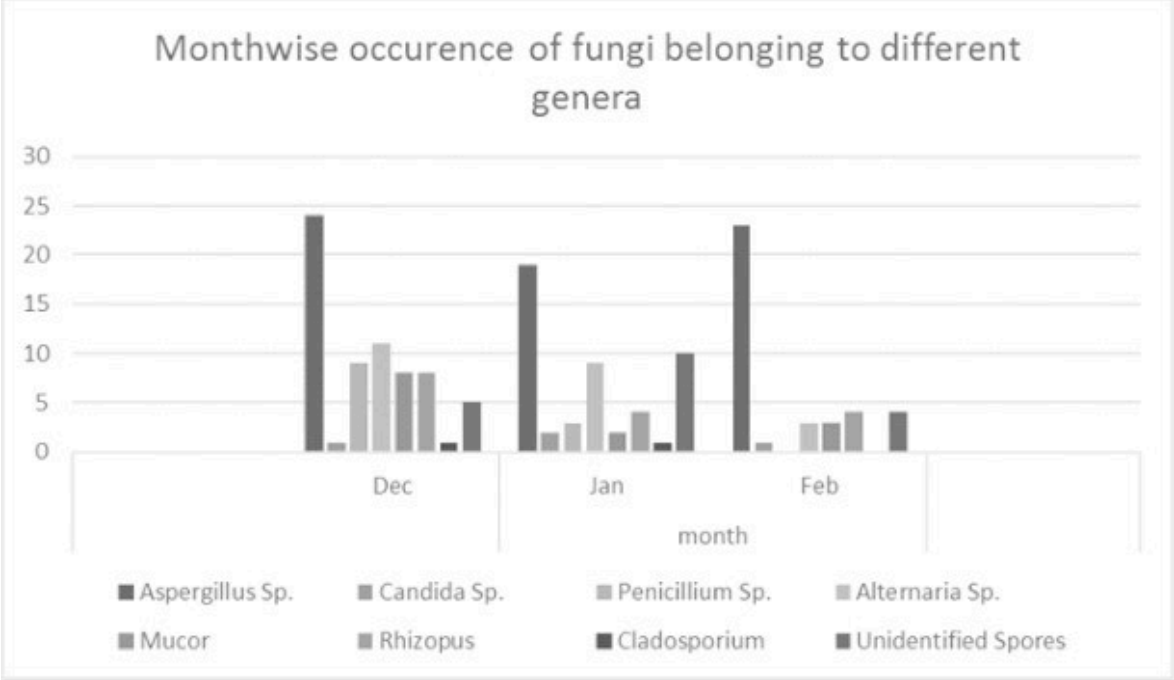
## RESULT AND OBSERVATION

Total 155 fungal colonies belonging to seven different genera were observed from all 12 sampling sites of Indore city. The dominant species were *Aspergillus sp*. having CFU (182476/m$^3$) and *Alternaria sp*. (11059/m$^3$) followed by *Rhizopus sp*. contributed (44236/m3), *Mucor* sp. (35942/m$^3$), *Penicillium* sp.(33177/m$^3$) *Candida* sp.(11059/m$^3$) and *Cladosporium* sp. (5529/m$^{3)}$ Unidentified spores also contributed about (52531/m$^3$) Meteorological parameters were also recorded during the sampling time. The temperature ranges between 26$^0$C to 29$^0$C and humidity is 19 % which favors the growth of fungi.

**Table shows Prevalence of dominant fungi in all selected locations of Indore**

| S.N. | Fungal Species | Total No. of Colonies | CFUs Count/m3 | % of contribution |
|---|---|---|---|---|
| 1 | *Aspergillus Sp.* | 66 | 182476 | 43.1 |
| 4 | *Alternaria Sp.* | 23 | 63590 | 15 |
| 6 | *Rhizopus* | 16 | 44236 | 10.4 |
| 5 | *Mucor* | 13 | 35942 | 8.4 |
| 3 | *Penicillium Sp.* | 12 | 33177 | 7.8 |
| 2 | *Candida Sp.* | 4 | 11059 | 2.6 |
| 7 | *Cladosporium* | 2 | 5529 | 1.3 |
| 8 | Unidentified Spores | 19 | 52531 | 12.4 |
| | | **155** | 423540 | |

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## DISCUSSION

This study was carried out to identify, isolate, evaluate the prevalence and distribution of air borne fungi of different extramural environments of Indore. During the present investigation total 155 colonies of fungi belonging to 7 different genera were observed. The highest prevalence of *Aspergillus sp*. and *Alternaria* sp. were found in all selected sampling sites which are one of the known causes of allergic problems. The prevalence of fungal spores is found more in the month of December and January as compared to February which proves that low temperature favors the growth of fungi. This type of results were observed by researchers worked on outdoor and indoor environment from Aurangabad.[9]

## CONCLUSION

Present study shows that the most dominant fungi were *Aspergillus* sp. and *Alternaria* sp.found in all the locations and both are responsible for causing allergic diseases and skin irritations in humans. *Alternaria* sp. also causes diseases in plants. The information about concentration and diversity of air borne fungi gives ideas to allergologists in the treatment of allergic diseases. Except *Aspergillus* sp. and *Alternaria* sp. all other fungi found in lowest concentration which may be due to the positive impact of Swachh Bharat Abhiyaan in Indore. Care for the environment is essential because healthy environment is the basic need of all type of living organism such as human beings, plants and air is the most important factor for survival so continuous sampling and analysis is required to provide information about allergic components of air which will help in restricting them from arising right at the source and minimize their impact on health.

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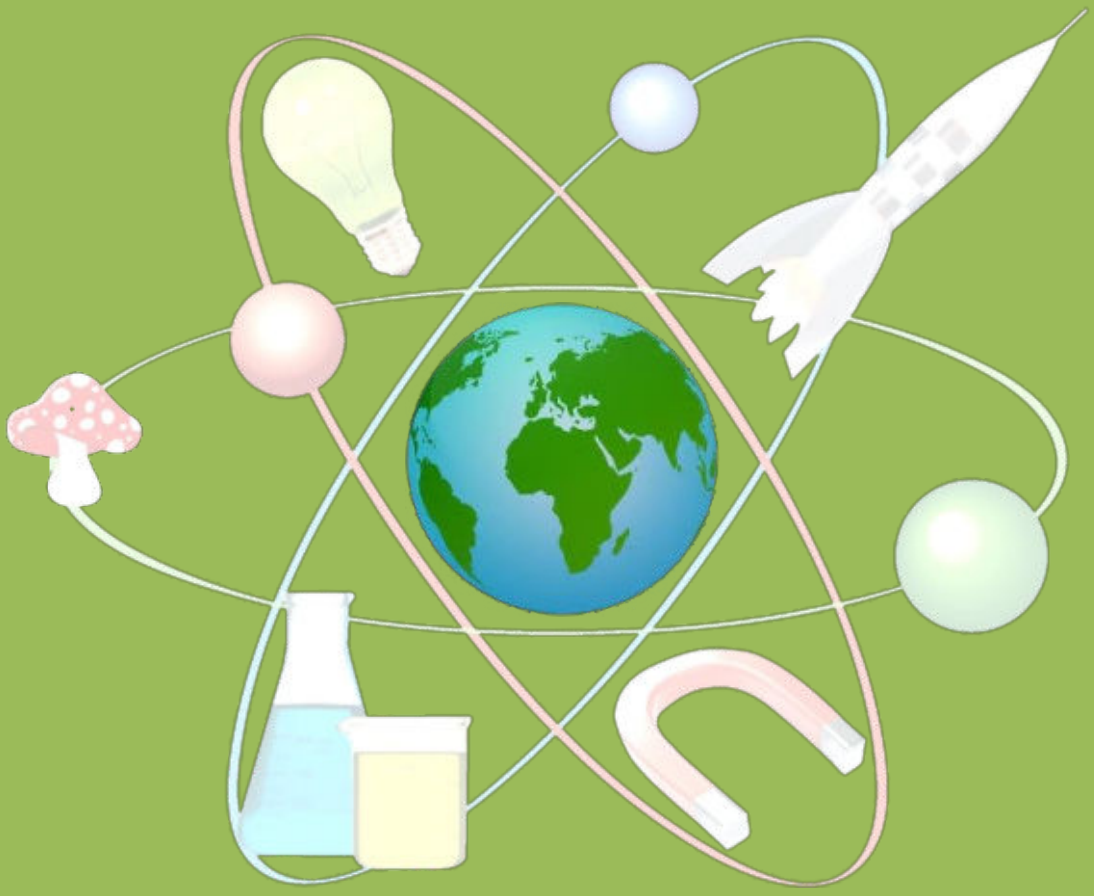
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# CONTENTS


| S. No. | Description | Page No. |
|---|---|---|
| 1. | COMPARATIVE STUDY OF ROUTINE FERTILIZER V/S SOLUBLE SILICA FERTILIZATION<br>*Tasneem Rangwala, Angurbala Bafna, Nagesh Vyas and Rohan Gupta* | 1-6 |
| 2. | BIODIVERSITY AND CONCENTRATION OF AIRBORNE FUNGI IN DIFFERENT LOCATIONS OF INDORE CITY<br>*Deepti Khare, Sanjay Vyas, Shweta Hardia, Anita Mukati, Anuja Sharma and Rashmi Sharma* | 7-10 |
| 3. | REVIEW ON PHASE CHANGE MATERIALS FOR ENERGY EFFICIENCY IN BUILDINGS<br>*Vinay Dashore and V.V.S. Murty* | 11-21 |
| 4. | THE QUANTIFICATION OF MICROORGANISM IN SOIL OF POTATO FIELDS OF INDORE DISTRICT OF MADHYA PRADESH<br>*Reena Sastiya, N.K. Jain and S.M.A. Naqvi* | 22-27 |
| 5. | DNA BARCODING OF FRESHWATER FISHES OF HALALI RESERVOIR TO RESOLVE AMBIGUITY, MISIDENTIFICATION AND CRYPTIC DIVERSITY<br>*Megha vishwakarma, Kiran Billore, R.K Garg, Mahjabeen Qureshi and Ruchi Sharma* | 28-46 |
| 6. | QUANTITATIVE ANALYSIS AND GREEN SYNTHESIS OF IRON OXIDE NANOPARTICLES USING AQUEOUS EXTRACT OF *NEOLAMARCKIA CADAMBA* AND EVALUATION OF ANTIOXIDANT ACTIVITY<br>*Anamika Jain, Bindiya Sharma and Rakhi Mandloi* | 47-53 |
| 7. | SUSTAINABLE WASTE MANAGEMENT IN CEMENT INDUSTRY OF MADHYA PRADESH<br>*Shagufta Khan and D.M.Kumawat* | 54-58 |
| 8. | OPTIMIZATION OF DYEING CONDITION FOR *EUCALYPTUS GLOBULUS* LEAVES EXTRACT WITH NATURAL MORDANTS<br>*Taiyaba Nimra Ansari and Sanjeeda Iqbal* | 59-72 |
| 9. | BUTTERFLY DIVERSITY AT HOLKAR SCIENCE COLLEGE, INDORE (M.P.)<br>*V. K. Sharma* | 73-75 |

SCIENCE SPECTRUM VOL. (1) ISSUE (1) 2022 ISBN 97881-95911300-8

# Review on Phase Change Materials for Energy Efficiency in Buildings

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**ABSTRACT :** The construction industry is responsible for consuming large amounts of energy. The development of new materials with the purpose of increasing the thermal efficiency of buildings is, therefore, becoming, imperative. Thus, during the last decades, integration of Phase Change Materials (PCMs) into buildings has gained interest. Such materials can reduce the temperature variations, leading to an improvement in human comfort and decreasing at the same time the energy consumption of buildings, due to their capability to absorb and release energy from/in the environment. In the present paper, recent experimental studies dealing passive building systems, have been examined. This review is mainly aimed at providing information on the currently investigated materials and the employed methodologies for their manufacture, as well as at summarizing the results achieved so far on this subject.

**KEY WORDS :** Thermal energy storage (TES), phase change material (PCM), building materials: passive building systems.

## 1. INTRODUCTION

Solar thermal energy storage systems and solar photoelctrochemical systems are found to be most promising during the last decade.

The main cause for the intensified energy consumption is the overall change in the living standardsand comfort demands for heating in cold regions and cooling in hot ones. As a consequence, theenergy efficiency of buildings is today a primary objective of policies regarding energy at regional, national and international levels. The development of novel building materials able to improve the efficiency in energy utilization in the buildings is gaining increasing interest in industrial and academic communities. In addition, thermal energy storage (TES) is a useful tool for improving energy efficiencyand increasing energy savings[1].

Whenever there is a gap between demand and supply, storage is essential. Out of the various solar thermal energy storage systems, latent heat thermal energy is convenient, due to its unique property of absorbing and releasing heat energy at a constant temperature called as melting temperature or phase change temperature. (Figure 1).

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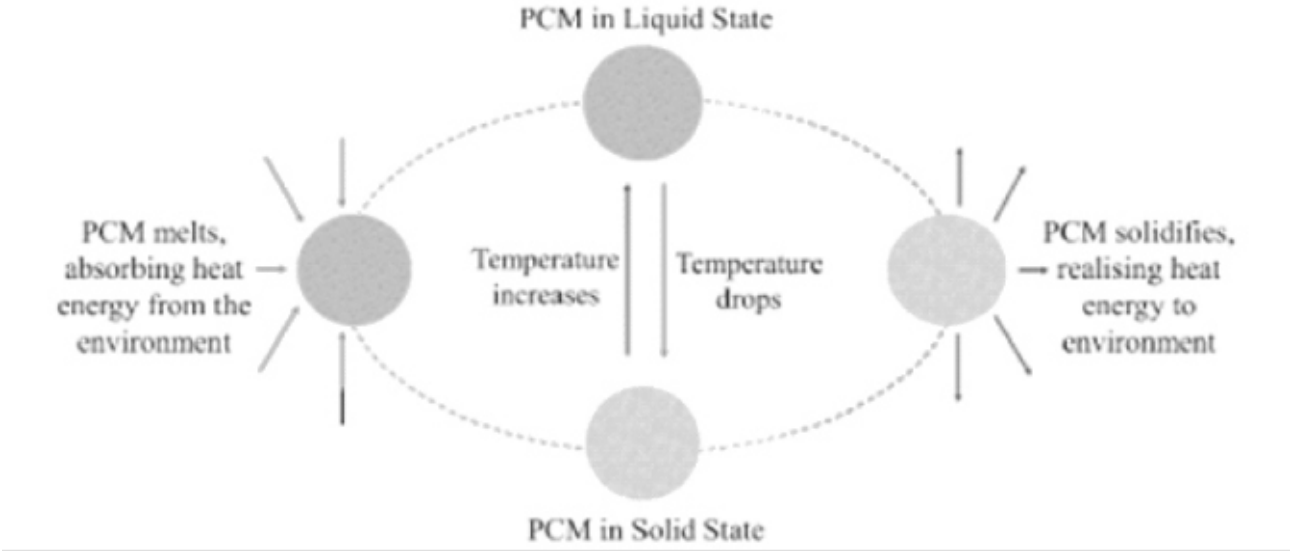



**Figure1** Phase change in PCMs

The incorporation in the building materials of a suitable PCM can reduce the temperature fluctuations, thus, leading to an improvement in human comfort and a reduction in the consumption of energy in the building. The use of PCMs in building materials is beneficial, especially in extremely hotand cold climates, where the energy required to maintain the internal conditions of buildings at acomfortable level can achieve significant consumption levels.

One of the oldest research on PCMs, describing the application of these materials in buildings, was published by Telkes in 1975, followed by another work authored by Lane in 1986. Duringthe last decades, the integration of PCMs in building materials has gained renewed interest [2].

The PCMs in buildings are used in walls, floors, and ceilings, or in other building components(e.g., shutters and windows) as well as in heat and cold storage units [3]. Most of the applicationsin building structures consist of wallboards containing a PCM.

This paper presents a literature review of the recent research works dealing with PCMs. After ageneral summary of the classification and properties of PCMs, the incorporation methods and the applications in the building sector are illustrated.

## 2. CLASSIFICATION OF PCMs

The first classification of materials used for thermal storage appeared in 1983 and was proposedby Abhat [15]. Based on chemical composition, a PCM can be classified as an organic, inorganic oreutectic compound (Figure 2).

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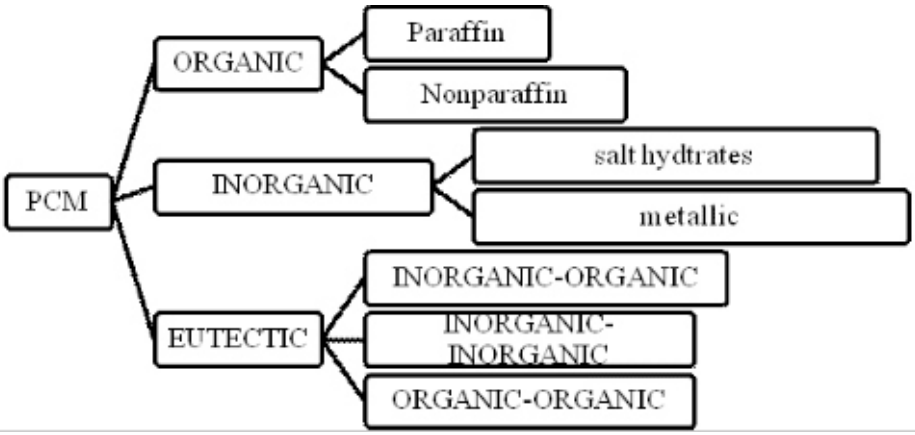



**Figure 2.** Classification of PCMs.

Organic materials, in turn, can be para_nic or non-para_nic. Typically, they can change theirstate several times without displaying any degradation. Salt hydrates and metals belong to a classof inorganic materials. The eutectic mixtures result from the combination of two or more organic and/or inorganic compounds, with the transition temperatures that can meet specific demands .In Table 1, the main features of PCMs are summarized. The advantages and disadvantages of eachclass of PCMs are described in Table 2 [4].

**Table 1.** Main features of the different class of PCMs

| Type of PCM | Composition | Melting Temperature (C) | Heat of Fusion (J/kg K) | Cost |
|---|---|---|---|---|
| **Organic** | Paraffin | -12-71 | 190-260 | Costly |
| | Non Paraffin | 8-127 | 130-250 | Highly costly |
| **Inorganic** | Salt hydrates | 11-120 | 100-200 | Low cost |
| | Metallic | 30-96 | 25-90 | Costly |
| **Eutectic** | Paraffin | 4-93 | 100-230 | Costly |
| | Non Paraffin | -12-71 | 190-260 | Costly |

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**Table 2.** Main advantages and disadvantages of each type of PCMs.

| Type of PCMs | Advantages | Disadvantages |
|---|---|---|
| **Organic** | 1. Available in a large temperature range.<br>2. Freeze without much supercooling.<br>3. Able to melt congruently.<br>4. Self nucleating properties.<br>5. Compatibility with conventional<br>6. No segregation.<br>7. Chemically stable\<br>8. High latent heat of fusion.<br>9. Safe and non-reactive.<br>10. Recyclable. | 1. It has low thermal conductivity.<br>2. Low volumetric latent heat storage capability.<br>3. Inflammable. |
| **Inorganic** | 1. High volumetric latent heat storage capability.<br>2. Low cost and easy availability.<br>3. Sharp phase change.<br>4. High thermal conductivity.<br>5. Nonflammable. | 1. High volume change.<br>2. Super cooling.<br>3. Segregation. |
| **Eutectic** | 1. Sharp melting temperature<br>2. High volumetric thermal storage capability (slightly lower than organicPCMs) | Limited data available on their thermo-physical properties |

It must be underlined, however, that not all existing PCMs can be used for thermal storage inbuilding applications . In order to be suitable for this use, at least two important requirements must be fulfilled: the PCM must display (i) appropriate melting temperature and (ii) melting heat.

The melting heat is a measure of the thermal energy that a material absorbs when it changes itsstate from solid to liquid. The thermal storage capacity of a PCM is strictly correlated to its meltingheat [5].

Referring to the melting temperature, materials with a melting/freezing temperature between 18ºC and 40ºC are particularly suitable as PCM for building applications; this range of temperaturesis, in fact, considered to be an optimum. According to the literature, the temperature of phase transition of the selected PCM should be very close to the human comfort temperatures (i.e., 22–26 ºC) .

PCMs that fall within three temperature ranges have been suggested for use inbuildings :

1. Up to 21ºC for cooling applications;
2. From 22ºC to 28ºC for optimal human comfort;
3. From 29ºC to 60ºC for hot water applications, such as in the case of radiant floors often using water combined with PCMs.

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The PCMs more suitable for building applications are summarized in Table 3, with the indicationof the melting temperature and heat [6]. Only the materials with phase change temperatures ranging from 18ºC to 40 ºC have been reported.

**Table 3.** PCMs for building applications: composition, category, melting temperature and melting heat.

| PCMs | Type | Melting Temperature ( ºC) | Melting Heat (J/kg K) |
|---|---|---|---|
| Glycerine | o | 18 | 198.7 |
| Hexadecane | o | 18.1 | 236 |
| KF 4H2O | I | 18.5 | 231 |
| Butyl stearate | o | 19 | 140 |
| Propyl palmitate | o | 19 | 186 |
| Para n C16–C18 | o | 20–22 | 152 |
| Heptadecane | o | 20.8–21.7 | 171–172 |
| Dimethyl sebacate | o | 21 | 120-135 |
| Octadecyl 3-mencaptopropylate | o | 21 | 143 |
| Lithium chloride ethanolate | o | 21 | 188 |
| FeBr3 6H2O | I | 21 | 105 |
| Para n C17 | o | 21.7 | 213 |
| Erythritol palmitate | o | 21.9 | 201 |
| Polyglycol E600 | o | 22 | 127.2 |
| Isopropyl stearate | o | 22.1 | 113 |
| Para n C13–C24 | o | 22-24 | 189 |
| 34%C14H28O2 + 66%C10H20O2 | E | 24 | 147.7 |
| 50%CaCl2 + 50%MgCl2 6H2O | E | 25 | 95 |
| Octadecane + decision | E | 25.5-27 | 203.8 |
| Mn(NO3)2 6H2O | I | 25.8 | 125.9 |
| Octadecane + heneicosane | E | 25.8-26 | 173.93 |
| Octadecyl thioglycolate | o | 26 | 90 |
| Lactic acid | o | 26 | 184 |
| 1-Dodecanol | o | 26 | 200 |
| 50%CH3CONH2+50%NH2CONH2 | E | 27 | 163 |
| Vinyl Stearate | o | 27-29 | 122 |
| Ara n C18 | o | 28 | 244 |
| Octadecane | o | 28-28.1 | 244-250.7 |
| Methyl palmitate | o | 29 | 205 |
| CaCl2_12H2O | I | 29.8 | 174 |
| CaCl2_6H2O | I | 29-30 | 171-192 |
| LiNO3_3H2O | I | 30 | 296 |

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| PCMs | Type | Melting Temperature ( ºC) | Melting Heat (J/kg K) |
|---|---|---|---|
| Ga | I | 30 | 80.9 |
| 47%Ca(NO3)2·4H2O + 53%Mg(NO3)2·6H2O | E | 30 | 136 |
| Capric acid | o | 30.1 | 158 |
| 60%Na(CH3COO) H2O + 40%CO(NH2)2 | E | 30-31.5 | 200.5-236 |
| Tridecanol | o | 31.6 | 223 |
| Na2SO4 10H2O | I | 31-32.4 | 251.1-254 |
| Na2SO4 3H2O | I | 32 | 251 |
| Na2CO3 10H2O | I | 32-36 | 246.5-247 |
| CaBr2 6H2O | I | 34 | 115.5 |
| LiBr2 2H2O | I | 34 | 124 |
| Zn(NO3)2 6H2O | I | 35-36 | 265-281 |
| Na2HPO4_12H2O | I | 36-36.4 | 146.9-147 |
| FeCl3_6H2O | I | 37 | 223 |
| Tetradecanol | o | 37.8 | 225 |
| Camphenilone | o | 39 | 205 |
| Docasyl bromide | o | 40 | 201 |
| Caprylone | o | 40 | 259 |

O=organic E= Eutectic I=Inorganic

## 3. PROPERTIES OF PCMs

Among all possible candidates, the most appropriate PCM for a specific application must be selected taking into account some characteristics that will determine its effectiveness. For any thermal energy storage application in buildings, in fact, a careful examination of the overall properties of a PCM should be made, comparing the advantages and disadvantages displayed by each available system and, possibly, admitting a certain degree of compromise.

The main attractive properties and characteristics that a PCM should possess are reported in Figure 3[4].

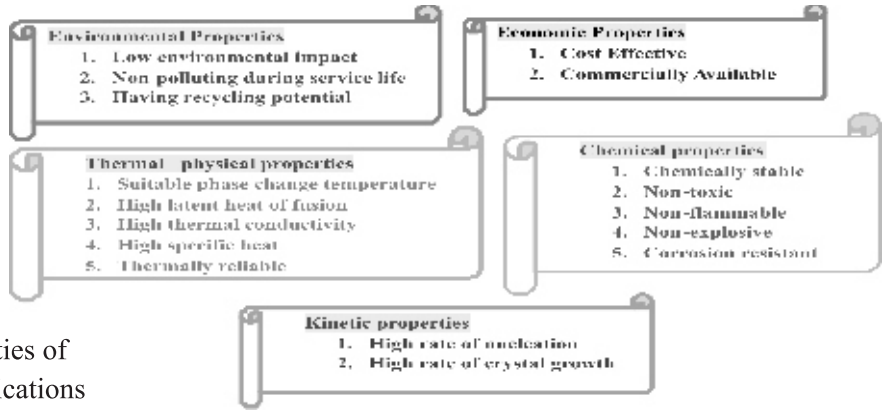



**Figure 3.** Advantageous properties of PCMs employed in building applications

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## 4. PCMs IN BUILDING MATERIALS

Although this review mainly focuses on passive building systems for thermal energy storage based on the integration of PCM in building materials, a short overview of all the available solutions is presented. Generally speaking, the possible introduction of PCMs in building materials is described as follows [7].

I. Free cooling. This system requires a storage unit to accumulate the thermal energy and use it inheat absorption and in heat release. In this way, the storage medium is used to maintain a cold temperature, when the ambient temperature is lower than room temperature. This process is carried out during the night; the cold air flows through the storage unit, removes heat from the liquid PCM through an electrical fan; at this point, the PCM starts to solidify. When the room temperature rises above a comfortable level, the cold stored in PCM is released. Thus, the PCM absorbs heat from the air, starting the transformation from solid to liquid state[7].

II. Peak load shifting. This method is based on the use of PCMs that shift the peak energy request far from the peak hours of electrical demand; the peak load may be split throughout the day reducing the highest peaks [5,13,39]. The cooling/heating stored in off-peak hours is used during an on-peak load [40]. Peak cooling load reductions can range from 10 to 57% [1].

III. Active building systems. The storage capability of PCMs can be used in systems such as solar heat pump systems, heat recovery systems, and floor heating systems. An example of incorporating PCMs in an active system is radiant floors [5]. These systems consist of a lightweight pipe dradiant floor, where an integrated PCM layer is aimed at buffering internal gains during the summer season without affecting the winter warming capacity [6].

IV. Passive building systems. For passive applications, PCMs are integrated into building materialsto increase their thermal mass. The incorporated PCM melts during the daytime and solidifiesduring the night: this process can warm the environment during the day.

### 4.1. Typical Applications

Among all potential applications of PCMs in buildings, the incorporation in construction materials(passive building system), aimed at modifying their thermal properties, has proven to be the most interesting. The combination of building materials with PCMs is an efficient way to increase the thermal energy storage capacity of construction elements. Thereby, wallboards, floors, roof, concrete and other parts are integrated with PCMs in order to improve the thermal performance of the building. The most common solution for implementing PCMs in buildings is the installation of PCM into the interior side of the building envelope. Thus, the use of suitable PCMs in the interiors of the construction allows to absorb and release heat in any room during a large part of the day. Several experimental investigations showed how this strategy positively affects indoor climate and energy use.

Wallboards or plaster boards are very suitable components for the incorporation of PCMs. These elements are cheap and widely used in building applications, especially in light weight constructions, to reduce the internal air temperature fluctuations. The PCMs can be incorporated in the panel in different ways, as described below.

A PCM can also be added to conventional and alveolar bricks in constructions. To insert a PCM in a house roof, a sequence of panels is usually used, each

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one containing the PCM, or a layer of mortar/concrete, with frustum holes filled with the PCM. The PCM placed in the roof can absorb both the incoming solar energy and the thermal energy from the surroundings; hence, it reduces the internal temperature fluctuations.

The floor is another part of the building that offers a large surface and, thus, a great storage capability. As already described, the floor can often act as an active building system, but it can also be employed in passive ones. In some applications, in fact, PCMs have been included in the concrete layer placed under the floor; PCM panels have been also employed as an overlay to substitute the floor. Advantageous effects are obtained by integrating PCMs in a floor, since agreat amount of energy is usually lost from the floor, due to the heat transfer with the ground.

Emerging solutions are those in which PCMs are placed in windows and sunshades In such applications, a PCM must fill the glass, frame, layer, or any other hollow part, such as the cavity of the shutters. The main issue of this application is due to the lack of transparency of PCMs in both their liquid and solid states. Hence, the windows using such systems are blurry, with a reduced transmission of daylight and solar radiation.

Finally, PCMs in mortars or plasters are also considered for interior finishing on walls and ceiling sin residential buildings [8-11].

**4.2. Methods of Incorporation**

Using one or more of the described elements in a house, a significant improvement in energy efficiency is achieved. Such an approach in construction allows to activate thermal inertia and heat storage capability of each room, reducing the internal temperature fluctuations and improving the level of indoor thermal comfort [10].

Different methods have been used to incorporate PCMs in building materials, such as:

1. Direct incorporation;
2. Immersion;
3. Use of micro or macro encapsulated PCMs;
4. Addition of shape-stabilized PCMs;
5. Addition of form-stable PCM composites.

The term form-stable composite PCM is specifically used to define a composite material retainingan optimum/maximum percentage of PCM and showing no leakage when the temperature of thecomposite approaches the melting point of the PCM [69]. This feature also extends the durability of thematerial, preventing its degradation upon thermal cycling. This represents an important advantage forapplications requiring long-term performance, like those related to buildings [12]

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**Table 4.** Advantages and disadvantages of different methods for incorporation of PCMs into building materials.

| Methods of incorporation | Advantage | Disadvantages |
|---|---|---|
| **Direct incorporation** | Simple and cheap | Possible leakage of PCM in the meltingstate; flammability of the impregnatedelements is possible, as well asincompatibility between the materials. |
| **Direct impregnation** | Simple, practical and cheap | Leakage and incompatibility can occur, affecting the mechanical properties and durability of the construction elements. |
| **Micro-encapsulated PCM** | Reduced leakage of PCM during phase transition; higher heat transfer rate; improved chemical stability and thermal reliability | The capsules are expensive; their rigidity may prevent natural convection and reduce the heat transfer rate; the mechanical properties of the construction materials may be affected. |
| **Shape-stabilized PCM** | Large apparent specific heat; suitable thermal conductivity; ability to maintain the shape of PCM during the phase-change; thermal reliability over a long period of time; reduced leakage phenomena. | Complex equipment is needed for their preparation; need to use additives to improve the thermal conductivity |
| **Form-stable composite** | Very cheap; retaining of the high amount of PCM without leakage above its melting point. | Complex equipment is needed for their preparation. |

## 5. EFFECTS OF PCM'S TYPE AND CONTENT

In the examined literature, para_n compounds] are themost used PCM in mortars. Furthermore, higher hydrocarbons (like octadecane, hexadecane, or heptadecane), fatty acids or their mixtures, and polyethyleneglycols have been extensively examined for these applications. Their phase change temperature usually ranges between 18ºC and 36ºC, and the phase change enthalpy is between 100and 260 J/g. Some of these compounds have a low thermal conductivity which limits heat transmission, this latter representing a significant drawback thermal exchange applications. However, the addition of fillers with high thermal conductivity could solve this problem; for instance, expanded graphite is widely used to increase the thermal conductivity of the PCMs [13].

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## 6. ECONOMIC AND ENVIRONMENTAL EVALUATION

The environmental impact of PCMs could be greater than the conventional construction materials, depending on the type of PCM and the climate. The benefits of the PCM increase in siteswhere the weather conditions are similar all year long . Salt hydrates can be compensated in25 years of use (while alkanes in 61 years). However, at the end of their useful life, most PCM scan be recycled; organic PCMs are biodegradable, and inorganic ones are innocuous. However, in order to minimize the overall environmental impact, the use of long-lasting PCMs, the extension of the useful life of the building, as well as the development of new PCMs with very low environmental impact, are suggested . The use of PCM in heating and cooling systems in combination with conventional systems can further reduce the environmental impact[14].

## 7. OUTLOOK FOR FUTURE WORKS

Experimental studies conducted in the field would be useful to document the performance and potential of the PCM in a real context. On the basis of these tests in real full-scale buildings, numerical models to assess the advantages and disadvantages of structures with or without PCMs (in advance) could be elaborated.

## 8. CONCLUSION

In this paper, the use of PCMs in building materials was reviewed,especially for passive building systems, with the aim to outline their advantages in terms of thermal effects and thermal efficiency. The main characteristics of PCMs were reported

1. PCMs are generally considered efficient materials that can improve thermal comfort in a building.
2. The selection of the appropriate PCM for a specific construction material and/or a definite application must start from its properties (thermo-physical, chemical, functional, environmental and economic).
3. The most widespread PCMs in building materials are organic in nature and have a melting temperature in a range between 20ºC and 40ºC.
4. The performance of micro-encapsulated PCM and those of pure PCM have been scarce compared so far.
5. Chemical properties, thermal properties, and thermal stability are the main properties analysed for PCMs.

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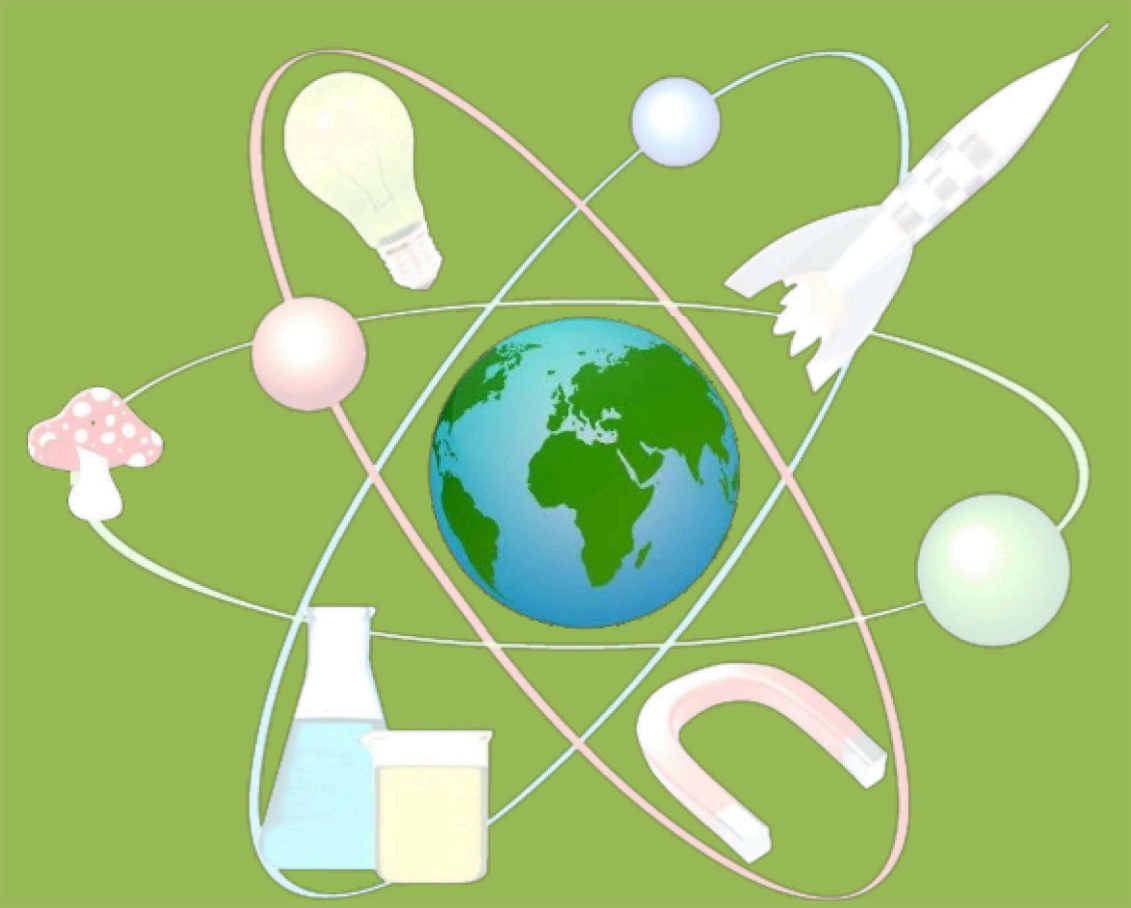
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# CONTENTS


| S. No. | Description | Page No. |
|---|---|---|
| 1. | COMPARATIVE STUDY OF ROUTINE FERTILIZER V/S SOLUBLE SILICA FERTILIZATION<br>*Tasneem Rangwala, Angurbala Bafna, Nagesh Vyas and Rohan Gupta* | 1-6 |
| 2. | BIODIVERSITY AND CONCENTRATION OF AIRBORNE FUNGI IN DIFFERENT LOCATIONS OF INDORE CITY<br>*Deepti Khare, Sanjay Vyas, Shweta Hardia, Anita Mukati, Anuja Sharma and Rashmi Sharma* | 7-10 |
| 3. | REVIEW ON PHASE CHANGE MATERIALS FOR ENERGY EFFICIENCY IN BUILDINGS<br>*Vinay Dashore and V.V.S. Murty* | 11-21 |
| 4. | THE QUANTIFICATION OF MICROORGANISM IN SOIL OF POTATO FIELDS OF INDORE DISTRICT OF MADHYA PRADESH<br>*Reena Sastiya, N.K. Jain and S.M.A. Naqvi* | 22-27 |
| 5. | DNA BARCODING OF FRESHWATER FISHES OF HALALI RESERVOIR TO RESOLVE AMBIGUITY, MISIDENTIFICATION AND CRYPTIC DIVERSITY<br>*Megha vishwakarma, Kiran Billore, R.K Garg, Mahjabeen Qureshi and Ruchi Sharma* | 28-46 |
| 6. | QUANTITATIVE ANALYSIS AND GREEN SYNTHESIS OF IRON OXIDE NANOPARTICLES USING AQUEOUS EXTRACT OF *NEOLAMARCKIA CADAMBA* AND EVALUATION OF ANTIOXIDANT ACTIVITY<br>*Anamika Jain, Bindiya Sharma and Rakhi Mandloi* | 47-53 |
| 7. | SUSTAINABLE WASTE MANAGEMENT IN CEMENT INDUSTRY OF MADHYA PRADESH<br>*Shagufta Khan and D.M.Kumawat* | 54-58 |
| 8. | OPTIMIZATION OF DYEING CONDITION FOR *EUCALYPTUS GLOBULUS* LEAVES EXTRACT WITH NATURAL MORDANTS<br>*Taiyaba Nimra Ansari and Sanjeeda Iqbal* | 59-72 |
| 9. | BUTTERFLY DIVERSITY AT HOLKAR SCIENCE COLLEGE, INDORE (M.P.)<br>*V. K. Sharma* | 73-75 |

ISBN 97881-95911300-8

2013). The problems which we are focusing in our research deals with fungal infection of potatoes, more specifically by Alternaria solani.

## MATERIALS AND METHODS

In present study we have collected the soil samples from rhizosphere and plant root materials as rhizoplane. The sampling were done three times: during seedling stage, peak of vegetative growth and fruiting of potato (October/November to February/March) from potato fields (Depalpur, Sanwar and Indore) of Indore district of Madhya Pradesh. A total of 27 field soils (rhizosphere) and 27 samples of plant root materials (rhizoplane) from three different locations. The collected samples were divided into two parts, one part of each samples were analyzed for bacterial analysis remaining second part of fungal identification. The serial dilution method was opted for the soil bacterial and fungal samples , all the samples were spread on the specified medium agar plates(Nutrient Agar Medium and PDA).

## RESULTS AND DISCUSSION

Bacterial quantification : We have assessed microbial population (Bacterial species) in soil samples ,collected from of the Depalpur ,Indore, and Sanwer tehsils, of Indore district of Madhya Pradesh, India. Total counts of bacteria isolated from the rhizospheric soils and rhizoplane were analyzed using traditional dilution plating method for the quantitative study of microflora were shown in Table 1.

After the quantification of bacteria from rhizospheric soils of Potato fields of all studied tehsil of Indore district of Madhya Pradesh we found the range from $4.46 \times 10^6$ to $7.06 \times 10^6$ CFU $gm^{-1}$ of soil. We could not reported any significant variation when we have compared bacterial distribution in soil samples of among different villages of three tehsils of Indore district but monthly variations were reported in bacterial CFU count in soil samples collected during different growth stages of potato plant. It was reported low ($4.46 \times 10^6$ CFU $gm^{-1}$ of soil) when soil samples collected during the seedling stage and observed high ($7.06 \times 10^6$ CFU $gm^{-1}$ of soil) during the peak of vegetative growth followed during the fruiting stage of potato plant (table), Similar type of results of inhabiting bacterial population occurrence were also recorded by Das and Dkhar (2011). The rhizospheric bacteria compete for nutrients , water, and space and on occasion improve their competitiveness by evolving an cherished association with plant (Hartmann *et al.*, 2009). These bacterial strains play significant roles during the growth and ecological suitability of plant. Plant also promote the surrounding microbial growth via secreting the secondary metabolites, which is the basic need for certain bacterial strains growth hence earlier studies supported the dense colonization of bacteria in rhizospheric area of soil than the non-rhizospheric (Ridder-Duine *et al.*, 2005). When we have compared the microbial quantitative data among the rhizosphere and rhizoplane, we have seen high abundance of bacterial populations in rhizoplane samples, while it were remain lower side in rhizosphere samples, samples were taken from different developmental stages of potato plant viz the seedling stage, the peak of vegetative growth and the fruiting stage of potato plant. Similar results have been documented by Osorio Vega (2007).

### Fungus quantification

During this quantification study of fungus from rhizosphere region and rhizoplane samples of Potato fields of all selected tehsils of Indore district of Madhya Pradesh we reported the range from $2.77 \times 10^3$ to $4.94 \times 10^4$ CFU $gm^{-1}$ in rhizosphere soil. We have been observed slight variation among the fungal species

ISBN 97881-95911300-8

dispersal in soil samples of between different villages of three tehsils of Indore district but on the other hand significant difference were reported in fungus CFU count in soil from rhizosphere region, which were collected during different developmental events of potato plant. It was reported low ($2.77 \times 10^3$ CFU $gm^{-1}$ of soil sample) in soil samples collected during the seedling stage but the count were reported higher side ($4.94 \times 10^4$, $4.89 \times 10^4$) in both stages such as the peak of vegetative growth and the fruiting stage of potato plant (table 2), Almost same pattern of fungal species were earlier documented by bu-Dieyeh *et al*., (2010) they also observed monthly variations in the fungus populations.

The rhizospheric soil populations of fungus underwent a greater shift from seedling stage to flowering stage when compared to bulk soil communities it will recorded low during seedling stage ($3.99 \times 10^4$ ) But found high ($4.31 \times 10^5$, $3.81 \times 10^5$) The peak of vegetative growth and the fruiting of potato. As we know that the substances released by plant roots during its development of plants, called root exudates which affect the biomass and activity of microorganisms, present in rhizosphere area of soil (Raaijmakers *et al.*, 2009). It was reported low ($3.99 \times 10^4$ CFU $gm^{-1}$ of root materials ) when rhizoplane samples collected during the seedling stage and it was recorded highest ($4.31 \times 10^5$ CFU $gm^{-1}$ of soil) during the peak of vegetative growth followed, after the vegetative growth there was slight decline ($3.81 \times 10^5$) have been found in terms of bacterial populations.

## CONCLUSION

The fungal quantitative data among the rhizosphere and rhizoplane, we have reported high abundance of bacterial populations in rhizoplane samples, while it were remain lower side in rhizosphere samples, samples were taken from different developmental stages of potato.

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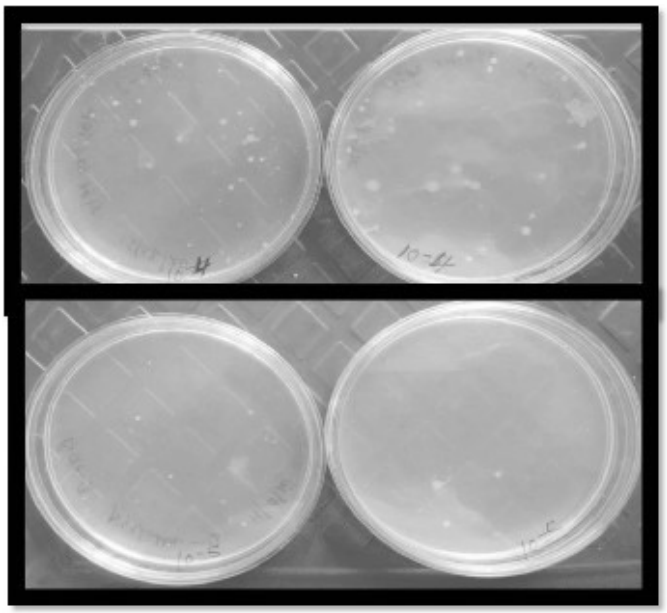


Figure 1: Present representative selected image showing the quantitatively assessment of the bacterial species on nutrient agar media.



Figure 2. Present representative selected image showing the quantitatively assessment of the fungal species on PDA media.

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Table 1 : Bacterial quantification of rhizospheric and rhizoplane soils Potato fields of Indore district of Madhya Pradesh.

| S. No. | Tehsil of Indore District | The seedling stage (10 samples mean value given in this table ) | The peak of vegetative growth (10 samples mean value given in this table ) | The fruiting of potato (10 samples mean value given in this table ) |
|---|---|---|---|---|
| 1 | Villages of Depalpur | $4.33\times10^{6}$ CFU $gm^{-1}$ of soil | $7.33\times10^{6}$ CFU $gm^{-1}$ of soil | $6.33\times10^{6}$ CFU $gm^{-1}$ of soil |
| 2 | Villages of Indore | $5.12\times10^{6}$ CFU $gm^{-1}$ of soil | $7.53\times10^{6}$ CFU $gm^{-1}$ of soil | $6.25\times10^{6}$ CFU $gm^{-1}$ of soil |
| 3 | Villages of Sanwer | $3.92\times10^{6}$ CFU $gm^{-1}$ of soil | $6.32\times10^{6}$ CFU $gm^{-1}$ of soil | $5.73\times10^{6}$ CFU $gm^{-1}$ of soil |
| Average values of all district in different stages | | **$4.46\times10^{6}$** | **$7.06\times10^{6}$** | **$6.10\times10^{6}$** |
| Quantification of rhizoplane soils Potato fields of Indore district of Madhya Pradesh | | | | |
| **S. No.** | **Tehsil of Indore District** | **The seedling stage** (10 samples mean value given in this table ) | **The peak of vegetative growth** (10 samples mean value given in this table ) | **The fruiting of potato** (10 samples mean value given in CFU $gm^{-1}$ of soil) |
| 1 | Villages of Depalpur | $5.43\times10^{6}$ CFU $gm^{-1}$ of soil | $8.48\times10^{7}$ CFU $gm^{-1}$ of soil | $7.21\times10^{7}$ CFU $gm^{-1}$ of soil |
| 2 | Villages of Indore | $6.82\times10^{6}$ CFU $gm^{-1}$ of soil | $8.42\times10^{7}$ CFU $gm^{-1}$ of soil | $7.92\times10^{7}$ CFU $gm^{-1}$ of soil |
| 3 | Villages of Sanwer | $6.27\times10^{6}$ CFU $gm^{-1}$ of soil | $8.12\times10^{7}$ CFU $gm^{-1}$ of soil | $8.87\times10^{7}$ CFU $gm^{-1}$ of soil |
| Average values of all district in different stages | | **$6.17\times10^{6}$** | **$8.67\times10^{7}$** | **$8.00\times10^{7}$** |

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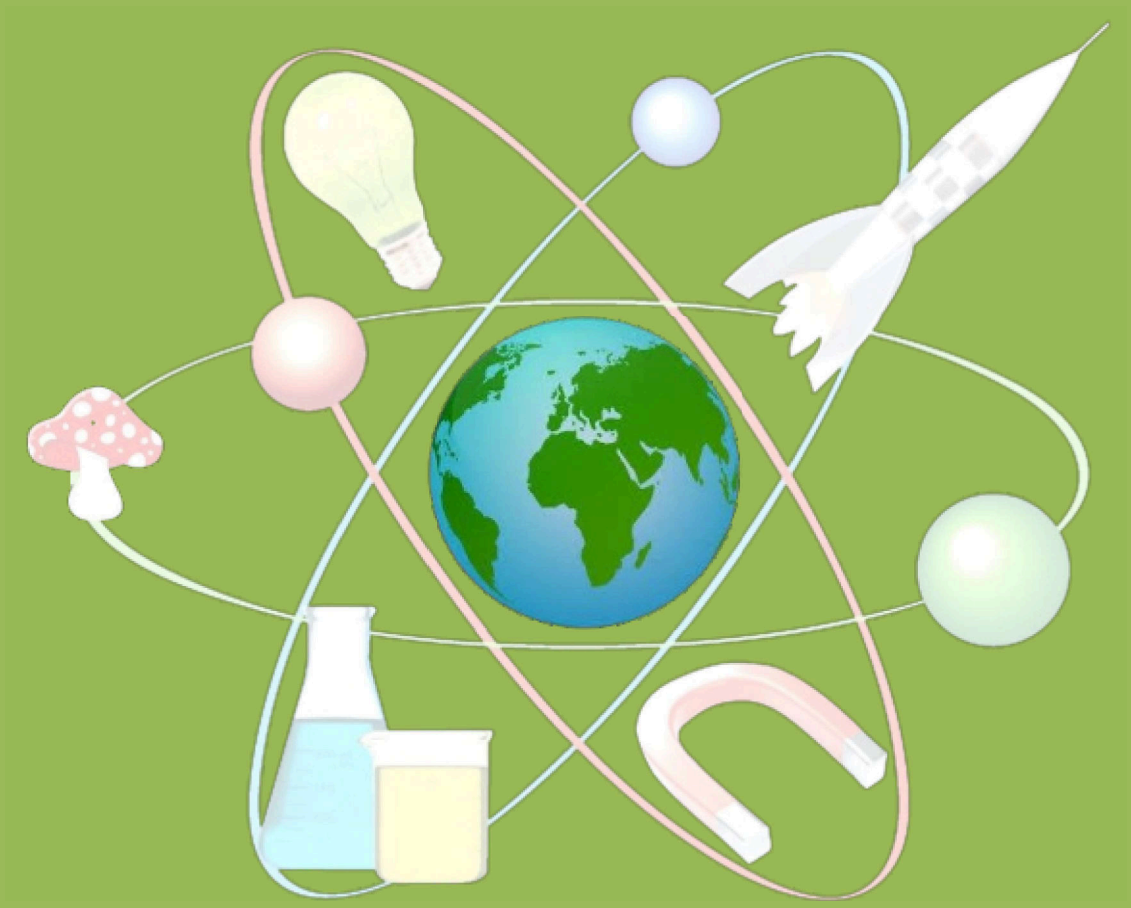
Table 2 : Fungus quantification of rhizospheric and rhizoplane soils of Potato fields of Indore district of M.P.

| **S. No.** | **Tehsil of Indore District** | **The seedling stage** (10 samples mean value given in this table ) | **The peak of vegetative growth** (10 samples mean value given in this table ) | **The fruiting of potato** (10 samples mean value given in this table ) |
|---|---|---|---|---|
| 1 | Villages of Depalpur | $2.50\times10^{3}$ CFU $gm^{-1}$ of soil | $4.57\times10^{4}$ CFU $gm^{-1}$ of soil | $4.28\times10^{4}$ CFU $gm^{-1}$ of soil |
| 2 | Villages of Indore | $3.13\times10^{3}$ CFU $gm^{-1}$ of soil | $5.82\times10^{4}$ CFU $gm^{-1}$ of soil | $5.91\times10^{4}$ CFU $gm^{-1}$ of soil |
| 3 | Villages of Sanwer | $2.67\times10^{3}$ CFU $gm^{-1}$ of soil | $4.44\times10^{4}$ CFU $gm^{-1}$ of soil | $4.48\times10^{4}$ CFU $gm^{-1}$ of soil |
| Average values of all district in different stages | | **$2.77\times10^{3}$** | **$4.94\times10^{4}$** | **$4.89\times10^{4}$** |
| Quantification of rhizoplane soils Potato fields of Indore district of Madhya Pradesh | | | | |
| **S. No.** | **Tehsil of Indore District** | **The seedling stage** (10 samples mean value given in this table ) | **The peak of vegetative growth** (10 samples mean value given in this table ) | **The fruiting of potato** (10 samples mean value given in CFU $gm^{-1}$ of soil) |
| 1 | Villages of Depalpur | $3.33\times10^{4}$ CFU $gm^{-1}$ of soil | $3.58\times10^{5}$ CFU $gm^{-1}$ of soil | $3.75\times10^{5}$ CFU $gm^{-1}$ of soil |
| 2 | Villages of Indore | $4.38\times10^{4}$ CFU $gm^{-1}$ of soil | $4.02\times10^{5}$ CFU $gm^{-1}$ of soil | $3.58\times10^{5}$ CFU $gm^{-1}$ of soil |
| 3 | Villages of Sanwer | $4.25\times10^{4}$ CFU $gm^{-1}$ of soil | $5.33\times10^{5}$ CFU $gm^{-1}$ of soil | $4.11\times10^{5}$ CFU $gm^{-1}$ of soil |
| Average values of all district in different stages | | **$3.99\times10^{4}$** | **$4.31\times10^{5}$** | **$3.81\times10^{5}$** |

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90 / 555

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# CONTENTS


| S. No. | Description | Page No. |
|---|---|---|
| 1. | COMPARATIVE STUDY OF ROUTINE FERTILIZER V/S SOLUBLE SILICA FERTILIZATION<br>*Tasneem Rangwala, Angurbala Bafna, Nagesh Vyas and Rohan Gupta* | 1-6 |
| 2. | BIODIVERSITY AND CONCENTRATION OF AIRBORNE FUNGI IN DIFFERENT LOCATIONS OF INDORE CITY<br>*Deepti Khare, Sanjay Vyas, Shweta Hardia, Anita Mukati, Anuja Sharma and Rashmi Sharma* | 7-10 |
| 3. | REVIEW ON PHASE CHANGE MATERIALS FOR ENERGY EFFICIENCY IN BUILDINGS<br>*Vinay Dashore and V.V.S. Murty* | 11-21 |
| 4. | THE QUANTIFICATION OF MICROORGANISM IN SOIL OF POTATO FIELDS OF INDORE DISTRICT OF MADHYA PRADESH<br>*Reena Sastiya, N.K. Jain and S.M.A. Naqvi* | 22-27 |
| 5. | DNA BARCODING OF FRESHWATER FISHES OF HALALI RESERVOIR TO RESOLVE AMBIGUITY, MISIDENTIFICATION AND CRYPTIC DIVERSITY<br>*Megha vishwakarma, Kiran Billore, R.K Garg, Mahjabeen Qureshi and Ruchi Sharma* | 28-46 |
| 6. | QUANTITATIVE ANALYSIS AND GREEN SYNTHESIS OF IRON OXIDE NANOPARTICLES USING AQUEOUS EXTRACT OF *NEOLAMARCKIA CADAMBA* AND EVALUATION OF ANTIOXIDANT ACTIVITY<br>*Anamika Jain, Bindiya Sharma and Rakhi Mandloi* | 47-53 |
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SCIENCE SPECTRUM VOL. (1) ISSUE (1) 2022 ISBN 97881-95911300-8

# DNA Barcoding of Freshwater Fishes of Halali Reservoir to resolve ambiguity, misidentification and cryptic diversity

*Megha vishwakarma[1], Kiran Billore[1], R.K Garg[2], Mahjabeen Qureshi[1] and Ruchi Sharma[1]*

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**ABSTRACT : Review of Literature -** This review focuses on conservation of fresh water fishes and attempts to revise current knowledge and practices in fish population genetics and molecular markers and their applications in fisheries management, conservation and aquaculture. The technical advances of molecular markers have led to the blossoming of genetic analysis of populations in the last decade; however, the indiscriminate application of genetic markers used for population genetics to conservation genetics can potentially lead to inappropriate interpretations. This is due to the two fields having differences in content (historic/contemporary genetic variation), population size (big/small populations), time window (over past/recent events), and purpose (understanding evolutionary forces/exploring effects of eroded diversity on survival).

## INTRODUCTION

Nearly 30 years ago, single gene sequence analysis of ribosomal DNA was being used to investigate evolutionary relationships at a high level (Woese & Fox 1977), and mitochondrial DNA approaches dominated molecular systematics in the late 1970s and 1980s (Avise 1994). Hebert *et al*., 2003 proposed that a single gene sequence would be sufficient to differentiate all, or at least vast majority of, animal species, and proposed the use of the mitochondrial DNA gene cytochrome oxidase subunit I (cox1) as a global bio identification system for animals. They established that diversity in the amino acid sequences coded by the 5$^{th}$ section of this mitochondrial gene was sufficient to reliably place species into higher taxonomic categories (from phyla to orders). Hybridization among species would create taxonomic uncertainty: mitochondrial DNA is maternally inherited and any hybrid or subsequent generation would have the maternal species DNA only. Mitochondrial DNA is one of the most widely used molecular markers for studying the inter specific and intra species variation in animals (Avies 1986, Billington and Herbert 1988).

Molecular analyses of mt-DNA markers have been extensively used to investigate stock structure in a variety of vertebrates including fish fauna (Avise *et al*., 1986; Graves *et al.*, 1992), birds (Barker and Marshall, 1997), (Greenberg, 1998), mammals (Menotti-Raymond and O'Brien, 1991) and reptiles (Serb *et al.,* 2001). On the other hand, (Nagl *et al.,* 2001) has point out that, mt-DNA analysis is not of much help in the help in the resolution of phylogenetic relationship among the groups. However, despite the general lack of resolution of the deep brain chip patterns, the phylogenetic analysis of the tilapinines allows us to make inferences about two controversial issues the evolution of reproductive behavior and the adaptation life under extreme conditions.

The sequence analysis of 46 samples collected from 12 geographic locations identified 16 cytochrome

ISBN 97881-95911300-8

b haplotype, to be used as molecular markers for conservation planning (Zhang & Jiang, 2006). Partial cytochrome b based molecular analysis of genetic distances has revealed that there is considerable genetic divergence between the Korean goral and the Chinese goral, but virtually none between Korean and Russian gorals (Min *et al*., 2004). Mitochondrial cytochrome oxidase 1 (COI) gene has recently gained more attention in developing DNA barcodes for species identification and biodiversity analysis.

**Paul D. N. Hebert M *et al.,* (2003)** studied and stated with millions of species and their life-stage transformations, the animal kingdom provides a challenging target for taxonomy. Their work suggested that a DNA-based identification system, founded on the mitochondrial gene, cytochrome c oxidase subunit 1 (COI), can aid the resolution of this diversity. While past work has validated the ability of COI sequences to diagnose species in certain taxonomic groups, the present study extends these analyses across the animal kingdom. The results indicate that sequence divergences at COI regularly enable the discrimination of closely allied species in all animal phyla except Cnidaria. This success in species diagnosis reflects both the high rates of sequence change at COI in most animal groups and constraints on intraspecific mitochondrial DNA divergence arising, at least in part, through selective sweeps mediated via interactions with the nuclear genome.

**Wong and Henner (2008)** Report the recent DNA barcoding has gained considerable support as a rapid, cost-effective and broadly applicable tool for species identi- fication. DNA barcoding targets a small standardized fragment of the cytochrome *c* oxidase I (COI) mitochondrial gene (Hebert, Cy- winska, Ball, & deWaard, 2003; Hebert, Ratnasingham, & DeWaard, 2003) and as a molecular diagnostic technique, holds great prom- ise (Dasmahapatra & Mallet, 2006). The target 650 base pair frag- ment located at the $5^0$ end of the COI gene is PCR amplified and sequenced to produce reference sequences or "DNA barcodes" that act as molecular identification tags for each species profile. DNA barcoding employs a standardized methodology to populate a pub- licly accessible database for species identification, one that is ac- tively curated and explicitly derived from expert-identified reference materials. The scale of species coverage envisioned and the subsequent scope of potential applications to be supported dis-tinguish DNA barcoding from previous molecular approaches. In 2005, fishes were selected as primary targets for global barcode coverage because of their socio-economic importance and more than 5000 species have currently been profiled. A growing body of literature on DNA barcoding demonstrates that the relatively short fragment of COI used for barcoding contains enough variation to accurately identify a large variety of animals to the species level (Waugh, 2007). This includes both freshwater (Hubert et al., 2008) and marine fishes (Rock et al., 2008; Spies, Gaichas, Stevenson, Orr, & Canino, 2006; Ward, Holmes, White, & Last, 2008; Ward, Zemlak, Innes, Last, & Hebert, 2005).

**Francisco Prosdocimi *et al*., 2011** report the complete sequence of mitochondrial genomes for two sister taxa of freshwater teleosts, the recently derived Yarra pigmy perch Nannoperca obscura and the southern pygmy perch Nannoperca australis. These represent the first complete mitochondrial genomes for Percichthyidae (Perciformes), a family mostly distributed in Australia.

Mitochondrial DNA has a number of specific biological properties, which should make it an appropriate marker of molecular biodiversity. First, its

ISBN 97881-95911300-8

inheritance is clonal (maternal), which means that the whole genome behaves as a single, non-recombining locus- all sites share a common genealogy. This considerably simplifies the representation and analysis of within-species variation data. Secondly, mt-DNA has been supposed to evolve in a nearly neutral fashion. Being involved in basic metabolic functions (respiration), mitochondrial-encoded genes have been considered as less likely than other genes to be involved in adaptive processes (N. Galtier *et al*., 2009). For many animal taxa, sequence divergences within the 5′ region of the mitochondrial cytochrome oxidase subunit I (COI) gene were much greater between species than within them, and this in turn suggests that the approach is widely applicable across phylogenetically distant animal groups. Herbert argued that sequence diversity in this gene could be used to create a Barcoding system that would enable identification of all living animal life. COI has a faster evolutionary rate (Simons *et al.,* 1994). Within vertebrates, a cytochrome b (cyt b) gene in the mitochondrial DNA has been studied from multiple viewpoints including the nucleotide diversity among species (Hsieh HM *et al.,*2001) and the availability of nucleotide sequence data for reference (Parson W *et al*.,2000). Many of the other regions studied are also located in the mt-DNA. The coding regions for 12S and 16S ribosomal RNA (Balitzki-Korte B, Rodrı´guez MA *et al*., 2004:2005) and the noncoding D-loop region (Murray BW, Montiel-Sosa JF, Ramadan HAI *et al.,* 2000:08) have shown their potential to be the target for the species test. Recent investigations have suggested the feasibility of creating identification systems reliant on the analysis of sequence diversity in small segments of DNA (Tautz *et al*., 2003). DNA sequencing with key sequence serving as a pattern "barcode" has therefore been proposed as a technology that might expedite species identification (Waugh J: 2007). Besides the COX1 gene, other mitochondrial markers also have been widely sequenced across vertebrates for the utility in phylogenetic or to complement cox1 in DNA barcoding (Hassan A.I.Ramadan and Nabih A.Baeshen).

**Nicole *et al.,* 2011** studied Animal DNA barcoding allows researchers to identify different species by analyzing a short nucleotide sequence, typically the mitochondrial gene cox1. They used DNA barcoding to genetically identify seafood samples that were purchased from various locations throughout Italy. They adopted a multi-locus approach and analyzed the cob, 16S-rDNA and cox1 genes, and compared our sequences to reference sequences in the BOLD and GenBank online databases. Method is a rapid and robust technique that can be used to genetically identify crustaceans, mollusks and fishes. This approach could be applied in the future for conservation, particularly for monitoring illegal trade of protected and endangered species. Additionally, this method could be used for authentication in order to detect mislabeling of commercial processed seafood.

The cox1 gene, which encodes for the cytochrome oxidase subunit I, was originally proposed to be a specific mitochondrial marker for animal DNA barcoding. Researchers identified a 648-nucleotide sequence near the 5' end of the gene that could be amplified and sequenced with a pair of universal primers for a wide range of animal species (Folmer, Simmon, Rach *et al*., 2001-08). Molecular identification based on cox1 sequencing has provided reliable results for several animal groups that have been tested (Lin *et al*., 2005), and has also been expanded to include high resolution at the species level for fish (Hogg et al., 2004). Based on these encouraging results, the barcoding community has established a Fish-BOL (Fish Barcode of Life) initiative that seeks to assemble a comprehensive

ISBN 97881-95911300-8

reference system based on cox1 sequencing for all of the estimated 20,000 marine and 15,000 fresh-water fish species (http://www.fishbol.org/index.php).

Accurate and unambiguous identification of fish and fish products, from eggs to adults, is important in many areas. It would enable retail substitutions of species to be detected, assist in managing fisheries for long-term sustainability, and improve ecosystem research and conservation. Hitherto, a wide variety of protein- and DNA-based methods have been used for the genetic identification of fish species (Ward & Grewe 1994; Pe´rez-Martin & Sotelo 2003). Here they examine cox1 diversity within and among 207 fish species, most of which have been examined from multiple specimens, with the goal of determining whether DNA barcoding can achieve unambiguous species recognition in fish. Most of the species examined were Australian commercial species, but many more such species and by catch, species remain to be barcoded.

An attempt was made to present a phylogenetic systematic framework for an improved barcode as well as a taxonomic framework for interweaving classical taxonomy with the goals of 'DNA barcoding' (De salle *et al.,* 2005). According to Hajibabaei *et al*., 2005 study showed that DNA arrays and DNA barcodes are valuable molecular methods for biodiversity monitoring programs (hajibabaei M *et al.,* 2007). Currently records are available for 41771 fishes, representing 6566 fish species on the Barcode of Life Data System; BOLD (Ratnasingham and Hebart, 2007).

**Negrisolo *et al*., 2011** has stated that the marker that had the highest number of positive and unambiguous matches was the Cox1 gene; of the 37 samples, 26 matched the reference sequences in the GenBank database and 21 matched the reference sequences in the BOLD database. This actual number of matched samples may be lower than expected because there were problems with identifying the various species of tuna, which could only be placed into the appropriate genus. With the 16S-rDNA data we were able to identify the species for 28 of the samples, although nine of these matches produced equal identity scores for more than one species. In contrast, the cob gene was the least reliable marker and only identified the species of 21 products, five of which had equal scores for several species. Although cob was originally thought to be an optimal marker for phylogenetic and forensic studies in animals, new international studies have begun to use the cox1 gene instead. Five samples could not be identified by their cob sequence because the reference sequence was unavailable in GenBank. This problem was much more frequent with cob rather than cox1 or 16S-rDNA as only two 16S-rDNA and four cox1 sequences were unavailable in GenBank and BOLD, respectively.

A phylogenetic approach based on construction of a Neighbor-Joining tree with validated cox1 reference sequences was employed to validate the results from the similarity searches. In the NJ tree, samples that belong to the same species are clustered in the same monophyletic group; the exceptions are the Thunnus, Macruronus and Gadus species, which had poor resolution of the species clusters. The majority of samples that we collected were grouped with the species listed on the label; however, a few species had a cox1 sequence that clustered them with a different species, indicating that the food samples were either substituted or mislabeled.

It has been proposed that a single gene sequence of the cytochrome *c* oxidase subunit I gene could serve as the basis for a global identification system for animals (Herbet *et al.,* 2003). The suggestion was that each species would be delineated by a particular sequence or a tight cluster of very similar sequences.

ISBN 97881-95911300-8

The first reading frame region up to 655 base pair of vertebrate cox1 of 1545 total length base pair has been nominated as a barcode region. Support for the barcoding concept ranges from invertebrates (springtails and butterflies) up to birds. Studies in barcoding have now been published for a diverse array of animals like amphibians (Vences *et al*., 2005), ants (Smith *et al*., 2005), birds (Stoeckle *et al.,* 2004), collembolans (Hogg *et al.,* 2004),fishes (Ward *et al*., 2005), flies (Smith *et al.,*2006), moths and butterflies (Ball *et al*.,2006) and Spiders (Barrett *et al.,*2005). For barcoding to succeed in species identification, the nucleotide sequences within the species need to be more similar to one another than the sequences in different species. In particular, the mitochondrial gene cytochrome *c* oxidase subunit 1 can serve as a uniform target gene for a bio identification to complete the taxonomic data and global validation of systemic position, phylogeny and food traceability in trade monitoring.

**Sati *et al*., 2012** examined the phylogenetic relation and identification of five mahseer species (*Tor putitora, Tor tor, Tor khudree, Tor chelynoides, and Neolissochilus hexagonolopis*) using partial sequence of cytochrome oxidase 1(COI) DNA barcodes. The data analysis showed that 134 (21.61%) sites out of 628 sites were variable without insertion or deletion. Rates of transition (70.5%) were higher than transversion (29.41%). There was a high inter-species divergence (range 4.1% to 12.2%) in Mahseer species as compared to intra species sequence divergence (1.7% for Tor *putitora*, 1.2% for *Tor tor, 1.4%* for *Tor khudree, 3.0% for Tor chelynoides, 0.26% for N.hexagonolopis*). The phylogenetic tree, constructed by maximum parsimony, maximum likelihood and unweighted pair group average methods revealed similar results suggesting that *T.putitora, Tor tor, Tor khudree* had a close relationship to each other while maximum divergence was observed in T. *chelynoides* which was also confirmed by the genetic distance data. The result indicates that COI sequencing and barcoding is useful in unraveling phylogenetic relationships and identification of Mahseer species.

**Hyung-Bae Jeon *et al*., 2012** used the cytochrome c oxidase subunit 1 (COI) sequences from 144 species of gobies and related species to evaluate the performance of distance-based DNA barcoding and to conduct a phylogenetic analysis. Significantly more nucleotide changes were observed at the third codon position than that at the first and the second codons, revealing that extensive variation in COI reflects synonymous changes and little protein level variation. Despite clear signatures in several genera, the COI sequences did resolve genealogical relationships in the phylogenetic analysis well. Our results support the validity of COI barcoding for gobiid species identification, but the utilization of more gene regions will assist to offer a more robust gobiid species phylogeny.

**Torgunakova *et al.,* 2012** studied the polymorphism of three mitochondrial genes of the cytochrome oxidase complex (Cox 1, Cox2 and Cox3) in natural populations of wild carp living in the Volga, Amur and Don river Basin. The highest level of nucleotide and haplotype in the diversity in the studied sample was detected for the Cox 1 gene.

**Krishnamurthy and Francis (2012)** Report the one of the arguments for promoting DNA barcoding initiatives is that genetic data have the potential to enhance conservation strategies, and indeed molecular tools are used in con- servation biology to inform at different levels of analysis (Haig 1998; DeSalle and Amato 2004). For conservation biology, genetic tools can aid in research as diverse as fine-scale management of coral reefs (Neigel et al. 2007), identification of

ISBN 97881-95911300-8

cryptic and invasive species (Ball and Armstrong 2006; Stoeckle 2008) and regional management of fisheries (Schander and Willassen 2005; Swartz et al.). DNA barcoding, in particular, can contribute to conservation policy in two important ways: by speeding up local biodiversity assessments to prioritise conservation areas or evaluate the success of conservation actions, and by providing information about evolutionary histories and phylogenetic diversity.

**Kim *et al.*, (2012)** stated that in recent years, the DNA barcoding has been exploited for both phylogenetic (research) and commercial (legal) purposes in many taxa, not only fishes but also crustaceans and mollusks. In fact, if it is true that DNA barcoding was initially exploited almost exclusively for biodiversity studies in marine organisms, it is also true that more recently DNA barcoding was also proposed for genetic traceability of seafood products (56-67). Moreover, barcodes have been used for population and conservation genetics, phylogeographic studies, detection of invasive species, forensics, and seafood safety (56 and citations herewith). More controversially, barcodes have been adopted to delimit species boundaries, reveal cryptic species, and discover new species.

**Ravichandirane *et al.*, (2012)** had studied in threadfin breams, its molecular identification and phylogenetic relationship using mt-DNA markers. Cytochrome C Oxidase I gene sequence of mitochondrial genome was analysed for species identification and phylogenetic relationship among the commercially important Nemipterus species. Sequence analysis of the COI gene clearly indicated that all the nine fish samples fell into distant clads, which are generally distant from each other and exhibited phylogenetic reservation. This study proves the use of mt-DNA COI gene sequence-based approach is an alternative tool for identifying fish species at a faster pace.

**Maloyjo J. Bhattacharjee *et. al,* (2012)** A total of 75 native catfish specimens were collected from across northeast India and their morphological characteristics were compared with taxonomic keys. The detailed taxonomic study identified 25 species belonging to 17 genera and 9 families. The genetic portion of the 1 cytochrome oxidase c subunit of the samples was then sequenced according to standard DNA coding protocols. The sequences were compared with public databases, namely GenBank and BOLD. The sequences developed in the present study and from databases of the same taxa and related taxa were analyzed to calculate the congenital and conspecific genetic divergences using the 2-parameter Kimura distance model, and a Neighbor Joining tree was created using the MEGA5 software. 1. The DNA barcode approach described 21 different species that showed 4.33-fold differences between the closest congeners. Four species, namely Amblyceps apangi, Glyptothorax telchitta, G. trilineatus and Erethistes pusillus, showed a high conspecific divergence; therefore, their identification by molecular approach remained inconclusive. On the other hand, the database sequences for three species, namely Mystus horai, Bagarius yarrelli and Clarias batrachus, appeared to be mislabeled.

**Nicolè *et al.,* (2012)** DNA barcoding can be applied to several fields, including biodiversity monitoring (*e.g.* taxonomic, eco- logical and conservation studies) and forensic science. Additionally, DNA barcoding can be used to identify organisms that lack distinctive morphological features *i.e.* in the larval stage or because of homoplasy and phenotypic plasticity of a given diagnostic character to environmental factors. Moreover, DNA barcoding could be used to monitor the illegal trade of wildlife, such as protected or endangered species or to identify

ISBN 97881-95911300-8

the species origin of commercially processed food. Application of DNA barcoding for food authentication has recently gained attention because of food safety concerns, including incorrect food labeling, food substitutions or recent food contamination. Proper identification of species contained in food is important for protecting consumers against potential food adulteration, ingredient mislabeling, GMOs or food poisoning. According to the U.S. Food and Drug

Administration(*http://www.fda.gov/Food/FoodSafety/ProductSpecificInformation/Seafood/RegulatoryFishEncyclo-pediaRFE/ucm071528.htm*), fish substitutions in seafood derivatives are becoming increasingly common; thus, ana- lytical methods to verify food labeling are needed.

**Taylor and Harris (2012)** More pertinently, although the concept and applica- tion of DNA barcoding are simple, there is, as yet, no solid system in place to deal effectively with the enormous volumes of data this field is generating in its attempts to create a genetic reference library (Lucking 2008; Packer *et al.* 2009). The advent of high-throughput next generation sequencing (NGS) technology is already ushering in a new era for molecular ecology (Ellegren 2008) by making rapid access to fully sequenced genomes a distinct possibility. With such technology becoming increasingly accessible (Kircher & Kelso 2010), this avail- ability of data from the entire genome has obvious impli- cations for surrogate measures such as DNA barcoding and it will be important for its proponents to find a way to evolve their methods to encompass these new devel- opments.

The aim of this review is to examine the progress made thus far by the still relatively new field of DNA bar- coding. In doing so, this review also considers the capac- ity and the motivation of the DNA barcoding movement to evolve in response to the challenges of its critics and explores whether it has the potential to meet the decid- edly heavyweight challenge of obsolescence posed by NGS technology.

**Zainal et al., (2013)** DNA barcoding has already been applied in many ani- mals such as birds (Hebert et al. 2004b), springtails inver- tebrates (Hogg and Hebert 2004), skipper butterflies (Hebert et al. 2004a), blowflies (Whitworth et al. 2007), leaf beetles (Jurado-Rivera et al. 2009), nematodes (De Ley et al. 2005), amphibians (Vences et al. 2005a), ants (Smith et al. 2005), crustaceans (Lefébure et al. 2006), and scuttle flies (Boehme et al. 2010). In addition, DNA barcodes have been obtained for more than 8000 species of fish and the COI sequences deposited in the Barcode of Life Data Systems (BOLD) online workbench and repos- itory (Ragnasingham and Hebert 2007).

Kottelat and Whitten (1996) reported that among the east-, south-, and southeast Asian nations, Indonesia has the largest number of freshwater fishes (1300), of which 114 species occur in Aceh waters (Muchlisin and Siti- Azizah 2009). Unfortunately none of those species have been barcoded. Hence, the presently reported study exam- ined the patterns of DNA sequences of freshwater fishes from Lake Laut Tawar based on the barcoding cytochrome oxidase subunit I (COX1) gene. The fish fauna in Lake Laut Tawar is unique due to its geographical isolation and environmental conditions and therefore, the greater likeli- hood of species endemism, for example *Rasbora tawaren- sis* Weber et de Beaufort, 1916 and *Poropuntius tawaren- sis* (Weber et de Beaufort, 1916) (see Muchlisin and Siti- Azizah 2009, Muchlisin et al. 2012). Currently, the indige- nous fish populations in Lake Laut Tawar, Indonesia are threatened by both biological- and physical factors, i.e., presence of introduced species, pollution, overharvesting, and habitat loss. Unfortunately, very limited information

ISBN 97881-95911300-8

on fish populations in Lake Laut Tawar is available. In many situations, genetic data are the best way to deter- mine whether a species is worth a special protection under the Endangered Species Act (ESA) or other form of con- servation status (Matoso et al. 2004), as it allows calculat- ed decisions on the best course of action to be taken for protection and conservation (Leuzzi et al. 2004) as well as managing different stocks (Salini et al. 2006).

**Yong-Yi Shen *et al.*, (2013)** had made an attempt and stated that DNA barcoding is a powerful tool for identifying and confirming species and one very important application involves forensics. They studied and used DNA barcoding to detect erroneous sequences in Gene Bank by evaluating deep intraspecific and shallow interspecific divergences to discover possible taxonomic problems and other sources of error. They use mitochondrial DNA gene encoding cytochrome b (Cyt b) from turtles to test the utility of barcoding for pinpointing potential errors. This gene is widely used in phylogenetic studies of the species group. Intraspecific variation is usually less than 2.0% and, in most cases, it is less than 1.0%. In comparison, most species differ by more than 10.0% in our dataset. Overlapping intra-specific and interspecific percentages of variation mainly involve problematic identifications of species and outdated taxonomies. Further, they detect identical problems in Cytb from Insectivora and Chiroptera. Upon applying this strategy to 47,524 mammalian Cox I sequences; they resolve a suite of potentially problematic sequences. Their study reveals that erroneous sequences are not rare in Gen Bank and that the DNA barcoding can serve to confirm sequencing accuracy and discover problems such as misidentified species, inaccurate taxonomies, contamination, and potential errors in sequencing.

**Donna-Mareè Cawthorn *et al*., (2013)** aimed to investigate the utility of DNA barcoding for the identification of a variety of commercial fish in South Africa and, in so doing, to estimate the prevalence of species substitution and fraud prevailing on this market. A ca. 650 base pair (bp) region of the COI gene was sequenced from 248 fish samples collected from seafood wholesalers and retail outlets in South Africa, following which species identifications were made in the Barcode of Life Database (BOLD) and in GenBank. DNA barcoding was able to provide unambiguous species-level identifications for 235 of 248 (95%) samples analyzed.

**Chakraborty, and Ghosh (2013)** suggested that India is rich in fishery resources and comprises around 2508 fish species (Eschmeyer and Fricke, 2012) of which 856 are freshwater inhabitants (Froese and Pauly, 2012; Menon, 1999). Indian freshwater fishes represent about 8.9% of the known fish species of the world and occupy the ninth position in terms of freshwater fish diversity (Leveque et al., 2008). We have analyzed1383 barcode sequences of 175 Indian freshwater fish species available in the databases, of which 172 sequences of 70 species were generated. Overall, 87% of the available, Indian freshwater fish barcodes were diagnosed as true species in parity with the existing checklist and can act as reference barcodes for the particular taxa. DNA barcoding has been extensively used for species identification as well as species discovery in various groups of organisms (Hajibabaei, 2012; Mendonca et al., 2012). It has gained wide popularity with over 1000publications in less than a decade's time. Effectiveness of DNA barcoding has now been validated for many groups of animals (Waugh, 2007), both invertebrates and

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vertebrates (Hajibabaei et al., 2006a,b; Hebert et al., 2004; Hernandez-Davila et al., 2012), with fishes being one of the most extensively studied groups among them (Becker et al., 2011; Ward, 2012). These studies have generated a large scale of barcode data that is available in bold (Ratnasingham, 2007) and NCBI.

A total of 363 individuals, representing 109 morphologically identified species, were barcoded by amplification and nucleotide sequencing of the partial 5′ region of the COI mitochondrial gene. The entire dataset of 363 COI sequences was represented by 109 species, 57 genera, 22 family and 7 orders. Out of 109 species, 37 were represented by single specimens.

**John Kress, *et al., (2014)*** Studied that the DNA barcodes, which are short gene sequences taken from a standardized portion of the genome and used to identify species, is entering a new phase of application as more and more investigations employ these genetic markers to address questions relating to the ecology and evolution of natural systems. The application of next- generation sequencing technology will greatly expand the versatility of DNA barcodes across the tree of life, habitats and geographies as new methodologies are explored and developed. An extensive DNA barcode study on microgastrinae wasps demonstrated significant insights into their taxonomy and species discovery (Smith *et. al.*, 2012). Cryptic diversity has been uncovered using DNA barcodes in other animal taxa, including crustaceans, diatoms and fish (Silva, E.D. *et al.*, 2014). The use of DNA barcodes for the discovery of new species is emerging as a powerful tool to clarify species boundaries and the quantify species diversity (Costion, C. *et.al.*,)

**Khedkar *et al.*, (2014)** Studied that the DNA barcoding was employed using COI gene sequences as a supplemental identification method. This study describes the species diversity of fishes of the Narmada River in India. A total of 820 fish specimens were collected from 17 sampling locations across the whole river basin. Fish were taxonomically classified into one of 90 possible species based on morphological characters, a total of 314 different COI sequences were generated, and specimens were confirmed to belong to 85 species representing 63 genera, 34 families and 10 orders. DNA barcoding (Hebert PDN 2007) relies on the sequencing and comparison of a standardized portion of the genome to aid in specimen identification and species discovery. The analysis of DNA sequence variation in the cytochrome *c* oxidase subunit 1 (COI) region of mtDNA has proven highly effective for the delineation and identification of animal species in general and fish in particular (Teletchea, & Fontain 2010).Our study represents the first molecular survey of diversity using COI barcode data of freshwater fishes for whole Narmada River system in India. This includes generation of COI barcodes for 83 fishes out of 85 samples (~98%) and the inference of five putative new species based on genetic data. Our study confirms that employing COI barcoding can help in the identification of the majority of fish species in diverse river systems. Increasing use of DNA barcoding can overcome the limitations of morphology-based identifications and help identify previously unidentified species by documenting the diversity of COI sequences within currently recognized species.

**Asmaa *et al.*, (2014)** suggested that DNA can be obtained even from highly processed food (Teletchea, Maudet, & Hanni, 2005). DNA barcoding is one of the most widely used and effective methods in food traceability. It is based on the sequence diversity of a short DNA region (DNA barcode) in the genome that possesses a high interspecific, but low intraspe- cific, variability for reliable differentiation between species (Galimberti *et al.*, 2013). Several markers have already been used for fish authentication (Wen *et al.*, 2010). The usage of the mito- chondrial

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gene cytochrome oxidase I (COI) was first suggested by Hebert, Cywinska, Ball, and deWaard (2003) as the core of a global bioidentification system for animals. The COI barcode region (around 650 base pairs (bp)) is relatively conserved between species but at the same time shows sufficient variation to allow species differentiation (Rasmussen Hellberg & Morrissey, 2011). It is noteworthy mentioning that cytochrome oxidase I (COI) has become an effective barcode (Hajibabaei *et al.*, 2006) widely used in various accurate fish and shellfish identification studies, such as cyprinids, groupers, salmon, crabs, cusk-eels, lutjanidae and snake- heads (& Hwang, 2012; Chiu, Su, Pai, & Chang, 2012;

**Vidya *et al.*, (2015)** Reported the use of DNA in forensics has grown rapidly for human applications along with the concomitant development of bioinformatics and demographic databases to help fully realize the potential of this molecular information. Similar techniques are also used routinely in many wildlife cases, such as species identification in food products, poaching and the illegal trade of endangered species. The use of molecular techniques in forensic cases related to wildlife and the development of associated databases has, however, mainly focused on large mammals with the exception of a few high-profile species. There is a need to develop similar databases for aquatic species for fisheries enforcement, given the large number of exploited and endangered fish species, the intensity of exploitation, and challenges in identifying species and their derived products. A 500 bp fragment of the mitochondrial cytochrome b gene from representative individuals from 26 harvested fish taxa from Ontario, Canada, focusing on species that support major commercial and recreational fisheries sequenced. Ontario provides a unique model system for the development of a fish species database, as the province contains an evolutionarily diverse array of freshwater fish families representing more than one third of all freshwater fish in Canada. Inter and intra specific sequence comparisons using phylogenetic analysis and a BLAST search algorithm provided rigorous statistical metrics for species identification. (Kyle CJ., et.al. 2007).

**Gianni *et al.*, (2015)** Suggested that DNA barcoding is a taxonomic method that uses a short genetic marker from a standard part of the genome of an organism's DNA to identify it as belonging to a particular individual, breed/cultivar, or species. It represents an essential tool to vouch for quality controls of food products, to guarantee food traceability, to safeguard public health, to minimize food piracy, and to valorize local and typical agro-food production systems.

In general, DNA barcoding is based on the amplification of short DNA fragments belonging to the mitochondrial (animal foodstuffs) or chloroplast (plant foodstuffs) genomes, which are conserved at the species levels and preserved in most of the processed food products, then showing these advantages as compared to other DNA fingerprinting and genotyping approaches. DNA barcoding can be used on both fresh and raw materials for species authentication, species delimitation, and identification from different individual parts where other methods of characterization usually fail. Moreover, DNA barcoding can be applied to distinct food products and matrices deriving from single or mixed species, producing species-specific DNA sequences (*i.e.*, barcodes). In this way this methodology could be used to discover voluntary or accidental replacements associated with foods mislabeling and commercial frauds.

**Shen *et al.*, (2016)** Studied that the Species

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identification is the most significant task in many fields of biological research and conservation efforts. Traditional morphological identification is not fully effective for eggs, fry, and adults lacking distinctive morphological characteristics. Moreover, the number of specialists in alpha taxonomy is insufficient for conve- nient and complex morphological identification (Carvalho et al. 2011, 2015). Thus, rapid, reliable, and reproducible molecular tests to identify fish species are needed in many areas (Rasmussen and Morrissey 2009; Steinke et al. 2009). One proposed method is DNA barcoding, which uses the mtDNA gene cytochrome oxidase subunit I (COI) as a global DNA barcoding identification system for animals (Hebert et al. 2003a,b). Sequences for the same species are generally considered to be correctly identified when they form a monophyletic cluster on a neigh- bor-joining (NJ) tree with intraspecific distances that are below a given threshold (Srivathsan and Meier 2012). At present, this approach has proven to be highly efficient and reliable in many fish groups (Ward et al. 2005; Hubert et al. 2008, 2010; Rock et al. 2008; Keskin et al. 2013; Loh et al. 2014) and is regularly used for a variety of applications, such as fishery management, biodiversity assessments and conservation (Triantafyllidis et al. 2011; Weigt et al. 2012; Keskin et al. 2013; Loh et al. 2014; Shen et al. 2016).

**Sarma1, and Mankodi (2017)** Studied that, taxonomic identification has been done for few of the species and DNA barcoding has been attempted to strengthen the identification. This modern approach led us to the present study in which the classification of 52 species of the freshwater species found in selected six districts of Gujarat. 38 species of freshwater fishes, all belonging to the class Actinopterygii, were discriminated sequences (barcoded) for a 655bp region of the mitochondrial cytochrome oxidase subunit I gene (cox1).Indian freshwater fishes represent about 8.9% of the known fish species of the world and occupy the ninth position in terms of freshwater fish diversity (Levêque*et al.,* 2008). DNA barcoding has been extensively used for species identification as well as species discovery in various groups of organisms (Hajibabaei *et al.,* 2012). Efficacy of barcoding has now been approved for many groups of animals (Waugh, 2007), both invertebrates and vertebrates (Hajibabaei, *et al.,* 2006; Herbert, *et al.,* 2004; Hernández- Dávila, *et al.,* 2012), with fishes being one of the most extensively studied groups among them (Becker, *et al.,* 2011; Ward, 2012). Many successful nationwide studies on ichthyofaunal diversity have been undertaken using this method for both marine and freshwater fishes (Lakra, *et al.,* 2011; Bhattacharjee, *et al.,* 2012; Chakraborty and Ghosh, 2014). Furthermore, these studies have also generated a large scale of barcode data that are available in BOLD (Ratnasingham & Hebert, 2007a) and NCBI (http://www.ncbi.nlm.nih.gov).

**Raja and Achiappanperumal (2017)** reported that DNA barcoding is an effective tool for the identification of species representing diverse taxa especially through the sequence analysis of mitochondrial cytochrome c oxidase subunit I (COI) gene. In the present study, DNA barcodes were generated from 46 species of freshwater fishes covering the Orders *Cypriniformes*, *Siluriformes*, *Synbranchiformes* and *Perciformes* representing 30 genera under 9 families. All the samples were collected from diverse sites which also includes some endemic species. A total of 47 COI sequences were generated. The present study strongly supports the efficiency of COI as an ideal marker for DNA barcoding of selected freshwater fishes. DNA barcoding is a promising technique for species identification using a short mitochondrial DNA sequence of COI gene (Lakra WS,

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Singh M *et al*,.2015). This technique involves the analysis of the sequence diversity of a 50 segment mitochondrial COI gene to identify species (Hebert PD *et al* 2004) DNA barcoding method has been extensively followed for species identification as well as species discovery in various groups of organisms (Hajibabaei M 2012). During DNA barcoding by Hebert et al. (Hebert PD et al 2003) the sequencing of a ~650bp region of the mitochondrial cytochrome oxidase I gene (COI), has been proven to be extremely an effective method for discriminating fish species (Lakra WS, Verma M S*et al*,.2011). DNA barcoding analysis has clearly discriminated against freshwater fish species from India, Canada and Mexico and Guatemala.

**Ayesha *et al.,* (2017)** View of DNA barcoding is an advanced and efficient method for species identification. Various set of primers of mitochondrial gene for barcoding are available in published data. Researchers can also design primers by using different software, for example, PRiFi (Fredslund et al. 2005), BARCRAWL BARTAB (Frank 2009) and Primer-Blast (Ye et al. 2012). A good primer of a specific gene is basic key of success in PCR protocols. The translated sequences of unidentified samples after sequencing can be easily aligned by using various downloadable software or even online, such as ExPASy which is Sib information resource portal (Artimo et al. 2012) (www.expasy.org/genomics/sequence_alignment), MEGA version 6.06 (Tamura et al. 2013) (www.megasoftware.net) and MAFFT version 7 (Katoh and Sandley 2013) (http://mafft.cbrc.jp/alignment/software).

**Barman *et al.,* (2018)** Suggested that, DNA barcoding proposed the method of molecular taxonomy or systematic, employing standardized and authenticated DNA based approach to provide accurate and automated species identification, using nucleotide sequence of partial region of mitochondrial gene, i.e. cytochrome oxidase I (COI) (Hebert, P.D., Ratnasingham 2003). DNA barcoding is not restricted to species identification only. It also helps in flagging new species (Barman, A. S., Singh, M. 2017Khedkar, G. D.,2014) identification of raw fish material used in the value-added products (Wong, E. H. K.2008& Hanner, Staffen, C. F2017),identification of larvae and juveniles, collected from natural ecosystems for identification of breeding grounds and assessment of different life history stages (Victor, B. C., Hanner 2009, Hofmann2017), identification of invasive alien species and forensics, including illegal wildlife harvesting (Lowenstein, J. H.,2009, Khedkar, G. D., Abhayankar 2016).

**Gyamfua *et al.,* (2019)** Studied that the traditional method of fish identification is based on external morphological features comprising body shape, the pattern of colours, scale size and count, number and relative position of fins, type of fin rays, gill, otoliths and geography (Granadeiro and Silva, 2000). This method of identification has proven not to be effective as it is unable to differentiate a fish species during its egg or larval stages (Zemlak et al., 2009). Even when the undamaged adult sample is available, the morphological characters alone are not enough to identify it, sometimes resulting in taxonomic doubt (Lakra et al., 2016). In the event of phenotypic plasticity among fish, morphological based identification may provide a less accurate result (Pavan- Kumar et al., 2016). Moreover, the traditional method does not consider the genetic composition of an organism for the variability of the characters used for species recognition and identification. As a result, species misidentification, an erroneous grouping of different taxa and faulty synonymous taxon names occur. This may lead to paying less attention to species

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which need immediate conservation strategies. Also, the existing cryptic species are overlooked (Zemlak et al., 2009; Hubert et al., 2012). Furthermore, it results in giving less priority to species which are needed to be conserved and also overlooks morphologically cryptic taxa that are common in many fishes species (Hubert et al., 2008). These associated challenges with the traditional technique of fish identification have resulted in the invention of genetic-based species identification method called DNA barcoding (Mitochondrial DNA).

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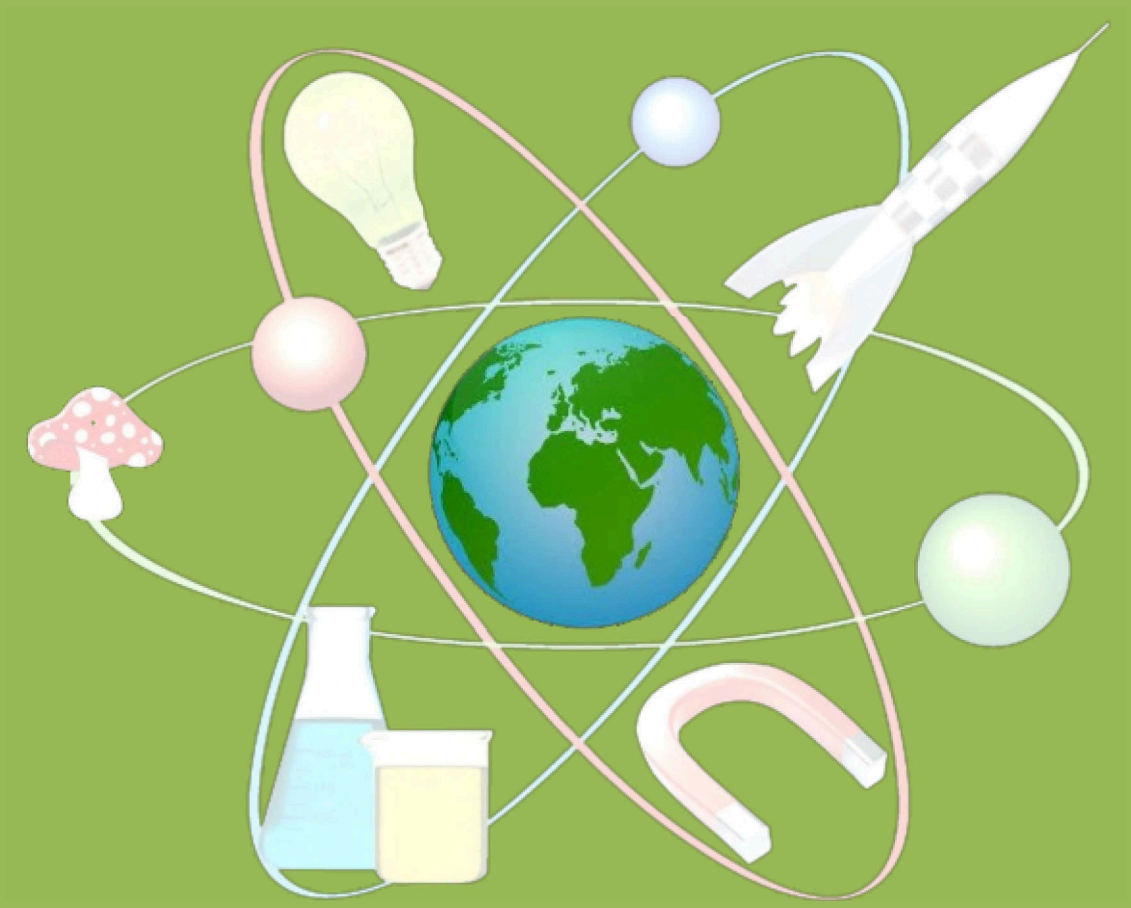
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112 / 555

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# CONTENTS


| S. No. | Description | Page No. |
|---|---|---|
| 1. | COMPARATIVE STUDY OF ROUTINE FERTILIZER V/S SOLUBLE SILICA FERTILIZATION<br>*Tasneem Rangwala, Angurbala Bafna, Nagesh Vyas and Rohan Gupta* | 1-6 |
| 2. | BIODIVERSITY AND CONCENTRATION OF AIRBORNE FUNGI IN DIFFERENT LOCATIONS OF INDORE CITY<br>*Deepti Khare, Sanjay Vyas, Shweta Hardia, Anita Mukati, Anuja Sharma and Rashmi Sharma* | 7-10 |
| 3. | REVIEW ON PHASE CHANGE MATERIALS FOR ENERGY EFFICIENCY IN BUILDINGS<br>*Vinay Dashore and V.V.S. Murty* | 11-21 |
| 4. | THE QUANTIFICATION OF MICROORGANISM IN SOIL OF POTATO FIELDS OF INDORE DISTRICT OF MADHYA PRADESH<br>*Reena Sastiya, N.K. Jain and S.M.A. Naqvi* | 22-27 |
| 5. | DNA BARCODING OF FRESHWATER FISHES OF HALALI RESERVOIR TO RESOLVE AMBIGUITY, MISIDENTIFICATION AND CRYPTIC DIVERSITY<br>*Megha vishwakarma, Kiran Billore, R.K Garg, Mahjabeen Qureshi and Ruchi Sharma* | 28-46 |
| 6. | QUANTITATIVE ANALYSIS AND GREEN SYNTHESIS OF IRON OXIDE NANOPARTICLES USING AQUEOUS EXTRACT OF *NEOLAMARCKIA CADAMBA* AND EVALUATION OF ANTIOXIDANT ACTIVITY<br>*Anamika Jain, Bindiya Sharma and Rakhi Mandloi* | 47-53 |
| 7. | SUSTAINABLE WASTE MANAGEMENT IN CEMENT INDUSTRY OF MADHYA PRADESH<br>*Shagufta Khan and D.M.Kumawat* | 54-58 |
| 8. | OPTIMIZATION OF DYEING CONDITION FOR *EUCALYPTUS GLOBULUS* LEAVES EXTRACT WITH NATURAL MORDANTS<br>*Taiyaba Nimra Ansari and Sanjeeda Iqbal* | 59-72 |
| 9. | BUTTERFLY DIVERSITY AT HOLKAR SCIENCE COLLEGE, INDORE (M.P.)<br>*V. K. Sharma* | 73-75 |

SCIENCE SPECTRUM VOL. (1) ISSUE (1) 2022 ISBN 97881-95911300-8

# Quantitative analysis and Green Synthesis of Iron Oxide Nanoparticles using Aqueous Extract of *Neolamarckia cadamba* and Evaluation of Antioxidant Activity

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**ABSTRACT :** Iron oxide is of significant importance for many industries due to its versatile properties, which have been enhanced with the production of this material in the nanoscale. Nonetheless, the increase in concerns related to environmental impact has led to the development of eco-friendly processes for its production. Recent interest in obtaining metal oxide nanoparticles using biological approaches has been reported in the literature. This method was termed 'green synthesis' as it is a less hazardous process than chemical and physical synthesis methods currently used in the industry to obtain these nanomaterials. Iron oxide nanoparticles have been successfully obtained by green synthesis using aqueous leaves extract and were characterized by UV–VIS spectroscopy, FTIR analysis. The antioxidant behavior of $Fe_2O_3$ nanoparticles was assessed by hydrogen peroxide scavenging method. The $H_2O_2$ scavenging activity was monitored by UV–VIs spectrophotometer.

**KEY WORDS :** Ironoxide nanoparticles, Neolamarckia cadamba, Green Synthesis, UV-VIS, FTIR, Antioxidant activity.

## INTRODUCTION

Phytochemicals are chemicals that are produced by plant through metabolism. Plants are capable of producing and synthesizing diverse groups of organic compounds and are divided into two major groups: Primary and Secondary metabolites. A primary metabolite is a kind of metabolite that is directly involved in normal growth, development and reproduction. It usually performs a physiological function in the organism. Secondary metabolites are not directly involved in those processe but required for interaction of plants with their environment and produced in response to stress. Change in environmental conditions are giving rise to a number of free radicals, which plants have to copes with them for survival. Reactive oxygen species for example singlet oxygen, superoxide ion, hydroxyl ion, and hydrogen peroxide are highly reactive, toxicant which are produced during metabolism. They induce oxidative damage to protein, lipids, enzymes by covalent binding. Phytochemicals have attracted huge interest by virtue of being free radical scavangers. Plant secondary metabolites such as phenolics, flavonoids, tannins may protects against several diseases. Hence, antioxidants are very important chemicals , which stop the chain reactions by blocking the initiation or propagation steps.[1] Because of their redox activities plant mediated synthesis of nanoparticles is more compatible than the physico-chemical methods. Green Synthesis of NPs is based on redox reaction, in which metal ions are reduced by plant metabolites. Therefore, Medicinal Plants are subject of the investigation for their antioxidant properties. The evaluation of antioxidant activity of nano materials has become one of the significant basic studies in pharmaceutical

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science as well as in nano science and technology. Antioxidants play an important role in the functioning of all bio-systems. In biological systems, free radicals are generated due to interaction of biomolecules with molecular oxygen. These free radicals are responsible for degradation of biomolecules.

Saikia et al. [2,3] reported that $Fe_3O_4$ and NiO nanoparticles have good antioxidant activity**.** Banerjee et al. [4] reported that the nano structured materials are expected to act as better free radical scavengers than their bulk counterparts wherever there is an interaction between the material and the surrounding environment. This characteristic is due to the high surface to volume ratioof the nano structures.

Recently, there is a growing interest in iron oxide NPs due to their ditinctive properties for example non-toxic and chemical stability. In oreder to reduce uses of hazardous subtances Green methods are used for the synthesis of IONPs (iron oxide nanoparticles). [5] The aim of present study was the biological synthesis of iron oxide nanoparticles using aqueous extract of Neolamarckia cadamba and its antioxidant activity.

## 2. MATERIALS AND METHODS

### 2.1 Preparation of Plant Extract :

Leaves of *Neolamarckia cadamba* were collected from local area of Bhawarkua Near Govt Holkar Scince College Indore. The plant was identified by Plant Taxonomy. Fresh leaves were washed with distilled and chopped into small pieces. 50 gm of leaves were placed in a Soxhlet chamber and extracted with distilled water. Extract was filtered with whatman No. 1 filter paper.

### 2.2 Quantitative Analysis

### (i) Total Phenolic Content

The total phenolic content was estimated by Folin- Ciocalteu method.**[6]** 1 ml of leaves extract was mixed with 5 ml of Folin-Ciocalteu reagent. Then 5 ml of sodium carbonate solution was added. The reaction mixture was incubated for 30 min in dark at room temperature to complete the reaction. The absorbance was measured at 650 nm using UV-Spectrophotometer. The total phenolic content was calculated using standard Gallic acid curve. Which is as follows:

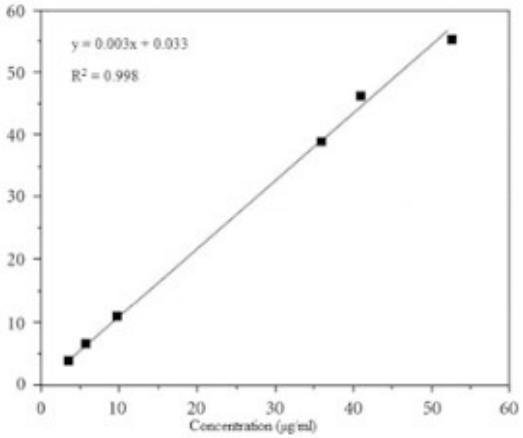



**Fig: 1** Gallic acid standard curve

### (ii) Total Flavonoid Content

The total flavonoid content was estimated by Aluminium Chloride Method.[7] 1 ml methanol was added into the extract and mixed with 4 ml of distilled water. Then 0.3 ml of sodium nitrite and 0.3 ml of aluminium chloride was added to the solution and leave for 10 min. After incubation 2 ml of 1 M NaOH solution was added and distilled water was added to make up the 10 ml reaction mixture. The reaction mixture was incubated for 20 min.

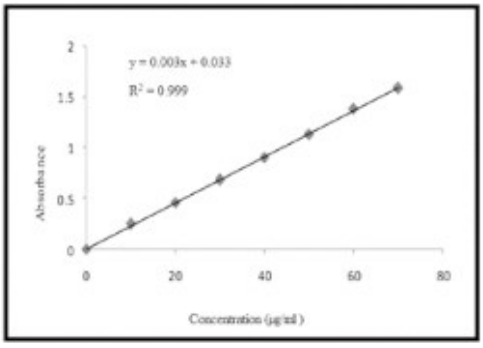



**Fig: 2** Quercetin Standard Curve

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The absorbance was measured using UV-Spectrophotometer at 510 nm. The total flavonoid content was calculated using standard calibration curve of Quercetin.

**2.3 Green Synthesis of Iron Oxide Nps:**

10 ml of leaves extract was mixed with 90 ml of 0.1 M $FeCl_3$ solution. The change in colour of reaction mixture indicates the formation of NPs. Reaction mixture was stirred on magnetic stirrer for 2 hr at 80$^{O}$C. Precipitates were separated by centrifugation at 2000rpm. The precipitates were dried in hot air oven at 80$^{O}$C for 1hr then calcinated in Muffel furnace at 300$^{O}$C for 2 hr. **(Fig. 3)**

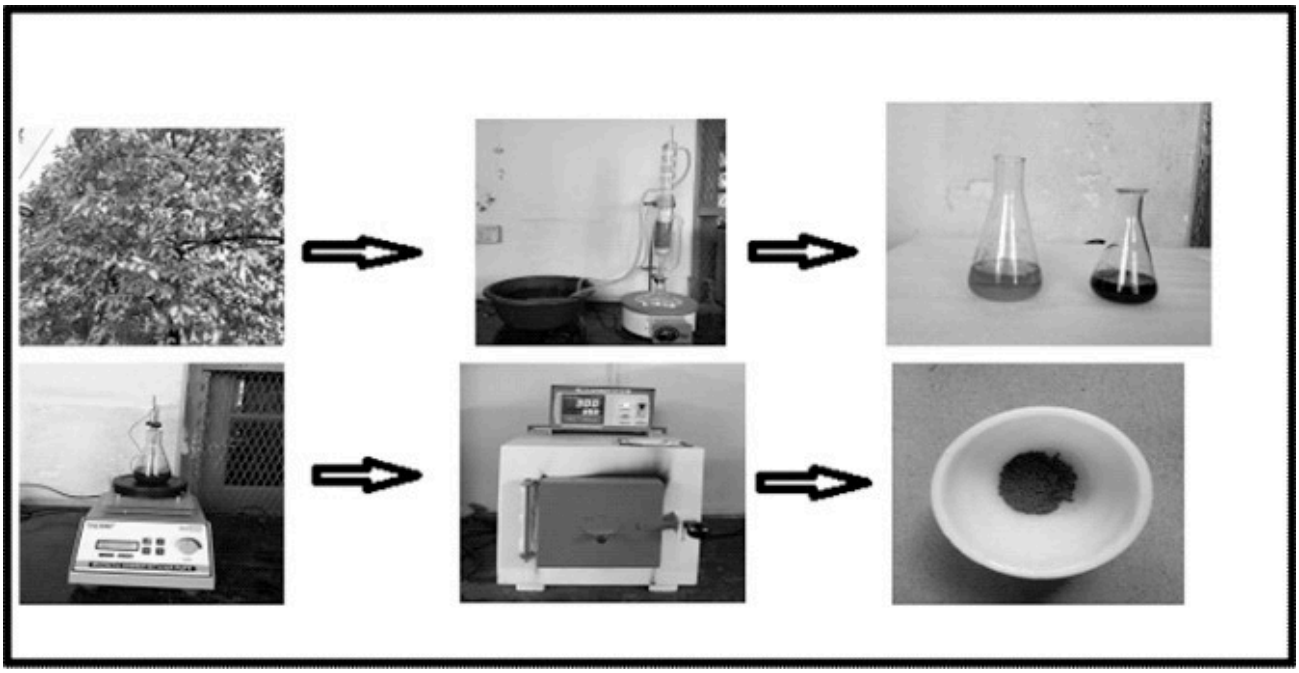


**Fig. 3 : Green Synthesis of Iron Oxide Nanoparticles**

## 3. CHARACTERIZATION:

UV-Spectrophotometer is used for the characterization of Iron Oxide NPs in the range of 200-800 nm. For the determination of functional groups present on the surface of nanoparticles FT-IR is used in the range of 4000-400 $cm^{-1}$.

## 4. ANTIOXIDANT ACTIVITY

**Hydrogen peroxide scavenging activity**: Hydrogen peroxide scavenging activity was used for the determination of antioxidant activity. The solution of $H_2O_2$ was prepared in phosphate buffer pH 7.4 and its concentration was measured at 560 nm using UV-Spectrophotometer. Sample solution was mixed with $H_2O_2$ solution and absorbance was measured at 560 nm using UV-Spectrophotometer against a blank solution containing phosphate buffer without $H_2O_2$. The percentage of hydrogen peroxide scavenging by the sample solution was calculated using the given formula:

$$\text{Percentage Scavenged} = 1 - \text{Absorbance}_{\text{Sample}} / \text{Absorbance}_{\text{Control}} \times 100$$

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**IONP method:** The IONP method for the determination of the antioxidant capacity is based on the electron-transfer reaction between iron ions and antioxidants in leaves extract. The addition of antioxidants to the $FeCl_3$ solution with acidic pH caused the formation of necessary heterogeneous nucleation sites and $Fe^{3+}$ ions formed complexes with the hydrophilic functional groups of antioxidant compounds present in extract. The hydroxyl groups of antioxidants reduced $Fe^{3+}$ ions to $Fe^{2+}$ ions, whereas at the same time antioxidants were oxidized by iron ions and converted to the corresponding quinone structure. The iron oxide nanoparticles (FexOy, mainly $Fe_2O_3$) was formed due to the chelating action of adjacent hydroxyl groups in the antioxidants and grew on the coordination sites.

## 5. RESULT AND DISCUSSION:

### 5.1 Total Phenolic and flavonoid contents

The total phenolic content of the aqueous leaves extract calculated from the calibration curve ($R^2$= 0.998), was 46.17 ± 1.80 gallic acid equiva-lents/g, and the total flavonoid content ($R^2$= 0.999) was 36 ± 2.10 quercetin equivalents/g (Table 1). Phenolic compounds have redox properties, which allow them to act as antioxidants [8]**.** Free radical scavenging ability by hydroxyl groups, the total phenolic concentration could be used as a basis for rapid screening of antioxidant activity. The antioxidant activity of plant secondary metabolites depends on the presence of free OH groups. [9, 10].

**Table 1 : Total Phenolic and Flavonoid Content of aqueous leaves extract**

| | |
|---|---|
| Total Phenolic Content | 46.17± 1.80 |
| Total Flavonoid Content | 36 ± 2.10 |

During the reaction the change in colour of the reaction mixture confirms the formation of $Fe_2O_3$ nanoparticles. On the treatment of $FeCl_3$ solution with the leaves extract the appearance of brick red colour suggested the formation of nanoparticles. After mixing the leaves extract and $FeCl_3$ solution suddenly color change from yellow to dark brown was observed and particles were settled down at the bottom of conical flask. After calcination red coloured NPs were obtained which confirms the formation of $Fe_2O_3$ from FeOOH that gets precipitated initially.

**5.2 UV-VIS Analysis:** The bio reduction of Fe ions in aqueous solutions was characterized by measuring UV-Visible spectra(Fig: 4). UV-Visible spectral analysis was performed in a range of 200-800 nm. The absorption peak was obtained at 315 nm due to the excitation of surface plasmon vibrations in FeNPs as has been reported earlier[11]**.** Effect of precursor salt solution on nanoparticle synthesis revealed that 1 mM concentration of $FeCl_3$ resulted in maximum nanoparticles synthesis with the absorption peak around 315 nm.

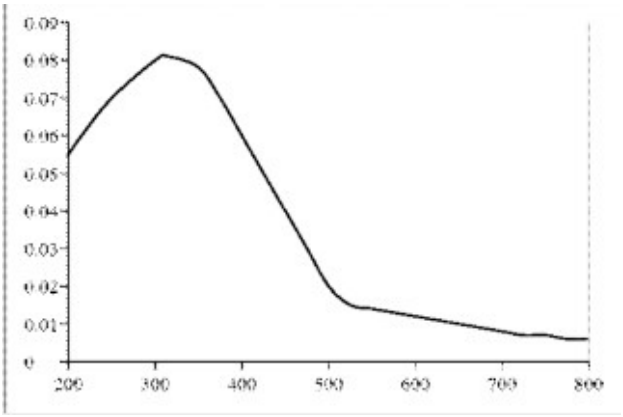



**Fig 4 : UV-Spectrum of FeNPs**

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**5.3 FT-IR Analysis:** FT-IR is used to study the surface interaction between synthesized nanoparticles with other molecules involved in the synthesis and stabilization of the nanoparticles. [12]

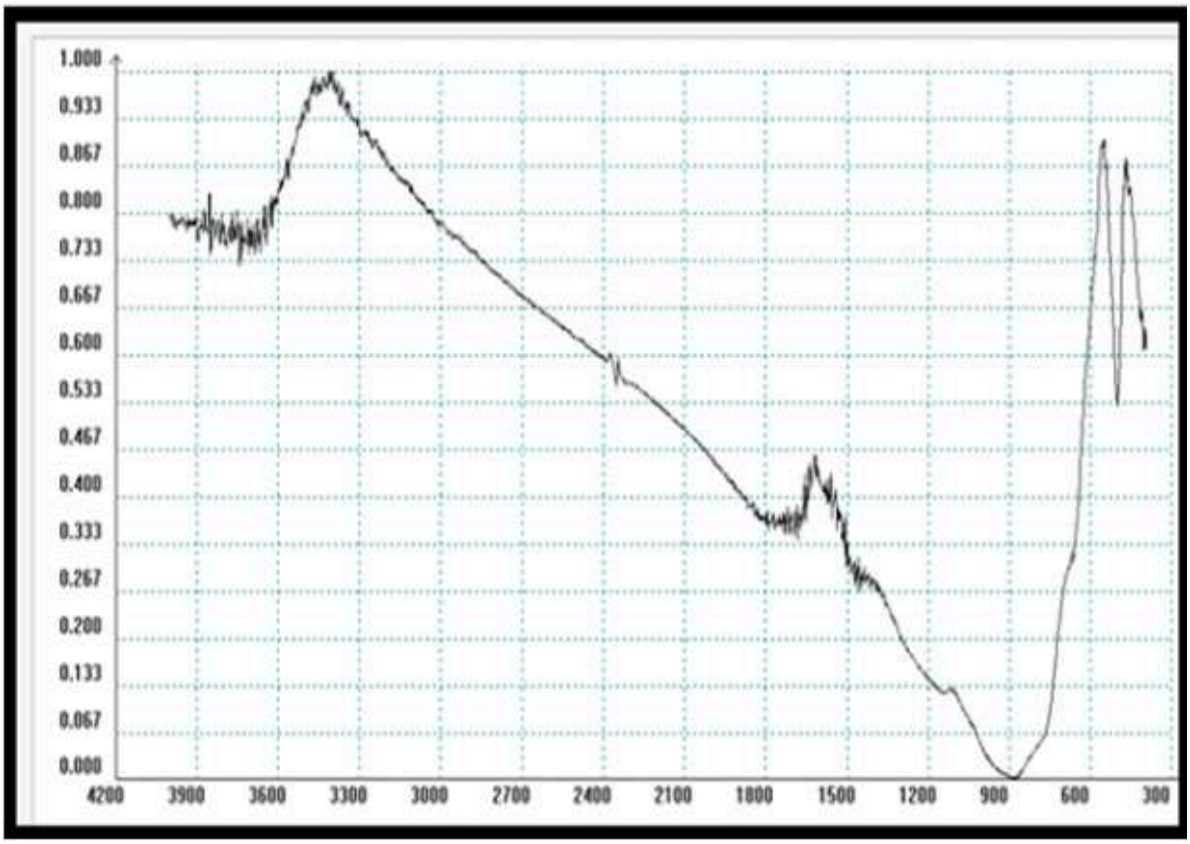



**Fig 5 : FT-IR Spectrum of Iron Oxide NPs**

Three strong peaks 3401, 1637.15 and 472.5 $cm^{-1}$ observed in the FTIR spectrum (Fig: 5) of synthesized FeNPs. [13,14] Organic molecules present on the surface of Fe NPs has been reported to have an effect on the FTIR peaks.

Based on our study the weak band at 3855 $cm^{-1}$ could well be attributed to the unsaturated nitrogen (C-N) compounds from the leaf extract, 1618 $cm^{-1}$ ($H_2O$ bending vibration) and a broad peak at 3401 $cm^{-1}$. The peaks observed at 1508 and 1457 $cm^{-1}$ indicating the C-O and C-C stretching of alcohols respectively [15, 16]. Finally the bands due to Fe-O stretching at 549.6 and 472.5 $cm^{-1}$ were also observed.

**5.5 Yield:** The yield of synthesized nanoparticles **(8.50 gm).**

**5.6 Antioxidant Activity**

Plants are rich source of secondary metabolites including phenolics and flavonoids, have antioxidant activity due to their chemical structure and redox properties. The high phenolic and flavonoid content is responsible for the bioactivity of plant extracts.

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Hydrogen peroxide scavanging activity was 63.18%. Flavonoids are highly effective scavengers of most oxidizing molecules, including singlet oxygen and various other free radicals implicated in several diseases[16]. Flavonoids suppress reactive oxygen formation, chelate trace elements involved in free radical production, scavenge reactive species and protect antioxidant defenses [17]. Similarly, phenolics conferring oxidative stress tolerance on plants. Crude extracts of fruits, herbs, vegetables, cereals and other plant materials rich in phenolics are increasingly being used in the food industry for their antioxidative properties and health benefits.

Basic principle of Iron oxide nanoparticles scavenging activity is that the hydroxyl groups of antioxidants reduced $Fe^{3+}$ ions to $Fe^{2+}$ ions, whereas at the same time antioxidants were oxidized by iron ions and converted to the corresponding quinone structure. The iron oxide nanoparticles (FexOy, mainly $Fe_2O_3$) was formed due to the chelating action of adjacent hydroxyl groups in the antioxidants and grew on the coordination sites.

During the reaction the change in colour of the reaction mixture confirms the formation of $Fe_2O_3$ nanoparticles. On the treatment of $FeCl_3$ solution with the leaves extract the appearance of brick red colour suggested the formation of nanoparticles. After mixing the leaves extract and $FeCl_3$ solution suddenly color change from yellow to dark brown was observed and particles were settled down at the bottom of conical flask. After calcination red coloured NPs were obtained which confirms the formation of $Fe_2O_3$ from FeOOH that gets precipitated initially.

## 6. CONCLUSION

The present investigation reports the green and eco-friendly synthesis of $Fe_2O_3$ nanoparticles using biological method from the leaves of *Neolamarckia cadamba*. y. Hence, the current study describes that $Fe_2O_3$ nanoparticles were synthesized by green, facile and easy method. Antioxidant efficiency of $Fe_2O_3$ nanoparticles increases with increasing in concentration. The particles show peroxide scavenging capacity, which gives the good evidence towards antioxidant activity. Therefore, this nanoparticle can be applied as a promising antioxidant in biological system.

**Conflicts of Interest:** The authors declare no conflict of interest.

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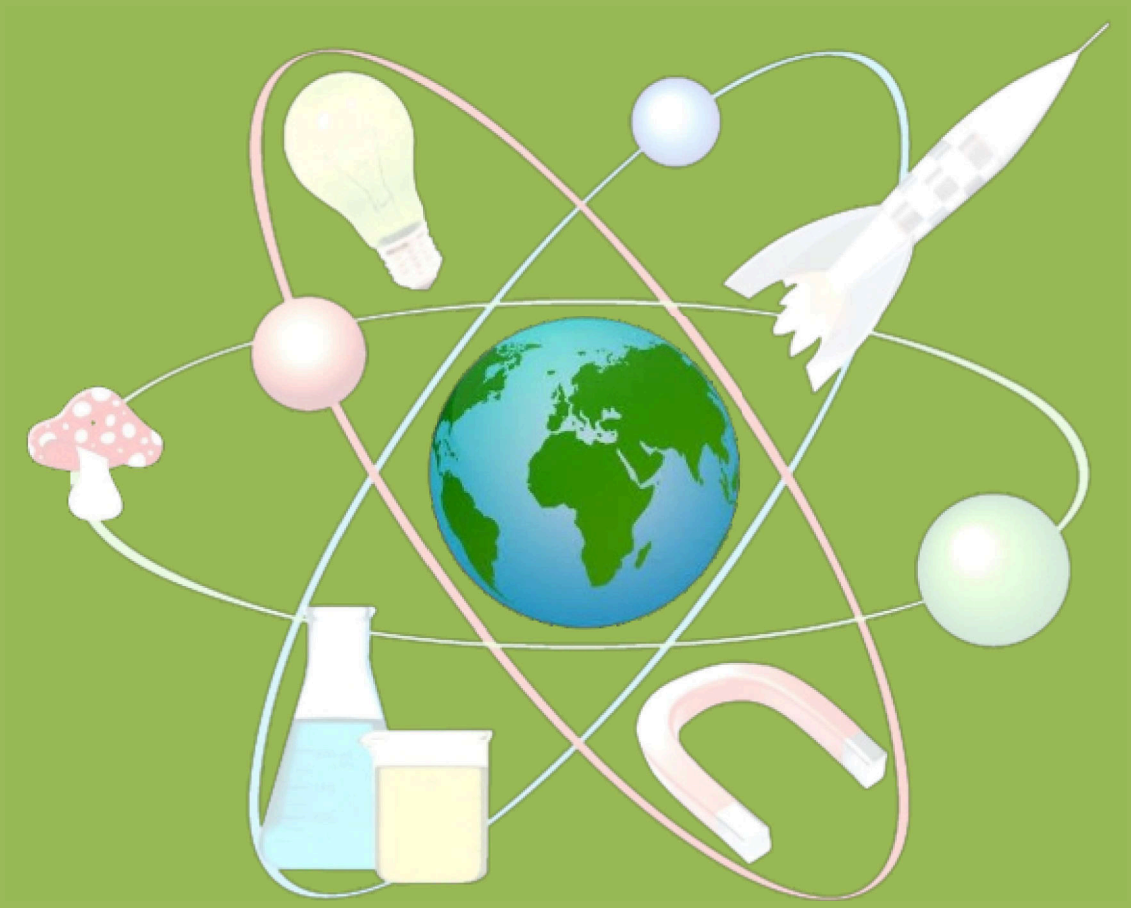
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Volume 1, Issue 1 2022

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122 / 555

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# CONTENTS


| S. No. | Description | Page No. |
|---|---|---|
| 1. | COMPARATIVE STUDY OF ROUTINE FERTILIZER V/S SOLUBLE SILICA FERTILIZATION<br>*Tasneem Rangwala, Angurbala Bafna, Nagesh Vyas and Rohan Gupta* | 1-6 |
| 2. | BIODIVERSITY AND CONCENTRATION OF AIRBORNE FUNGI IN DIFFERENT LOCATIONS OF INDORE CITY<br>*Deepti Khare, Sanjay Vyas, Shweta Hardia, Anita Mukati, Anuja Sharma and Rashmi Sharma* | 7-10 |
| 3. | REVIEW ON PHASE CHANGE MATERIALS FOR ENERGY EFFICIENCY IN BUILDINGS<br>*Vinay Dashore and V.V.S. Murty* | 11-21 |
| 4. | THE QUANTIFICATION OF MICROORGANISM IN SOIL OF POTATO FIELDS OF INDORE DISTRICT OF MADHYA PRADESH<br>*Reena Sastiya, N.K. Jain and S.M.A. Naqvi* | 22-27 |
| 5. | DNA BARCODING OF FRESHWATER FISHES OF HALALI RESERVOIR TO RESOLVE AMBIGUITY, MISIDENTIFICATION AND CRYPTIC DIVERSITY<br>*Megha vishwakarma, Kiran Billore, R.K Garg, Mahjabeen Qureshi and Ruchi Sharma* | 28-46 |
| 6. | QUANTITATIVE ANALYSIS AND GREEN SYNTHESIS OF IRON OXIDE NANOPARTICLES USING AQUEOUS EXTRACT OF *NEOLAMARCKIA CADAMBA* AND EVALUATION OF ANTIOXIDANT ACTIVITY<br>*Anamika Jain, Bindiya Sharma and Rakhi Mandloi* | 47-53 |
| 7. | SUSTAINABLE WASTE MANAGEMENT IN CEMENT INDUSTRY OF MADHYA PRADESH<br>*Shagufta Khan and D.M.Kumawat* | 54-58 |
| 8. | OPTIMIZATION OF DYEING CONDITION FOR *EUCALYPTUS GLOBULUS* LEAVES EXTRACT WITH NATURAL MORDANTS<br>*Taiyaba Nimra Ansari and Sanjeeda Iqbal* | 59-72 |
| 9. | BUTTERFLY DIVERSITY AT HOLKAR SCIENCE COLLEGE, INDORE (M.P.)<br>*V. K. Sharma* | 73-75 |

SCIENCE SPECTRUM VOL. (1) ISSUE (1) 2022 ISBN 97881-95911300-8

# Sustainable Waste Management in Cement Industry of Madhya Pradesh

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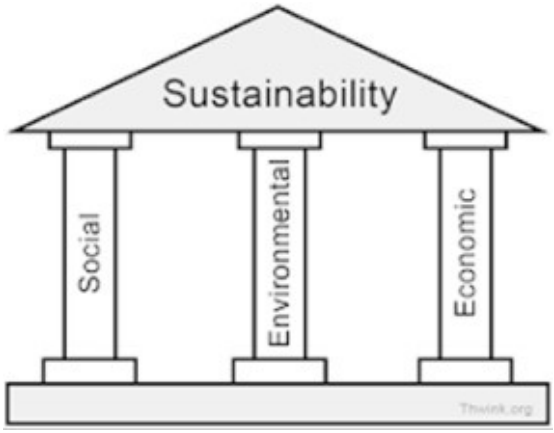
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**ABSTRACT :** Sustainability means meeting the needs of the present without compromising the ability of future generations to meet their own needs, and Sustainable Waste Management is using waste produced efficiently so that use of amount of material resources get reduced. India, is the second amongst cement producers in the world with a total capacity of 245.40 Million Tones (MT), has a huge cement industry and produces about 7% of world's total production. The Indian cement industry has on one hand, enormous pressure to increase profit and margins, while on other; there is considerable public interest on a sustainable and environment friendly usage of natural resources. The objective of this paper is to pursue sustainable waste management for a cement industry through replacement of coal with some alternative fuel, which actually belongs to the group of hazardous wastes and which could benefit the plant economically and environmentally, and improve sustainability of plant. The analysis is specially focused on the technical, economic, and environmental effects of the use of solid waste, namely, sewage sludge (SS), in the cement industry.

**KEY WORDS :** Sustainable, Waste Management, Alternative fuels, Cement industry.

## INTRODUCTION

Sustainable waste management is using material resources efficiently to cut down on the amount of waste produced. And, where waste is generated, dealing with it in a way that actively contributes to the economic, social and environmental goals of sustainable development. The different waste management options can be organized in an order known as the waste management hierarchy that reflects the relative sustainability of each..There has been a growing recognition of three essential aspects of sustainable development, which are Economic, Environmental, and Social aspects (1).



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The centrally located state of Madhya Pradesh is the second largest state of India (in terms of area) after Rajasthan with total geographical area of 3,08,252 $Km^2$ (Census of India, 2011) that accounts for 9.38% of the total land area of the country. Madhya Pradesh is second largest cement manufacturing state of the country after Andhra Pradesh. The Indian Cement Industry plays a key role in the national economy, not only by generating substantial revenue for State and Central Governments but also as a key industry that generates maximum employment directly or indirectly.

Co-processing waste in this way consists of using both the calorific potential to heat the kiln and the material component from the fuel ash as a raw material, it also has a direct impact on lowering $CO_2$ emissions, since it reduces the quantity of natural raw materials needed for clinker production (3).

Utilizing by-product or waste as a fuel goes to decrease the quality of fuel necessity, and hence, reduces the connected environmental impacts of results obtained in manufacturing, transporting, and burning these fuels as drained hazardous waste management. It also reduces the stress on localized solid waste landfills, waste incineration and minimizes their environmental impacts, which includes groundwater pollution, methane generation and harmful ash residues. Cement kilns are potential units to recuperate power from numerous non-hazardous wastes also as some hazardous wastes. Though the industry has been carefully using these waste materials for number of years, the processes, practices and technologies to perform are generally element of individual company's procedures, and thus not familiar to a broader community. The competent use of non-renewable fossil fuels, reducing the discharge of greenhouse gases and scheming ongoing warming, toxic residues left over and also the pollution of water and soil resources, are in the front position of ecological concerns and technical deliberations. Cost competitiveness, universal competition, and profitability are the concerns of huge business particularly in industries. The challenge faced by today's civilization is to maintain equilibrium between environmental safeguards and financial importance.

### 1.1. Types of Alternative Fuels:

Coal is the primary fuel burned in cement kilns, however, the use of alternative fuels in cement kilns is now common and increasing. The range of alternative fuels is extremely wide (4). They are usually available as gas, liquid and solid as shown in Table 1.1.

**Table 1.1: Types of Alternative Fuels used in the Cement Industries**

| S. No. | Category | Fuels |
|---|---|---|
| 1 | Gaseous Fuels | Refinery Waste Gas, Landfill Gas, Pyrolysis Natural Gas |
| 2 | Liquid Fuels | Tar, Chemical Wastes, Distillation Residues, Waste Solvents, Oil Sludge, Used Oils, Wax Suspensions, Petrochemical Wastes, Asphalt Slurry, Paint Waste. |
| 3 | Solid Fuels | Petroleum Coke (Petcoke), Paper Waste, Rubber Residues, Pulp Sludge, Sewage Sludge, Used Tyres, Battery Cases, Plastic Residues, Wood Waste, Domestic Refuse, Rice Husks, Refuse Derived Fuel, Nut Shells, Oil & bearing Soils, Diapers, etc. |
| Before consideration of some | | |

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Before consideration of some of these fuels an and their properties it is necessary to understand briefly the cement production process.

## 2. OBJECTIVES

The key objectives of study are given below:

* To understand the utility of hazardous waste as alternative fuel in cement manufacturing.

* With the help of cost, availability and accessibility factors analyzing the sustainable waste.

* Finding Benefits of using alternative fuels for a cement plant.

## 3. RESEARCH METHODOLOGY

Steps in Research Methodology are given below:

1. Selection of Cement Plant.
2. Selection of Alternative (waste) fuels.
3. Data Collection
4. Data Analysis & Comparison
5. Conclusion
6. Documentation

## 4. DATA COLLECTION & ANALYSIS

### 4.1 Implication in Cement Plant

The study was carried out for the plant that has two kilns installed, one with the capacity of 4 MTPA and another with 1.5 MTPA capacity. The conclusions for kiln with 1 MT capacity were drawn. Presently, the plant is using imported coal as the fuel for the production of clinker (5). The purpose of the study was to find out replacements for the coal which could benefit the industry economically and environmentally.

### 4.2 Sewage Sludge

A large amount of sewage sludge is produced worldwide. Sludge is formed during wastewater treatment. Wastewater is a combination of the liquid- or water &carried wastes removed from residential, institutional, commercial and industrial establishments. Landfill, dumping in the sea and use in agriculture as organic fertilizer and soil conditioner are the main conventional methods of disposal. There are however, economic and ecological constraints to these methods. The increasing costs of land for landfill coupled with increasing stringent environmental standards are making landfill a less attractive option. The use of sewage sludge in agriculture poses human health and environmental risks (6). Uncontrolled addition of sludge to the agricultural land may increase the concentration of heavy metals in farmland. These factors are making the thermal utilization of sewage sludge an attractive means of its management (7).The thermal utilization of sewage sludge is deemed feasible when its secondary environmental impacts are minimized.

The elemental analysis was carried out to establish the suitability of liquid waste on the quality of cement or manufacturing process. The results are given in **Table 4.1**:

**Table 4.1: Heavy Metal Analysis**

| S.No. | Heavy Metals | % |
|---|---|---|
| 1. | Cu | 0.001% |
| 2. | Zn | 4.13-21.18% |
| 3. | Fe | 0.04% |
| 4. | Pb | 0.04% |
| 5. | Cd | 0.01-0.0.6% |
| 6. | Ni | 0.006% |

The various combinations of sewage sludge (Alternative Fuel) and coal were evaluated for their calorific value, heavy metal analysis and emissions.

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The results were compared to standards established for disposal of waste in cement kiln**. (Table 4.2)** From the table below one could find that replacement of coal with sewage sludge provides better calorific value to the fuel. The emissions of the greenhouse gases are also reduced. This contributes to the environmental benefits. It can be concluded from the table that maximum 15% of the coal can be replaced by the sewage sludge. Above this percentage, the value of lead increases above the standard value i.e. 23% which affects the quality of the clinker. The sewage sludge as a fuel costs around Rs.1000 per tonne including the transportation cost where as coal costs around Rs. 5800. This brings economical benefits to the organization. If we use 100% coal, we require 1, 25, 806 ton of coal per annum for producing 1 million ton of cement. The total cost of this amount of coal is around 73 crore. Availability of sewage sludge was estimated around 20,000 metric tonne per annum.

**Table 4.2: Check for Suitability of Combination of Coal and Sewage Sludge**

| Fuel Mix | | Cal. Value | Elemental Analysis % | | | | | |
|---|---|---|---|---|---|---|---|---|
| % Coal | % Sewage Sludge | Kcal/Kg | Cu | Zn | Fe | Pb | Cd | Ni |
| 100% | 0% | 5200 | 0.001 | 0.1 | 0.01 | 0.001 | 0.0001 | 0.01 |
| 95% | 5% | 5085 | 0.001 | 0.011 | 0.011 | 0.086 | 0.0001 | 0.03 |
| 90% | 10% | 5975 | 0.001 | 0.010 | 0.012 | 0.124 | 0.0001 | 0.04 |
| 85% | 15% | 5825 | 0.001 | 0.009 | 0.013 | 0.181 | 0.0002 | 0.05 |
| 80% | 20% | 5600 | 0.001 | 0.008 | 0.014 | 0.192 | 0.0002 | 0.06 |
| 75% | 25% | 5475 | 0.001 | 0.10 | 0.016 | 0.268 | 0.0002 | 0.07 |
| 70% | 30% | 5350 | 0.001 | 0.11 | 0.018 | 0.301 | 0.0002 | 0.09 |
| 65% | 35% | 5225 | 0.001 | 0.13 | 0.020 | 0.306 | 0.0003 | 0.10 |
| 60% | 40% | 5100 | 0.002 | 0.14 | 0.02 | 0.355 | 0.0003 | 0.11 |
| 55% | 45% | 4600 | 0.002 | 0.15 | 0.21 | 0.449 | 0.0003 | 0.14 |
| 50% | 50% | 4325 | 0.002 | 0.16 | 0.22 | 0.506 | 0.0003 | 0.16 |
| 45% | 55% | 4200 | 0.002 | 0.2 | 0.24 | 0.580 | 0.0004 | 0.18 |
| 40% | 60% | 4075 | 0.002 | 0.21 | 0.26 | 0.668 | 0.0004 | 0.20 |
| 35% | 65% | 3985 | 0.002 | 0.22 | 0.28 | 0.720 | 0.0004 | 0.21 |
| 30% | 70% | 3885 | 0.002 | 0.24 | 0.29 | 0.830 | 0.0004 | 0.2 |
| 25% | 75% | 3620 | 0.003 | 0.26 | 0.30 | 0.842 | 0.0004 | 0.21 |
| 20% | 80% | 3580 | 0.003 | 0.28 | 0.03 | 0.920 | 0.0005 | 0.24 |
| 15% | 85% | 3565 | 0.003 | 0.29 | 0.32 | 0.926 | 0.0005 | 0.26 |
| 10% | 90% | 3665 | 0.003 | 0.03 | 0.034 | 1.011 | 0.0005 | 0.28 |
| 5% | 95% | 3765 | 0.003 | 0.3 | 0.036 | 1.086 | 0.0005 | 0.30 |
| 0% | 100% | 3600 | 0.003 | 0.31 | 0.038 | 1.093 | 0.0005 | 0.31 |

## 5. CONCLUSION

The Co-Processing of wastes in a cement kiln is a mix of recycsling and thermal recovery. The energy content of the waste is very efficiently recovered into thermal energy, thus saving conventional fuels. Therefore, in the waste hierarchy Co-Processing generally has a position just below recycling as it is more beneficial than incineration with energy recovery. The Co-Processing of waste as AFRs in the cement kiln therefore disposes the waste completely and thereby eliminates fully the societal concerns associated with it.

The objective of this research was to perform a Co-processing trial to demonstrate that the cement kiln is able to Co-process hazardous wastes in an irreversible and environmental sound manner, i.e., with no influence on the emissions when traditional fuel is partly replaced by hazardous waste. Co-

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processing of waste to replace virgin resources in the energy & intensive industries like cement plants has proved to be a valuable element in sustainable development.

Use of alternative fuels and raw materials will reduce our dependence on fossil fuels and natural resources. This will help in improving our environment and reducing greenhouse gas emissions. Substituting conventional fuels with alternative waste derived fuels including hazardous combustible wastes shall cut down the energy costs in cement plants.

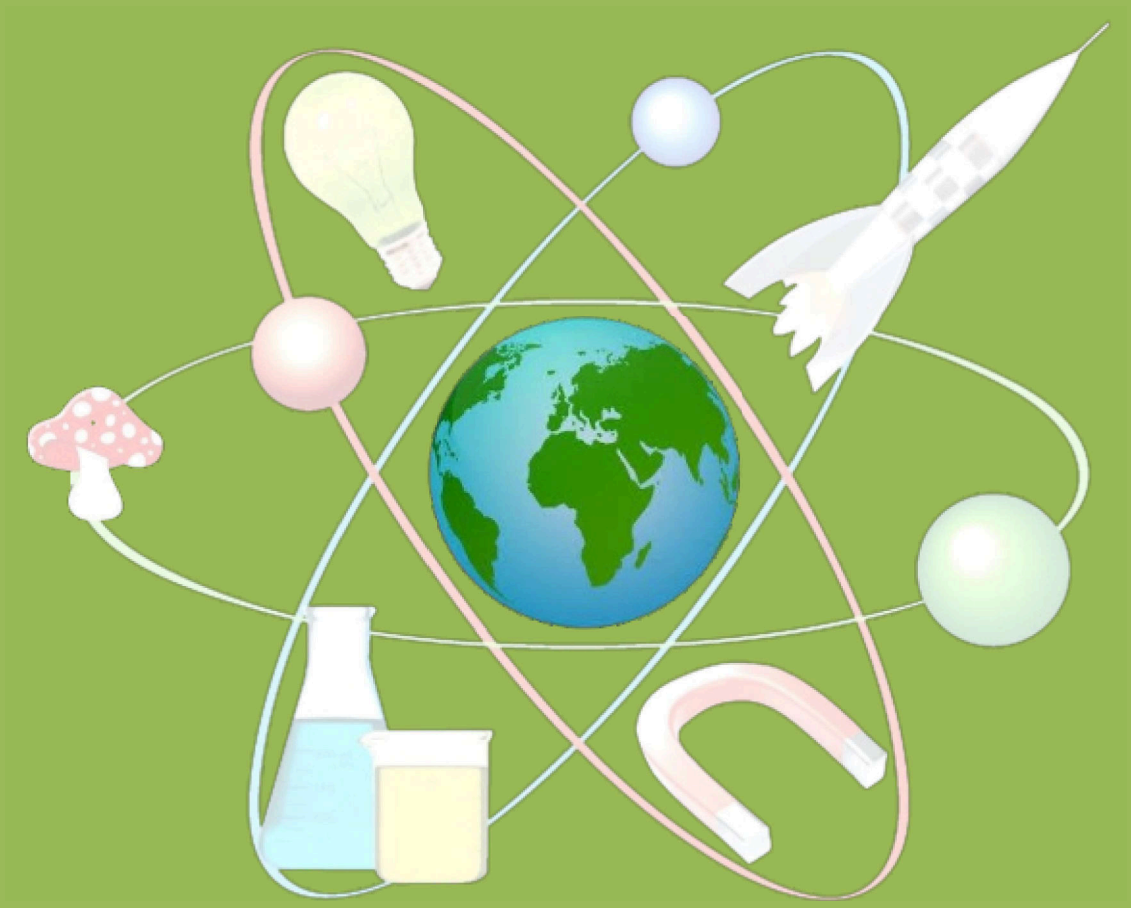
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# CONTENTS


| S. No. | Description | Page No. |
|---|---|---|
| 1. | COMPARATIVE STUDY OF ROUTINE FERTILIZER V/S SOLUBLE SILICA FERTILIZATION<br>*Tasneem Rangwala, Angurbala Bafna, Nagesh Vyas and Rohan Gupta* | 1-6 |
| 2. | BIODIVERSITY AND CONCENTRATION OF AIRBORNE FUNGI IN DIFFERENT LOCATIONS OF INDORE CITY<br>*Deepti Khare, Sanjay Vyas, Shweta Hardia, Anita Mukati, Anuja Sharma and Rashmi Sharma* | 7-10 |
| 3. | REVIEW ON PHASE CHANGE MATERIALS FOR ENERGY EFFICIENCY IN BUILDINGS<br>*Vinay Dashore and V.V.S. Murty* | 11-21 |
| 4. | THE QUANTIFICATION OF MICROORGANISM IN SOIL OF POTATO FIELDS OF INDORE DISTRICT OF MADHYA PRADESH<br>*Reena Sastiya, N.K. Jain and S.M.A. Naqvi* | 22-27 |
| 5. | DNA BARCODING OF FRESHWATER FISHES OF HALALI RESERVOIR TO RESOLVE AMBIGUITY, MISIDENTIFICATION AND CRYPTIC DIVERSITY<br>*Megha vishwakarma, Kiran Billore, R.K Garg, Mahjabeen Qureshi and Ruchi Sharma* | 28-46 |
| 6. | QUANTITATIVE ANALYSIS AND GREEN SYNTHESIS OF IRON OXIDE NANOPARTICLES USING AQUEOUS EXTRACT OF *NEOLAMARCKIA CADAMBA* AND EVALUATION OF ANTIOXIDANT ACTIVITY<br>*Anamika Jain, Bindiya Sharma and Rakhi Mandloi* | 47-53 |
| 7. | SUSTAINABLE WASTE MANAGEMENT IN CEMENT INDUSTRY OF MADHYA PRADESH<br>*Shagufta Khan and D.M.Kumawat* | 54-58 |
| 8. | OPTIMIZATION OF DYEING CONDITION FOR *EUCALYPTUS GLOBULUS* LEAVES EXTRACT WITH NATURAL MORDANTS<br>*Taiyaba Nimra Ansari and Sanjeeda Iqbal* | 59-72 |
| 9. | BUTTERFLY DIVERSITY AT HOLKAR SCIENCE COLLEGE, INDORE (M.P.)<br>*V. K. Sharma* | 73-75 |

SCIENCE SPECTRUM VOL. (1) ISSUE (1) 2022 ISBN 97881-95911300-8

# Optimization of dyeing condition for *Eucalyptus globulus* leaves extract with natural mordants

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**ABSTRACT :** The demand for eco-friendly products is increasing day by day; naturally dyed fabric is one of them. In the present study, *Eucalyptus globulus* leaves extract was taken as a dye source. Alum, *Musa acuminata* Pseudostem sap, *Terminalia chebula* fruits, and *Punica granatum* rinds were used as bio- mordant. Dyeing conditions such as concentration of mordant, pH, temperature and time affects dyeing quality. Optimization of different dyeing conditions was assessed by colour strength (K/S value).The condition with highest colour strength was selected for optimization. Each mordant gave the highest results in different conditions with *Eucalyptus globulus* dye.

**KEY WORDS :** *Eucalyptus globulus,* dyeing, optimization, colour strength

## 1. INTRODUCTION

Interest in the application of natural dyes has been growing rapidly due to the result of stringent environmental standards imposed by many countries for harmful and hypersensitive responses associated with synthetic dyes (Grover and Patni 2011). With the world's situation getting more cognizant of ecology and environment there is a greater need today to revive the tradition of natural dye (Thiyagarajan et al. 2016). Textile industries commonly use chemical/ synthetic dyes in the dyeing process which are not safe for dyers, consumers, and the environment. On the other hand, natural dyes are biodegradable, safe to use, non-carcinogenic, non-allergic, non-toxic, easily biodegradable, and available in huge quantities (Gulrajani and Gupta, 1992). The fabric or fiber dyeing process requires dye and mordant which is generally produced by chemical or synthetic material. In the natural dyeing process dyes also need mordant/fixative to adhere to the fabric. Mordants are the substance which is generally used for the fixation of dye on fabric. Mordants include certain salts of aluminium, chromium, iron, potassium, and sodium. Usually, natural dyes are applied on fabric with chemical or synthetic mordants by dyers. This is neither completely natural dyeing nor ecofriendly. The long-term exposure to these chemical dyes and mordants reported skin irritation, respiratory problems, even organ damage with prolonged time (Krewski et al. 2007). Dyeing comprises three steps –exhaustion, diffusion, and migration. In dyeing with natural dyes, the role of auxiliaries needs to be studied and procedures developed to optimize their use for dye uptake enhancement. The dyeing process is influenced by the concentration of mordant, pH, temperature, and time. These parameters can be standardized with the assessment of colour strength. The reason behind the less use of natural dyes in the textile industry is difficult to recreate the same shade (Khatri and White 2015). Optimization of dyeing conditions provides a way to produce almost similar shade on fabrics. Therefore, optimization of each dyeing parameter was accessed

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after the complete dyeing process. Very few studies were available for systematic optimization of dyeing parameters in the natural dyeing process. So, here we have developed the process for a pure environment safe dyeing process. In the present work natural source has been taken as bio-mordant, for fixing of natural dye on fabric. Alum, *Musa acuminata* (Banana) Pseudostem sap, *Terminalia chebula* dry fruit (Myrobalan), and *Punica granatum* fruit rinds (Pomegranate) were applied with natural dyes. Leaves of *Eucalyptus globulus* were taken as a source of dye. Cotton fabric was selected for dyeing because of its easy availability, comfort, excellent heat conductivity, hygroscopic nature, and cost-effectiveness.

## 2. MATERIAL AND METHODS

**2.1 Fabric:** Two different types of cotton fabric were taken i.e. handloom manufactured cotton (Khadi) as fabric 1 and power loom manufactured cotton as fabric 2 for study. Khadi was purchased from Khadi Bhandar (Indore Khadi Sangh) Rajwada Indore and fine cotton fabric procured from G. Sachanand Kala mandir, Hukumchand marg, Indore (M.P) India.

**2.2 Collection and extraction of dye:** *Eucalyptus globulus* leaves were plucked directly from the trees. The leaves were kept in polythene bags and brought to the laboratory. Powder of *Eucalyptus globulus* leaves were taken for the preparation of aqueous extraction of dye. 15 Gram of dye powder (15% o.w.f. ) weighted and poured in a beaker and soaked in 100 ml water for 15 minutes at room temperature. Dye pot (beaker) kept at high temperature (95-100 ±1˚C) till boiling then extracted for one hour at 60±1˚C. The extraction liquor was then filtered to obtain an aqueous solution of dye (Win and Swe, 2008).

(a)   (b)

**Figure 1 *Eucalyptus globulus* (a) tree, (b) leaves**

**2.3 Collection and extraction of Bio-mordant:** *Musa acuminata* Pseudostem was collected from the field of Raver Tehsil just near Burhanpur and Kasrawad (M.P.). The pseudostem was taken and cut into pieces then liquid collected with the help of a juice wheel. After that sap is stored in glass bottles in the refrigerator for further analysis. Alum and *Terminalia chebula* fruits *(*myrobalan) were purchased from the local shop. *Punica granatum* rinds peeled out from fruits and dried at room temperature. Dried fruits and rinds are ground in a mixer to prepare powder and stored in an airtight container (Kumaresan et al., 2011). Mordant extraction from natural materials was performed in aqueous conditions. Alum, *Terminalia chebula* fruit, and *Punica granatum* rind powder soaked in water for 15±1 minutes then extraction process done for about an hour in the water bath at 80±1˚C. The solution cooled down then filtered and used in the mordanting process. However, collected *Musa acuminata* sap used as it is.


©


(d)


(e)


(f)

**Figure 2 Bio-mordant: (c) *Musa acuminata,* (d) *Terminalia chebula,* (e) Alum, (f) *Punica granatum***

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**1.5 Optimization of dyeing condition:** Both types of fabric were dyed with eucalyptus leaves.15 gm/100 ml (o.w.f) dye was taken throughout the dyeing. To find optimum dyeing conditions, a series of trials were performed following concentration of mordants, pH, temperature, and time. Mordants used in dyeing were optimized with five concentrations 10, 15, 20, 25, and 30 gm/100 ml. Optimization was done based on the colour strength (K/S value) of the dyed fabric. Optimization of dyeing conditions was done individually with four mordants. Optimization trials are summarized in table 1.

**Table 1: Conditions for optimization**

| Conditions for optimization | Trials |
|---|---|
| Concentration of mordants (gm/100 ml) | 10, 15, 20, 25, 30 |
| pH | 8,8.5,9,9.5,10 |
| Temperature (°C) | 70,75,80,85,90 |
| Time (minute) | 70,75,80,85,90 |

**2.7 Colour strength:** K/S value defines the absorption of dye on fabric in percent. The colour strength (K/S) of dyed fabric was assessed using the kubelka- Munk equation. K/S of dyed samples was measured using a spectrophotometer (X4000).

**K/S= (1-R)2 / 2 R**

Where R is the reflectance value of dyed fabric at λ max, K is the absorption coefficient, S is scattering co- efficient. Each fabric was folded once to give two thickness and an average of three readings were taken each time (Habibzadeh et al., 2010).

**2.8 Statistical analysis:** Data was analyzed by using SPSS Statistics for Windows, Version 22.0 (IBM Corp. Released 2013, Armonk, NY: IBM Corp.). Data were expressed as means ± standard deviation (SD). Pearson correlation coefficient was performed on optimization conditions and colour strength. A value of $P < 0.05$ was considered statistically significant.

## RESULTS AND DISCUSSION

**3.1 Optimization of dyeing condition:** The concentration of mordants, pH, temperature, and time profile have to be carefully monitored throughout the dyeing cycle. The color strength (K/S value) was observed for each sample and the highest color strength (K/S value) condition was taken for optimum results.

**3.2 Optimization of Mordants concentration:** Colour strength (K/S value) for the various concentration of mordant with *Eucalyptus globulus* leaves is presented in tables 2 and 3.

**Table 2 : Optimization of Mordant Concentration for dyeing Fabric 1 with *Eucalyptus globulus***

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|
| | | | For Alum as mordant | | |
| 1. | 15 | 10 | 25.35±0.04 | | |
| 2. | 15 | 15 | 25.93±0.04 | .712** | .003 |

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| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|
| 3 | 15 | 20 | 26.18±0.04 | | |
| 4 | 15 | **25** | **26.46±0.03** | | |
| 5 | 15 | 30 | 26.01±0.03 | | |
| | | | **For *Musa acuminata* sap as mordant** | | |
| 1 | 15 | 10 | 26.85±0.02 | | |
| 2 | 15 | 15 | 27.15±0.03 | | |
| 3 | 15 | 20 | 28.39±0.01 | 987** | .000 |
| 4 | 15 | 25 | 29.51±0.01 | | |
| 5 | 15 | **30** | **30.48±0.01** | | |
| | | | **For *Terminalia chebula* fruit as mordant** | | |
| 1 | 15 | 10 | 30.23±0.02 | | |
| 2 | 15 | 15 | 31.67±0.01 | | |
| 3 | 15 | 20 | 32.14±0.01 | .907** | .000 |
| 4 | 15 | **25** | **33.68±0.01** | | |
| 5 | 15 | 30 | 33.03±0.01 | | |
| | | | **For *Punica granatum* rind as mordant** | | |
| 1 | 15 | 10 | 35.33±0.05 | | |
| 2 | 15 | 15 | 37.02±0.05 | | |
| 3 | 15 | **20** | **38.43±0.03** | .785** | .001 |
| 4 | 15 | 25 | 37.91±0.10 | | |
| 5 | 15 | 30 | 38.03±0.05 | | |

**. Correlation is significant at the 0.01 level (2-tailed).

**Table. 2 : Optimization of Mordant Concentration for dyeing Fabric 2 with *Eucalyptus globulus***

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|
| | | | **For Alum as mordant** | | |
| 1. | 15 | 10 | 13.54±0.03 | .518* | .048 |
| 2. | 15 | 15 | 13.94±0.06 | | |
| 3 | 15 | **20** | **14.29±0.03** | | |
| 4 | 15 | 25 | 14.04±0.04 | | |
| 5 | 15 | 30 | 13.94±0.02 | | |
| | | | **For *Musa acuminata* sap as mordant** | | |
| 1 | 15 | 10 | 13.21±0.01 | | |

ISBN 97881-95911300-8

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|
| 2 | 15 | 15 | 13.92±0.02 | | |
| 3 | 15 | 20 | 14.51±0.39 | .900** | .000 |
| 4 | 15 | 25 | 15.62±0.01 | | |
| 5 | 15 | 30 | 15.11±0.01 | | |
| | | | **For *Terminalia chebula* as mordant** | | |
| 1 | 15 | 10 | 16.11±0.03 | | |
| 2 | 15 | 15 | 16.38±0.02 | | |
| 3 | 15 | **20** | **18.71±0.03** | .778** | .001 |
| 4 | 15 | 25 | 18.54±0.04 | | |
| 5 | 15 | 30 | 18.05±0.04 | | |
| | | | **For *Punica granatum* as mordant** | | |
| 1 | 15 | 10 | 15.18±0.03 | | |
| 2 | 15 | 15 | 15.93±0.04 | | |
| 3 | 15 | 20 | 16.04±0.03 | .739** | .002 |
| 4 | 15 | 25 | **17.40±0.05** | | |
| 5 | 15 | 30 | 16.33±0.02 | | |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

In Alum, *Musa acuminata* sap, *Terminalia chebula* fruits, and *Punica granatum* rinds, the highest colour strength was found with the concentration of mordant 25, 30, 25, and 20 gm/100ml respectively for fabric 1. Whereas, in Alum, *Musa acuminata* sap, *Terminalia chebula* fruits, and *Punica granatum* rinds, the highest colour strength was found with the concentration of mordant 20, 25, 20 and 25 gm/100ml respectively for fabric 2.

Colour strength (K/S value) of fabric 1 was significantly positively correlated with Alum concentration, r=.712,$p < 0.01$. *Musa acuminata* sap concentration, r=.987, $p < 0.01$. *Terminalia chebula* fruits concentration, r=.907, $p < 0.01$. *Punica granatum* rinds concentration, r=.785, $p < 0.01$.

Colour strength (K/S value) of fabric 2 was also significantly positively correlated with Alum concentration, r=.518,$p < 0.05$. *Musa acuminata* sap concentration, r=.900, $p < 0.01$. *Terminalia chebula* fruits concentration, r=.778, $p < 0.01$. *Punica granatum* rinds concentration, r=.739, $p < 0.01$.

**3.3 Optimization of pH:** Colour strength (K/S value) for different pH of dyeing solution with *Eucalyptus globulus* is presented in Tables 4 and 5.

ISBN 97881-95911300-8

**Table. 4 : Optimization of dyeing solution pH for dyeing Fabric 1 with *Eucalyptus globulus***

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | pH | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| | | | **For Alum as mordant** | | | |
| 1 | 15 | 25 | 8 | 26.46±0.03 | | |
| 2 | 15 | 25 | **8.5** | **27.30±0.04** | | |
| 3 | 15 | 25 | 9 | 27.05±0.03 | -.400 | .140 |
| 4 | 15 | 25 | 9.5 | 26.54±0.04 | | |
| 5 | 15 | 25 | 10 | 26.29±0.03 | | |
| | | | **For *Musa acuminata* sap as mordant** | | | |
| 1 | 15 | 30 | 8 | 30.48±0.01 | | |
| 2 | 15 | 30 | **8.5** | **32.76±0.04** | | |
| 3 | 15 | 30 | 9 | 32.06±0.04 | -.406 | .133 |
| 4 | 15 | 30 | 9.5 | 31.55±0.04 | | |
| 5 | 15 | 30 | 10 | 31.81±0.01 | | |
| | | | **For *Terminalia chebula* as mordant** | | | |
| 1 | 15 | 25 | 8 | 33.68±0.01 | | |
| 2 | 15 | 25 | **8.5** | **35.92±0.01** | | |
| 3 | 15 | 25 | 9 | 35.39±0.04 | .317 | .249 |
| 4 | 15 | 25 | 9.5 | 34.81±0.01 | | |
| 5 | 15 | 25 | 10 | 33.97±0.02 | | |
| | | | **For *Punica granatum* as mordant** | | | |
| 1 | 15 | 20 | **8** | **38.43±0.03** | | |
| 2 | 15 | 20 | 8.5 | 37.63±0.01 | -.972** | .000 |
| 3 | 15 | 20 | 9 | 37.10±0.01 | | |
| 4 | 15 | 20 | 9.5 | 36.77±0.02 | | |
| 5 | 15 | 20 | 10 | 36.53±0.01 | | |

**. Correlation is significant at the 0.01 level (2-tailed).

ISBN 97881-95911300-8

**Table. 5 : Optimization of dyeing solution pH for dyeing Fabric 2 with *Eucalyptus globulus***

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | pH | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| | | | **For Alum as mordant** | | | |
| 1 | 15 | 20 | 8 | 14.29±0.03 | | |
| 2 | 15 | 20 | **8.5** | **15.86±0.03** | | |
| 3 | 15 | 20 | 9 | 15.38±0.03 | -.473 | .075 |
| 4 | 15 | 20 | 9.5 | 14.15±0.03 | | |
| 5 | 15 | 20 | 10 | 13.85±0.01 | | |
| | | | **For *Musa acuminata* sap as mordant** | | | |
| 1 | 15 | 25 | **8** | **15.62±0.01** | | |
| 2 | 15 | 25 | 8.5 | 15.48±0.02 | | |
| 3 | 15 | 25 | 9 | 15.04±0.01 | -.978** | .000 |
| 4 | 15 | 25 | 9.5 | 14.89±0.02 | | |
| 5 | 15 | 25 | 10 | 14.73±0.01 | | |
| | | | **For *Terminalia chebula* as mordant** | | | |
| 1 | 15 | 20 | 8 | 18.71±0.03 | | |
| 2 | 15 | 20 | 8.5 | 19.62±0.01 | | |
| 3 | 15 | 20 | 9 | 19.88±0.01 | .928** | .000 |
| 4 | 15 | 20 | **9.5** | **20.66±0.01** | | |
| 5 | 15 | 20 | 10 | 20.45±0.01 | | |
| | | | **For *Punica granatum* as mordant** | | | |
| 1 | 15 | 25 | 8 | 17.40±0.05 | | |
| 2 | 15 | 25 | **8.5** | **19.45±0.02** | -.407 | .135 |
| 3 | 15 | 25 | 9 | 18.84±0.03 | | |
| 4 | 15 | 25 | 9.5 | 17.33±0.02 | | |
| 5 | 15 | 25 | 10 | 17.10±0.01 | | |

**. Correlation is significant at the 0.01 level (2-tailed).

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In Alum, *Musa acuminata* sap, *Terminalia chebula* fruits, and *Punica granatum* rinds, the highest colour strength was found with pH of dyeing solution 8.5,8.5,8.5 and 8 respectively in fabric 1. Whereas, in Alum, *Musa acuminata* sap, *Terminalia chebula* fruits, and *Punica granatum* rinds, the highest colour strength was found fabric 2 with pH of dyeing solution 8.5, 8, 9.5, and 8.5 respectively.

There was a significant negative correlation between colour strength (K/S value) of fabric 1 and pH of dyeing for *Punica granatum,* r=-.972, $p$ <0.01. Colour strength (K/S value) of fabric 2 and pH of dyeing was also significantly negatively correlated with *Musa acuminata* sap, r=-.978, $p$ <0.01. Significant positive correlated with *Terminalia chebula* fruits concentration, r=.982, $p$ <0.01. No significant correlation was found with other mordants.

3.4 Optimization of temperature: Colour strength (K/S value) for the various temperature of dyeing with *Eucalyptus globulus* is presented in Tables 6 and 7.

**Table. 6 : Optimization of dyeing temperature for Fabric 1 with *Eucalyptus globulus***

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | pH | Dyeing Temperature (°C) | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|
| | | | | **For Alum as mordant** | | | |
| 1 | 15 | 25 | 8.5 | 70 | 27.30±0.04 | | |
| 2 | 15 | 25 | 8.5 | 75 | 28.52±0.03 | | |
| 3 | 15 | 25 | 8.5 | 80 | 26.63±0.02 | .581* | .023 |
| 4 | 15 | 25 | 8.5 | **85** | **30.28±0.02** | | |
| 5 | 15 | 25 | 8.5 | 90 | 29.07±0.02 | | |
| | | | | **For *Musa acuminata* sap as mordant** | | | |
| 1 | 15 | 30 | 8.5 | 70 | 32.06±0.04 | | |
| 2 | 15 | 30 | 8.5 | 75 | 33.52±0.01 | | |
| 3 | 15 | 30 | 8.5 | 80 | 34.31±0.02 | .989** | .000 |
| 4 | 15 | 30 | 8.5 | 85 | 35.65±0.01 | | |
| 5 | 15 | 30 | 8.5 | **90** | **36.02±0.02** | | |
| | | | | **For *Terminalia chebula* as mordant** | | | |
| 1 | 15 | 25 | 8.5 | 70 | 35.92±0.01 | | |
| 2 | 15 | 25 | 8.5 | 75 | 36.16±0.05 | | |
| 3 | 15 | 25 | 8.5 | 80 | 35.79±0.04 | -.509 | .053 |
| 4 | 15 | 25 | 8.5 | **85** | **36.21±0.06** | | |
| 5 | 15 | 25 | 8.5 | 90 | 35.37±0.04 | | |

ISBN 97881-95911300-8

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | pH | Dyeing Temperature (°C) | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|
| | | | | **For *Punica granatum* as mordant** | | | |
| 1 | 15 | 25 | 8 | 70 | 38.43±0.03 | | |
| 2 | 15 | 25 | 8 | 75 | 39.14±0.03 | | |
| 3 | 15 | 25 | 8 | 80 | 39.68±0.01 | .592* | .020 |
| 4 | 15 | 25 | 8 | **85** | **40.02±0.01** | | |
| 5 | 15 | 25 | 8 | 90 | 39.13±0.01 | | |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

**Table. 7 : Optimization of dyeing temperature for Fabric 2 with *Eucalyptus globulus***

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | pH | Dyeing Temperature (°C) | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|
| | | | | **For Alum as mordant** | | | |
| 1 | 15 | 20 | 8.5 | 70 | 15.86±0.03 | | |
| 2 | 15 | 20 | 8.5 | **75** | **17.09±0.01** | | |
| 3 | 15 | 20 | 8.5 | 80 | 16.80±0.01 | -.367 | .179 |
| 4 | 15 | 20 | 8.5 | 85 | 16.13±0.01 | | |
| 5 | 15 | 20 | 8.5 | 90 | 15.61±0.02 | | |
| | | | | **For *Musa acuminata* sap as mordant** | | | |
| 1 | 15 | 25 | 8 | 70 | 15.62±0.01 | | |
| 2 | 15 | 25 | 8 | 75 | 15.87±0.01 | | |
| 3 | 15 | 25 | 8 | 80 | 16.48±0.01 | .160 | .569 |
| 4 | 15 | 25 | 8 | **85** | **16.82±0.02** | | |
| 5 | 15 | 25 | 8 | 90 | 15.44±0.05 | | |
| | | | | **For *Terminalia chebula* as mordant** | | | |
| 1 | 15 | 20 | 9.5 | 70 | 20.66±0.01 | | |
| 2 | 15 | 20 | 9.5 | 75 | 21.49±0.02 | | |
| 3 | 15 | 20 | 9.5 | 80 | 22.53±0.01 | .993** | .000 |
| 4 | 15 | 20 | 9.5 | 85 | 23.72±0.2 | | |
| 5 | 15 | 20 | 9.5 | **90** | **24.17±0.02** | | |

ISBN 97881-95911300-8

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | pH | Dyeing Temperature (°C) | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|
| | | | | **For *Punica granatum* as mordant** | | | |
| 1 | 15 | 25 | 8.5 | 70 | 19.45±0.02 | | |
| 2 | 15 | 25 | 8.5 | 75 | 19.88±0.01 | | |
| 3 | 15 | 25 | 8.5 | 80 | 20.09±0.02 | .968** | .000 |
| 4 | 15 | 25 | 8.5 | 85 | 20.15±0.02 | | |
| 5 | 15 | 25 | 8.5 | **90** | **20.58±0.01** | | |

**. Correlation is significant at the 0.01 level (2-tailed).

In Alum, *Musa acuminata* sap, *Terminalia chebula* fruits, and *Punica granatum* rinds, the highest colour strength was found with the temperature of dyeing solution 85, 90, 85, and 85 respectively for fabric 1. Whereas, in Alum, *Musa acuminata* sap, *Terminalia chebula* fruits, and *Punica granatum* rinds, the highest colour strength was found with the temperature of dyeing solution 75, 85,90 and 90 respectively for fabric 2.

Colour strength (K/S value) of fabric 1 and temperature of dyeing was significantly correlated for Alum, r=.581,$p < 0.05$. *Musa acuminata* sap concentration, r=.989, $p < 0.01$. *Punica granatum* rinds concentration, r=.592, $p < 0.05$. Colour strength (K/S value) of fabric 2 and temperature of dyeing was significantly correlated for *Terminalia chebula* fruits, r=.993, $p < 0.01$. *Punica granatum* rinds , r=.968, $p < 0.01$.

**3.5 Optimization of time:** Colour strength (K/S value) for various times of dyeing with *Eucalyptus globulus* is presented in Tables 8 and 9.

**Table. 8 : Optimization of dyeing time for dyeing Fabric 1 with *Eucalyptus globulus***

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | pH | Dyeing Temperature (°C) | Dyeing time (Minute) | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| | | | | | **For Alum as mordant** | | | |
| 1 | 15 | 25 | 8.5 | 85 | 70 | 30.28±0.02 | | |
| 2 | 15 | 25 | 8.5 | 85 | 75 | 30.97±0.01 | .649** | .009 |
| 3 | 15 | 25 | 8.5 | 85 | 80 | 31.88±0.01 | | |
| 4 | 15 | 25 | 8.5 | 85 | **85** | **32.67±0.02** | | |
| 5 | 15 | 25 | 8.5 | 85 | 90 | 31.29±0.01 | | |

ISBN 97881-95911300-8

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | pH | Dyeing Temperature (°C) | Dyeing time (Minute) | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| **For *Musa acuminata* sap as mordant** | | | | | | | | |
| 1 | 15 | 30 | 8.5 | 90 | 70 | 36.02±0.02 | | |
| 2 | 15 | 30 | 8.5 | 90 | 75 | 36.70±0.02 | | |
| 3 | 15 | 30 | 8.5 | 90 | 80 | 37.11±0.01 | .930** | .000 |
| 4 | 15 | 30 | 8.5 | 90 | **85** | **37.75±0.03** | | |
| 5 | 15 | 30 | 8.5 | 90 | 90 | 37.52±0.02 | | |
| **For *Terminalia chebula* fruits as mordant** | | | | | | | | |
| 1 | 15 | 25 | 8.5 | 85 | 70 | 36.21±0.06 | | |
| 2 | 15 | 25 | 8.5 | 85 | 75 | 36.91±0.04 | | |
| 3 | 15 | 25 | 8.5 | 85 | **80** | **37.39±0.01** | -.138 | .623 |
| 4 | 15 | 25 | 8.5 | 85 | 85 | 36.80±0.02 | | |
| 5 | 15 | 25 | 8.5 | 85 | 90 | 36.02±0.02 | | |
| **For *Punica granatum* rinds as mordant** | | | | | | | | |
| 1 | 15 | 20 | 8 | 85 | 70 | 40.02±0.01 | | |
| 2 | 15 | 20 | 8 | 85 | 75 | 40.86±0.02 | | |
| 3 | 15 | 20 | 8 | 85 | 80 | 41.28±0.03 | .645** | .009 |
| 4 | 15 | 20 | 8 | 85 | **85** | **42.67±0.01** | | |
| 5 | 15 | 20 | 8 | 85 | 90 | 41.08±0.02 | | |

**. Correlation is significant at the 0.01 level (2-tailed).

**Table. 9 : Optimization of dyeing time for dyeing Fabric 2 with *Eucalyptus globulus***

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | pH | Dyeing Temperature (°C) | Dyeing time (Minute) | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| **For Alum as mordant** | | | | | | | | |
| 1 | 15 | 20 | 8.5 | 75 | 70 | 17.09±0.01 | | |
| 2 | 15 | 20 | 8.5 | 75 | 75 | 17.89±0.01 | | |
| 3 | 15 | 20 | 8.5 | 75 | 80 | 18.24±0.01 | .939** | .000 |
| 4 | 15 | 20 | 8.5 | 75 | **85** | **19.21±0.01** | | |
| 5 | 15 | 20 | 8.5 | 75 | 90 | 18.95±0.01 | | |
| **For *Musa acuminata* sap as mordant** | | | | | | | | |
| 1 | 15 | 25 | 8 | 85 | 70 | 16.82±0.02 | | |
| 2 | 15 | 25 | 8 | 85 | 75 | 17.14±0.02 | | |
| 3 | 15 | 25 | 8 | 85 | **80** | **17.65±0.03** | -.581* | .023 |
| 4 | 15 | 25 | 8 | 85 | 85 | 16.42±0.02 | | |
| 5 | 15 | 25 | 8 | 85 | 90 | 16.02±0.01 | | |

ISBN 97881-95911300-8

| S. No. | Dye Conc. (15gm/100 ml) | Mordant Conc. (gm/100ml) | pH | Dyeing Temperature (°C) | Dyeing time (Minute) | K/S value (%) | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| | | | | **For *Terminalia chebula* fruits as mordant** | | | | |
| 1 | 15 | 20 | 9.5 | 90 | 70 | 24.17±0.02 | | |
| 2 | 15 | 20 | 9.5 | 90 | 75 | 25.15±0.01 | | |
| 3 | 15 | 20 | 9.5 | 90 | 80 | 25.78±0.03 | .320 | .244 |
| 4 | 15 | 20 | 9.5 | 90 | **85** | **26.35±0.03** | | |
| 5 | 15 | 20 | 9.5 | 90 | 90 | 24.63±0.01 | | |
| | | | | **For *Punica granatum* rinds as mordant** | | | | |
| 1 | 15 | 25 | 8.5 | 90 | 70 | 20.58±0.01 | | |
| 2 | 15 | 25 | 8.5 | 90 | **75** | **22.28±0.02** | | |
| 3 | 15 | 25 | 8.5 | 90 | 80 | 21.78±0.02 | .234 | .400 |
| 4 | 15 | 25 | 8.5 | 90 | 85 | 21.35±0.03 | | |
| 5 | 15 | 25 | 8.5 | 90 | 90 | 21.20±0.01 | | |

In Alum, *Musa acuminata* sap, *Terminalia chebula* fruits, and *Punica granatum* rinds, the highest colour strength was found with the time of dyeing solution 85, 85, 80, and 85 respectively for fabric 1. Whereas, in Alum, *Musa acuminata* sap, *Terminalia chebula* fruits, and *Punica granatum* rinds, the highest colour strength was found with the time of dyeing solution 85,80, 85, and 75 respectively for fabric 2.

Colour strength (K/S value) of fabric 1 and time of dyeing was significant correlated for Alum, r=.649,$p < 0.01$. *Musa acuminata* sap, r=.930, $p < 0.01$. *Punica granatum* rinds, r=.645, $p < 0.01$. Colour strength (K/S value) of fabric 2 and time of dyeing was significant correlated for Alum, r=.939,$p < 0.01$. *Musa acuminata* sap , r=-.581, $p < 0.05$.

Colouration involves a sequential mechanism, e.g. migration of dye from bath to fiber surface, adsorption of dye on the surface of the fiber, and diffusion of dye inside followed by fixation (Chakraborty 2014). Mordants are required to attach the dye to the fabric. Increasing the concentration of mordant boosted the dye uptake of fabric unless absorption becomes stable. Hereafter, increasing the concentration of mordant does not enhance the dye uptake. The dyeing rate increases with an increase in temperature but the final exhaustion may increase or decrease depending upon the particular dyeing system(Alam et al. 2008). This is the usual effect of temperature on the rate of a dyeing process. Dyeing is usually an exothermic process i.e. heat-releasing; the interaction between the dye and fiber molecules is stronger than between the dye and water molecules in solution (Paul D et al. 2017). Time duration gives the same effect as the variation of temperature. The optimum condition for dyeing is depicted in Table 10.

ISBN 97881-95911300-8

**Table. 10 : Optimized dyeing conditions for *Eucalyptus globulus* leaves dye**

| | Alum | *Musa acuminata* | *Terminalia chebula* | *Punica granatum* |
|---|---|---|---|---|
| **Fabric 1** | 25 Con., pH 8.5,85°C, 85 minutes | 30 Con., pH 8.5, 90°C, 85 minutes | 25 Con., pH 8.5, 85°C, 85 minutes | 20 Con., pH 8, 85°C, 85 minutes |
| **Fabric 2** | 20 Con., pH 8.5,75°C, 85 minutes | 25 Con., pH 8,85°C, 80 minutes | 20 Con., pH 9.5,90°C, 85 minutes | 25 Con., pH 8.5,90°C, 75 minutes |

## 4. CONCLUSION

The natural dye extracted from *Eucalyptus globulus* leaves and bio-mordanting with Alum, *Musa acuminata* pseudostem sap, *Terminalia chebula* fruit, and *Punica granatum* rind used in dyeing. Effect of different parameters such as concentration of mordants, pH, temperature, and time of dyeing was determined with the help of colour strength. The optimized conditions provided a set method to obtain high colour strength.

A statistically significant correlation is observed in mordant concentrations and color strength.

Each mordant with *Eucalyptus globulus* leaves dye exhibited different colour strength in various dyeing conditions.

The colour strength of fabric 1 was found higher than fabric 2. It can be summarized from the above experimental data that handloom manufactured cotton absorbed more dye than the power loom manufactured cotton.

This is revealed by the investigation that optimization is necessary in case of natural dyes and bio-mordants as synthetic dyeing processes.

The investigation also highlighted the role of different parameters affect differently on dyeing process as well as natural mordants act in final results accordingly.

So, the natural dyeing process can be made purely natural by getting dyes and bio-mordants from nature without using any hazardous chemicals. Thus, further research is needed in this field to make a long list of natural dyes and bio-mordants to combat the problem of synthetic dyeing and printing. utilization after optimization of natural products is a milestone for saving the environment from the life-threatening effects of synthetic chemicals.

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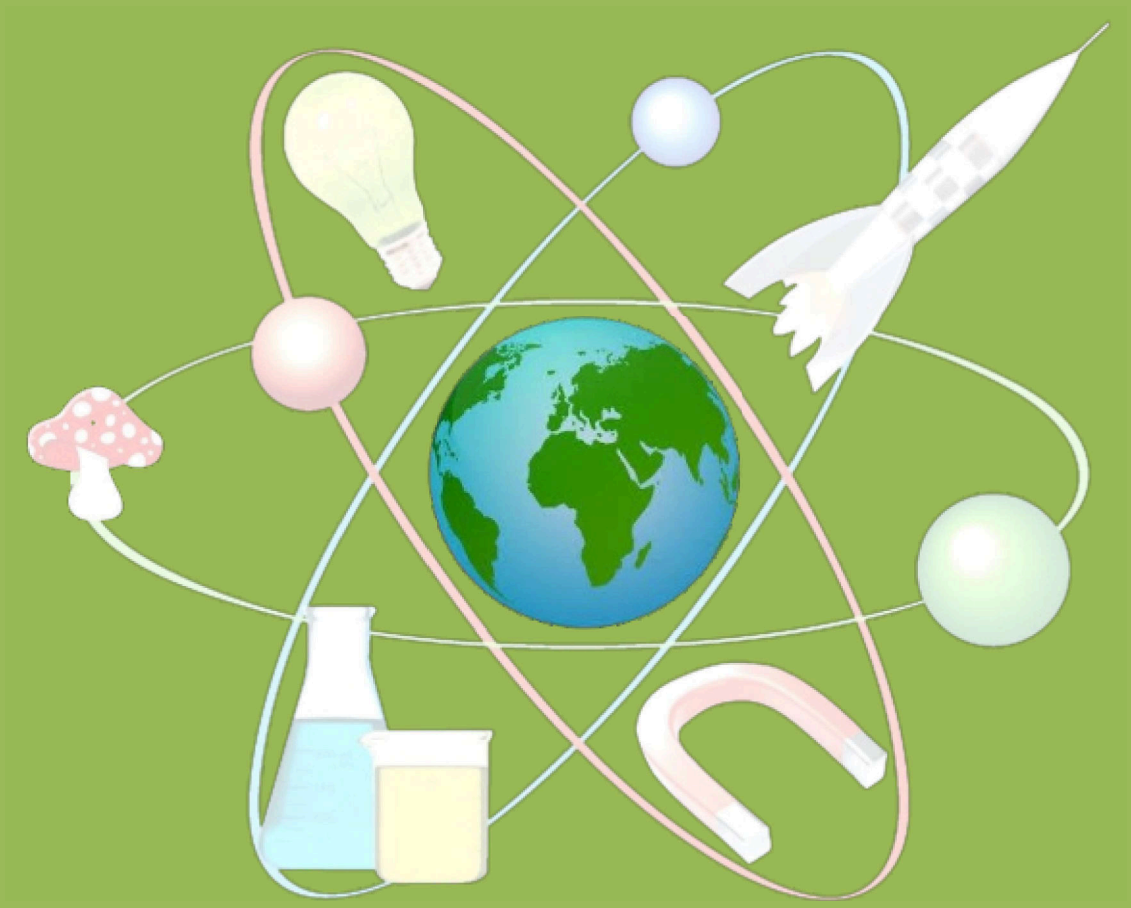
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# CONTENTS


| S. No. | Description | Page No. |
|---|---|---|
| 1. | COMPARATIVE STUDY OF ROUTINE FERTILIZER V/S SOLUBLE SILICA FERTILIZATION<br>*Tasneem Rangwala, Angurbala Bafna, Nagesh Vyas and Rohan Gupta* | 1-6 |
| 2. | BIODIVERSITY AND CONCENTRATION OF AIRBORNE FUNGI IN DIFFERENT LOCATIONS OF INDORE CITY<br>*Deepti Khare, Sanjay Vyas, Shweta Hardia, Anita Mukati, Anuja Sharma and Rashmi Sharma* | 7-10 |
| 3. | REVIEW ON PHASE CHANGE MATERIALS FOR ENERGY EFFICIENCY IN BUILDINGS<br>*Vinay Dashore and V.V.S. Murty* | 11-21 |
| 4. | THE QUANTIFICATION OF MICROORGANISM IN SOIL OF POTATO FIELDS OF INDORE DISTRICT OF MADHYA PRADESH<br>*Reena Sastiya, N.K. Jain and S.M.A. Naqvi* | 22-27 |
| 5. | DNA BARCODING OF FRESHWATER FISHES OF HALALI RESERVOIR TO RESOLVE AMBIGUITY, MISIDENTIFICATION AND CRYPTIC DIVERSITY<br>*Megha vishwakarma, Kiran Billore, R.K Garg, Mahjabeen Qureshi and Ruchi Sharma* | 28-46 |
| 6. | QUANTITATIVE ANALYSIS AND GREEN SYNTHESIS OF IRON OXIDE NANOPARTICLES USING AQUEOUS EXTRACT OF *NEOLAMARCKIA CADAMBA* AND EVALUATION OF ANTIOXIDANT ACTIVITY<br>*Anamika Jain, Bindiya Sharma and Rakhi Mandloi* | 47-53 |
| 7. | SUSTAINABLE WASTE MANAGEMENT IN CEMENT INDUSTRY OF MADHYA PRADESH<br>*Shagufta Khan and D.M.Kumawat* | 54-58 |
| 8. | OPTIMIZATION OF DYEING CONDITION FOR *EUCALYPTUS GLOBULUS* LEAVES EXTRACT WITH NATURAL MORDANTS<br>*Taiyaba Nimra Ansari and Sanjeeda Iqbal* | 59-72 |
| 9. | BUTTERFLY DIVERSITY AT HOLKAR SCIENCE COLLEGE, INDORE (M.P.)<br>*V. K. Sharma* | 73-75 |

SCIENCE SPECTRUM VOL. (1) ISSUE (1) 2022 ISBN 97881-95911300-8

# Butterfly Diversity at Holkar Science College, Indore (M.P.)

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**Received Date : 11.04.21** **Accepted Date : 18.04.21**

**ABSTRACT :** A study of consecutive three-year butterfly diversity in the different seasons was carried out at various gardens of Holkar Science College, Indore (M.P.) during 2018 to 2020. A total of 47 butterfly species were recorded. Nymphalid butterflies were found to be the most abundant with 21 species out of the various family. A largescale plantation drive was found to be the reason behind the increase in diversity and abundance of butterflies. During the study period, diversity and richness were reached their peak during two months from October to November. A decline in the butterfly diversity was observed from December to January which was continued up to the end of May.

**KEY WORDS :** Butterfly diversity, Insecta, Larval host plant.

## INTRODUCTION

Lepidoptera is the second largest order of Insecta in which butterflies and moths are included. Butterflies are the most beautiful and conspicuous insects. India is home to about 1504 species of butterflies (Triple, 2011). Butterflies are acts as central pollinators and food for many ecosystem Butterflies influence a range of plants and animals, therefore, they have been widely used by ecologists as model organisms. As they are very sensitive to the changes in the habitat and environment, their diversity can be used as a tool to study the heath of an ecosystem or as a bio indicator (Spitzer *et al.,* 1997).

Availability of butterfly in an area depends on two important factors food plants and larval host plants. Though, many butterfly species have adapted to feed upon invasive plants like lantana. The diversity of butterflies can be severely affected due to terrestrial ecosystem processes such as pollination and, because they feed on nectar, polluted plant materials may be transferred to higher trophic levels.

## MATERIAL AND METHODS

**Study Area-**The present study was carried out at Govt. Holkar Science College, Indore (MP). There are around 14 gardens surrounded by trees. A variety of shrubs, trees, and grasses provide good habitat for butterflies. The finding of the present research is based on a field survey through visual findings and taking photographs of butterflies on daily basis. Observation was mainly taken in the morning between 7:00 to 11:00 am and in noon 3:00 to 5:00pm (Kunte, 2000).

## RESULT AND DISCUSSION

The association of plant and butterfly diversity is well studied by many researchers. The diversity of plants influences the foraging choices of nectar feeding butterflies (Subedi, *et al.,* 2021). Our results reveal that a suitable habitat at gardens at the study area has provided valuable floral resources for butterflies by which there is a substantial increase in the population of the butterfly as well as diversity has also increased as compared to previous studies. A total of 47 Butterfly species were recorded belonging to the family Nymphalidae (21), Pieridae (09), Lycaenidae (09), Papilionidae (06) and Hesperidae (02). Nymphalidae outnumbered all other butterfly families.

The biggest threat that humans pose to the butterfly populations, is habitat destruction and pollution. The previous study (Pawar and Prakash,

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2016) have also made suggestions for the necessity for plantation of variety of larval host and nectar plants. During the study period in every monsoon season, a plantation drive has been put forward. Many efforts have been put in this direction to conserve the diversity of plants on the campus of Government Holkar Science College, Indore. Every year a large-scale plantation drive for selected plants is done. That has provided suitable habitat for diverse many butterflies, dragonflies, spiders, and birds.

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**Table - 1: Butterflies with their family, common name, scientific name and abundance status (modified table after Pawar, K. and Prakash, M. M., 2016).**

| Family | Common Name | Scientific Name | VC | C | R | VR |
|---|---|---|---|---|---|---|
| **I Family:** | 1. Common Mormon | *Papilo polytes Cr.* | | + | | |
| **PAPILIONIDAE** | 2. Lime Butterfly | *Papilo demoleus L.* | | + | | |
| | 3. Tailed Jay | *Graphium Agamemnon L.* | | + | | |
| | 4. Common Jay | *Graphium sarpedon* | | | + | |
| | 5. Spot Swordtai | *Graphium nomlus* | | | | + |
| | 6. Common Rose | *Pachliopta aristolochiae* | | | + | |
| **II Family:** | 1. Common Jezebel | *Delis eucharis Dry* | + | | | |
| **PIERIDAE** | 2. Common Gull | *Cepora nerissa F.* | + | | | |
| | 3. Pioneer | *Anaphaeis aurota F.* | | + | | |
| | 4. White Orange Tip | *Ixias marianne Cr.* | | | + | |
| | 5. Common Emigrant | *Catopsilia crocale pomona F.* | + | | | |
| | 6. Mottled Emigrant | *Catopsilia pyranthe L.* | + | | | |
| | 7. Common Grass Yellow | *Eurema hecabe* | + | | | |
| | 8. Common Wanderer | *Pareronia vateria* | | | | + |
| | 9. Plain Orange Tip | *Colotis eucharis* | | | | + |

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| Family | Common Name | Scientific Name | VC | C | R | VR |
|---|---|---|---|---|---|---|
| **III Family:** | 1. Red Pierrot | *Talicada nyseus* | | + | | |
| **LYCAENIDAE** | 2. Common Pierrot | *Castalius rosimon (F)* | | + | | |
| | 3. Lime Blue | *Chilades laius* | + | | | |
| | 4. Asian Zebra Blue | *Tarucus plinius* | | + | | |
| | 5. Pale Grass Blue | *Pseudozizeeria maha* | + | | | |
| | 6. Small Grass Jewel | *Chilades trochylus* | + | | | |
| | 7. Gram Blue | *Euchrysops cnejus* | | | + | |
| | 8. Common Silverline | *Spindasis vulcanus* | | | | + |
| | 9. Common shot Silverline | *Aphnaeus ictis* | | | | + |
| **IV Family:** | 1. Common Castor | *Ariadne merione Cr.* | | + | | |
| **NYMPHALIDAE** | 2. Common Leopard | *Phalanta phalantha Dry.* | | | + | |
| | 3. Peacock Pansy | *Junonia almana L* | | + | | |
| | 4. Lemon Pansy | *Junonia lemonias L.* | + | | | |
| | 5. Baronet | *Euthalia nais Forst* | | | | + |
| | 6. Blue Pansy | *Junonia orithya* | | + | | |
| | 7. Yellow Pansy | *Junonia hierta* | | + | | |
| | 8. Chocolate Pansy | *Junonia iphita* | | | | + |
| | 9. Great Eggfly | *Hypolimnas bolina* | + | | | |
| | 10. Tawny Coster | *Acraea violae* | | | + | |
| | 11. Common Sailor | *Neptis hylas* | | | | + |
| | 12. Common Baron | *Euthalia aconthea* | | | | + |
| | 13. Danaid Eggfly | *Hypolimnas misippus* | + | | | |
| | 14. Gray Pansy | *Junonia atlites* | | | + | |
| | 15. Plain Tiger | *Danaus chrysippus L.* | + | | | |
| | 16. Blue Tiger | *Tirumala limniace* | | + | | |
| | 17. Common Crow | *Euploea Core Cr.* | | | + | |
| | 18. Common Evening Brown | *Melanitis leda* | | | + | |
| | 19. Common Nawab | *Polyura athamas* | | | | + |
| | 20. Striped Tiger | *Danaus genutia* | | | | + |
| | 21. Commonder | *Moduza procris* | | | | + |
| **V Family:** | 1. Common Banded Awl | *Hasora chromus* | | | + | |
| **HESPERIIDAE** | 2. Brown Awl | *Badamia exclamationis* | | | + | |

***Where, VC = Very common, C = Common, R = Rare and VR = Very Rare.***

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# प्रेरणा समकालीन लेखन के लिए

समसामयिकी व साहित्य पत्रिका

( वर्ष 17+7 ) वर्ष : 7, अंक : 3, अप्रैल-जून 2022




महिला रचनाकार अंक

# रचना क्रम


06. **अपनी बात** : अरुण तिवारी

09. **आपकी कलम से** : पत्र-प्रतिक्रिया

**आलेख**

16 डॉ. कीर्ति शर्मा : स्त्री विमर्श से जन्मी आधुनिक स्त्री

22 डॉ. दीपा 'दीप' : समाज की उन्नति का पर्याय है स्त्री

24 देवी नागरानी : अपने ही चरित्र के आइने में एक सबला नारी

29 डॉ. आशा मिश्रा 'मुक्ता' : इक्कीसवीं सदी की स्त्री : भारतीयता की पोषक या विनाशक

36 कादम्बरी मेहरा : शक्तिस्वरूपा नारी वैश्विक पटल पर

42 डॉ. बूला कार : दलितों वंचितों और आदिवासियों की मसीहा- महाश्वेता देवी

50 पूर्णिमा ढिल्लन : भगतसिंह

**कहानी**

55 डॉ. निरूपमा राय : स्वर्ग की सीढ़ी

68 डॉ. अनिता सिंह चौहान : जवाब

74 किसलय पंचोली : नौकरी की छतरी

78 मंगला रामचंद्रन : बदली छंटी

87 नीना सिन्हा : गौरवशाली मां

90 प्रियंका पाठक : बिल्कुल अकेले

93 भावना सक्सेना : उजास में

99 हंसा दीप : काफी में क्रीम

**लघुकथा**

107 अलका शर्मा : वेदना

**कविता**

109 किरण अग्रवाल : शब्द ही तो नहीं है मेरे पास, निशाना,

111 प्रभा मुजुमदार : पुस्तकों के पन्नों से 1-2

कहानी

# नौकरी की छतरी

## किसलय पंचोली

सुरभि ने उपरी बर्थ से उतरने के बाद चलती ट्रेन से बाहर देखा। ओफ! काफी काले-काले बादल घिर आए हैं। बिजली भी चमक रही है। लगता है बारिश होगी। मैं छतरी लाई नहीं हूँ। मम्मी ने आखिर में देना चाही थी। पर भाई अक्षय ने 'कम सामान रखो' कहकर हटवा दी थी। देखो, शायद रुक जाए। यूँ सोचते-सोचते वह सीट पर बैठ गई।

कम्पार्टमेन्ट में ज्यादा सहयात्री नहीं थे। एक बुजुर्ग अंकल। छोटे बच्चे के साथ माँ। ताश खेलते दो युवा लड़के और अपने लैपटॉप पर काम करता अफसर उसके सहित कुल जमा सात यात्री। सभी मास्क पहने, सामाजिक दूरी का पालन करते, हाथ में सैनिटाइजर थामे हुए।

'इंदौर से बैंगलोर इंटरव्यू देने सुरभि अभी जाए या नहीं?' इस पर घर में खूब विचार हुआ था। पापा कह रहे थे 'क्या अड़ा -पड़ा है कोरोना काल में इतनी दूर इंटरव्यू देने जाना? ट्रेन भी दिन छटे पहुंचेगी। यह सेफ नहीं है। नहीं जाएगी सुरभि।'

मम्मी समझाइशी टोन में कह रही थीं 'जाने दो ना। प्लीज़। वह ध्यान रखेगी अपना।'

भाई अक्षय फट पड़े थे 'पापा, आप रहने ही दो। आपने हमें फूलकुंवर बना-बना के बहुत वर्ष रख लिया। आपकी पीढ़ी में नौकरियाँ आसानी से मिल जाती थीं। हमारे लिए कितना मुश्किल है यह हम ही जानते हैं। सुरभि, तुम जरूर जाओ इंटरव्यू देने। अच्छी कंपनी के मौके बार-बार नहीं मिलते।'

तभी स्टेशन छोड़ने भी भैया ही आए थे। माँ ने अपने आप को पापा के समक्ष

# Setu सेतु

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*सेतु वर्ष 6, अंक 9, फ़रवरी 2022*

सेतु के पीडीएफ़ (PDF) डाउनलोड, कविता कोश पर

**सम्पादकीय**
- सम्पादकीय: अनुराग शर्मा

**कथा-कहानी**
- सरप्राइज़: नीहार गीते
- बोस्की: ज्योत्सना सिंह
- संतूर के सुर: शशि पाधा
- वेलेंटाइंस डे: नीना सिन्हा
- ऊँट का मुँह: दीपक शर्मा
- बंधी हुई मुट्ठी: दीपक शर्मा
- एडमिन: कुमार विक्रमादित्य
- फ़ेसबुक पोस्ट: किसलय पांचोली
- सनकी सज्जन: चंद्र मोहन भण्डारी

**व्यंग्य**
- भानगढ़: जीतेंद्र भटनागर
- लालकिला और खाई: हरीश नवल

**स्थायी स्तम्भ**
- अहिंसा: कन्हैया त्रिपाठी
- बिंदास: धर्मपाल महेंद्र जैन

**साक्षात्कार**
- सुधा ओम ढींगरा: योगेंद्र सिंह
- राजकिशन नैन: अशोक बैरागी

**समीक्षा**
- केसरिया बालम (हंसा दीप): विजय कुमार तिवारी
- भीड़ और भेड़िये (धर्मपाल महेंद्र जैन): मुकेश राठौर
- मैं नहीं जानता (कमलेश भारतीय): दिनेश पाठक 'शशि'

**आलेख, विमर्श, व शोध**
- नायक किस मिट्टी से बनते हैं? (अनुराग शर्मा)
- अमेरिका से प्रकाशित हिंदी पत्रिकाएँ (बी सूर्याकुमारी)

**दृश्य-श्रव्य (सौजन्य: रेडियो प्लेबैक इंडिया)**
- आती क्या खण्डाला (अनुराग शर्मा): पूजा अनिल
- कथा चर्चा: पंकज सुबीर के साथ अनुराग शर्मा की वार्ता

**धरोहर**
- मन की आँखें खोल बाबा: पण्डित सुदर्शन

English हिन्दी Poetry काव्य Author आलेख लेखक Fiction कहानी Editorial समीक्षा पुस्तक Book स्तम्भ Review Article शोधपत्र कवि लघुकथा अनुराग शर्मा Sunil Sharma Anurag Sharma Translation अनुवाद सम्पादकीय Interview Art Excerpt व्यंग्य Photo Feature Ghazal दीपक शर्मा निबंध कन्हैया त्रिपाठी धरोहर समाचार Memoir बिंदास गीत साक्षात्कार मेहेर वान Author of the Month पत्र प्रकाश मनु संस्मरण भाषा जीवनी चित्र Novel अरुण कुमार निषाद आत्मकथा संस्कृत प्रवासी करोना पोषण शशि पाधा Autobiography बाल साहित्य बिस्मिल सम्मान Audio-Visual उर्दू यात्रा India@70 सत्यवीर सिंह My world and words कला प्रियांकी मिश्रा प्रेमचंद Travelogue क्यों और कैसे प्रतियोगिता अनूप शुक्ल मॉरिशस Report Mauritius सेतु सम्मान दृश्य-श्रव्य अभिमन्यु अनत गिरिजेश राव धर्म व्याकरण Heritage LitFest लिपि Ranking Quotes Recital feedback

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**कविता: क्या खोया, क्या पाया!**

शशि पाधा मन की गठरी बाँध के रखी यादें शहरों गाँव की मिटटी की सौंधी खुशबू की, बरगद की ठंडी छाँव की चौपालों पे हँसी ठिठौली, भरी पिटारी खु...

Setu 🚉 सेतु

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# कहानी: फेसबुक पोस्ट

**- किसलय पांचोली**



"आशु, तुम समझते क्यों नहीं, लोग क्या कहेंगे?" झूमर की तरह लटकते, झूलते पीले फूलों वाले अमलतास के पेड़ के नीचे लगी बैंच पर अट्ठाईस वर्षीय युवक आशीष से सटी बैठी, पच्चीस वर्षीया युवती रीना ने तनिक झुँझलाकर दूर सरकते हुए कहा।

"क्या कहेंगे?"

"यही कि... कैसे घर जा रही है रीना? कि उसकी सास... बेटे की शादी से पहले खुद दूसरी शादी कर रही है! उस इट लुक्स नाईस?"

"रीना, मुझे लोगों की परवाह नहीं। एंड लुक्स नाईस आर नॉट इस अ व्हेरी रिलेटिव थिंग। तुम अपने दिल की कहो। तुम क्या सोचती हो?" बैंच पर मढ़े रंग-बिरंगे टाइल्स के टुकड़ों की आउट लाइन पर ऊँगली घुमाते हुए आशीष ने पूछा।

"अंहअहं वो... कि मैं... ऐसा कुछ नहीं... पर..." रीना इस सीधे प्रश्न से अचकचा उठी।

"कोई बात नहीं। तुम अपना टाइम लो। जब दिल की आवाज़ सुन पाओ मुझे बता देना। मैं इन्तजार करूँगा।" आशीष ने शांत, गंभीर स्वर में जवाब दिया।

दोनों उठ गए। अमलतास का पेड़ जिज्ञासा में और ज्यादा कलियाँ चटकाने लगा। फूल बतियाने लगे। 'क्या बोलेगा रीना का दिल?' पुराने प्रेमी-प्रेमिका हैं। पर इस बात पर सहमति नहीं बना पा रहे। आखिर पिछले चार सालों से ये दोनों पार्क की इसी बैंच पर बतियाते रहे हैं। बैंच और पेड़ ने खिलखिलाहटों, प्रेमासिक्त साँसों, प्यार से भीगे स्पर्शों को ही देखा, सुना और महसूस किया है। अनबन जैसी कोई बात कभी हुई ही नहीं।
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"आशीष, आज तू इतना उदास क्यों है?" प्राइवेट स्कूल में लेक्चरर आशा ने घर आए बेटे को केक के साथ चाय दे, पास बैठ, उसके सिर पर स्नेहसिक्त हथेली रखते हुए पूछा।

"कहाँ माँ?.... मैं कहाँ उदास।... न। बस... जरा थक गया हूँ।" एजुकेशनल स्टार्टअप में कंटेंट राइटर आशीष ने फियांसी रीना के साथ हुए वार्तालाप से उपजी उदासी को माँ के प्रति जिम्मेदार मुस्कुराहट से बखूबी ढकते, उनका हाथ थामकर जवाब दिया।

"चल रहने दे। तुझे अभी नहीं बताना, मत बता।" आशा ने बात को और नहीं खींचा। हालाँकि वह जानती है कि बेटे द्वारा घर आकर जल्दी से कपड़े न बदल, फेसबुक खोल रोज की पोस्ट न लिख, यूँ ही पेनस्टैंड में रखे पेन, पेंसिल चाबी आदि को गोल-गोल घुमाना, उसकी किस मन:स्थिति का द्योतक है।

यूँ घर में अब है ही कौन? बस माँ आशा और बेटा आशीष। दोनों एक दूसरे का बेहद ख्याल रखते हैं। इतना ध्यान देते हैं कि पूछो मत! चेहरा देखकर दिल पढ़ लेते हैं। भंगिमा बूझकर इस सलीके से बात करते हैं मानो दोनों गहरे मित्र हों।
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एक समय था जब ज़िन्दगी इस घर को बहुत थपेड़े मारती थी। ये दीवारें ढेरों तानों को परावर्तित करती थीं। जब दरवाजे कँपकँपा उठते थे, गुस्से की थरथराहट से। जब खिड़कियों के शीशे बड़ी मुश्किल से दरकने से बच पाते थे, आए दिन के उलाहनों से। जब घर में आशीष के दादाजी और पापा भी रहते थे। तब वह स्कूल जाता छोटा बच्चा था। क्या समझता? कुछ भी नहीं।

पापा सिविल कांट्रेक्टर थे। देर रात को घर आते। उनके आते ही वह ठण्ड के दिन होते, रजाई में दुबक जाता। गर्मी होती, चादर ओढ़कर सो रहता। बिलकुल भी नहीं हिलता डुलता। आधी आँख और एक कान से चुपचाप देखता सुनता रहता।

"तुम्हें जरा खाना बनाना नहीं आता। गोबर परोस लाती हो गोबर।" झन्न से थाली फिंकती।

"मैं गर्म रोटी उतार लाती हूँ।" माँ जल्दी से नई थाली में अचार, पापड रखती कहतीं। लेकिन पापा हर निवाले के साथ माँ को एक और झिड़की देते जाते। तभी दूसरे कमरे से दादाजी कह उठते-

"अरे बेटा मैंने भी बड़ी मुश्किल से खाना खाया। बड़ा बेस्वाद बना था। राम राम! गैया भी मुँह मोड़ ले ऐसा।"

English हिन्दी Poetry काव्य Author आलेख लेखक Fiction कहानी Editorial समीक्षा पुस्तक Book स्तम्भ Review Article शोधपत्र कवि लघुकथा अनुराग शर्मा Sunil Sharma Anurag Sharma Translation अनुवाद सम्पादकीय Interview Art Excerpt व्यंग्य Photo Feature Ghazal दीपक शर्मा निबंध कन्हैया त्रिपाठी धरोहर समाचार Memoir बिंदास गीत साक्षात्कार मेहेर वान Author of the Month पत्र प्रकाश मनु संस्मरण भाषा जीवनी चित्र Novel अरुण कुमार निषाद आत्मकथा संस्कृत प्रवासी करोना पोषण शशि पाधा Autobiography बाल साहित्य बिस्मिल सम्मान Audio-Visual उर्दू यात्रा India@70 सत्यवीर सिंह My world and words कला प्रियांकी मिश्रा प्रेमचंद Travelogue क्यों और कैसे प्रतियोगिता अनूप शुक्ल मॉरिशस Report Mauritius सेतु सम्मान दृश्य-श्रव्य अभिमन्यु अनत गिरिजेश राव धर्म व्याकरण Heritage LitFest लिपि Ranking Quotes Recital feedback

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**कविता: क्या खोया, क्या पाया!**

शशि पाधा मन की गठरी बाँध के रखी यादें शहरों गाँव की मिटटी की सौंधी खुशबू की, बरगद की ठंडी छाँव की चौपालों पे हँसी ठिठौली, भरी पिटारी खु...

आशीष सोचता खाना ऐसा कहाँ था? कोफ्ते की सब्जी कितनी स्वादिष्ट बनी थी। मैंने चटकारे लेकर खाई थी। माँ ने अभी तक खाना नहीं खाया है। पता नहीं अब वे खा पाएँगी कि नहीं। जब पीछे से पापा खरटि लेने लगते वह दबे पाँव उनके पास पहुँच जाता।

“माँ, आप खाना खा लो न!” मनुहार से कहता।

“मुझे भूख नहीं है।”

“आप को मेरी कसम। मेरे सामने खाओ।” दोनों की आँखों से आँसू झरते जाते। जब तक वे खाना नहीं खा लेती आशीष वहीं बैठा रहता। टक-टकी लगाए उन्हें निहारता रहता। ‘कितनी सुंदर है मेरी माँ। कितनी कोमल और जगत वत्सला।’ अनावश्यक डाँट और असम्मान के ऐसे दृश्य आए दिन घर में घटित होते रहते। वे सुनती जातीं। नज़रें झुकाए खड़ी रहतीं। आशीष को लगता ‘यह क्या बेहूदगी है? दादाजी पापा का अँधा पक्ष लेते हैं। और पापा दादाजी की गलत बातों पर चुप लगाए रहते हैं। माँ हर बार बस कसमसाकर रह जाती हैं।’

वे शादी से पूर्व स्कूल टीचर थीं। आशीष ने सुना है कि उसके जन्म के पहले ही उन्हें सख्ती दिखाकर जॉब करने से रोक दिया गया था। घरेलू खर्चों की खींचतान से परेशान हो एक बार उन्होंने कहा -

"मैं वापस स्कूल ज्वाइन कर लेती हूँ। आशीष की फीस समय पर दे पाएंगे।"

“बहू, चाहे उधार लेना पड़े। तुम्हें कोई ज़रूरत नहीं है ज्वाइन करने की। हमारे परिवार की बहुएँ बाहर काम करने नहीं जातीं। तुम कहीं नहीं जाओगी।" दादाजी माँ के कँपकँपाते हाथों से अपाइंटमेंट लेटर छीन चिंदी-चिंदी फाड़ते हुए फरमान जारी कर देते। पापा चुप लगा जाते। वे अकेली बैठी आठ-आठ आँसू रोती रहतीं। कोई उन्हें चुप कराने नहीं आता। बच्चा आशीष उन्हें उदास बैठा देखता रहता। उसे घर के समीकरण गणित के समीकरण से भी बहुत कठिन लगते।

वह सोचता ‘ऐसा क्यों है कि माँ की कोई बात सुनी नहीं जाती?’ रात को वह उनके पल्लू से लिपट जाता। वे उसे प्यार करतीं। एक बार उसने उनसे पूछ लिया।

"माँ, आप दिन भर कितना काम करती हो। फिर भी दादाजी आपको झिड़कते हैं। पापा आपकी गलतियाँ निकालते हैं। ताने मारते हैं। क्यों? आप इतना क्यों सहती हो?"

"तेरी खातिर बेटा। तेरे लिए मैं सहती हूँ। तू बड़ा हो जा। फिर सब ठीक हो जाएगा।"

जब दादाजी की मृत्यु हुई आशीष की आँखों में एक बूंद आँसू न था। उसे लगा ‘चलो माँ को सताने वाला एक जन कम हुआ।’ पर वह क्या जानता था कि अब घर और गहरे आर्थिक संकट में डूब जाएगा। दादाजी की पेंशन आना बंद हो गई। पापा के काम में अनिश्चितताएँ और बढ़ गई।

आशीष अपने पापा को कभी समझ ही नही पाया। वह उनसे दूर-दूर और कटा-कटा ही रहता। वे थे ही ऐसे। आत्ममुग्ध-ठसक से भरे इंसान। जितनी देर घर में रहते, खुद की प्रशंसा का आलाप चलता रहता। उनके किस्से, उनकी वाहवाही की बातें होती रहतीं। दादाजी, पड़ोसी या दोस्तों के साथ। साक्षात या टेलीफोन पर। उसे लगता ‘क्या माँ मशीन हैं? इंसान नहीं! उनकी तारीफ में कभी कोई बातें क्यों नही होती?’

वह अपने घर के हालात नानी के घर बयाँ करना चाहता। वे उसे मना कर देतीं। 'घर की बात घर में रहनी चाहिए।' वह सोचता ‘ऐसी बात जिससे घर की हवा में घुटन हो उसे घर में ही रखे रखना क्या ठीक है?’ पर वह उनके कहे का बहुत सम्मान करता था। सो बाहर कुछ नहीं कहता।
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दादाजी के गुजर जाने के बाद भी लगभग पाँच सालों तक घर उसी पटरी पर चलता रहा जो वे खींच गए थे। पापा की कॉन्ट्रेक्टरशिप कभी अच्छी चल निकलती। कभी बिल्कुल ठप्प हो जाती। पर वे अपनी गैर जिम्मेदाराना आदतों जैसे काम को टालना, समय पर नहीं करना और कोई समझाने जाए जैसे माँ उन्हें झिड़क देना, ईगो पर ले लेना से बाज नहीं आते थे।

हाँ, पर माँ की नसीहत और व्यवहार आशीष के लिए प्रेरणास्पद थे। साथ ही घर के हालातों ने उसे भली-भांति समझा दिया था कि 'मुझे अच्छे नम्बरों से पढाई पूरी करना है। और जल्दी से जल्दी कोई जॉब लेना है। ताकि घर की मुसीबतों को कम करने में सहायक बन सकूँ।' उसने अपने स्तर पर छोटी कक्षाओं की ट्यूशन पढ़ाना भी शुरू कर दिया।

पापा की ठसक अब भी कम नहीं पड़ी थी। पर फीकी ज़रूर हो गई थी। उनका काम ठीक-ठाक नही चल रहा था। इसलिए उन्होंने माँ नौकरी करने के लिए दुबारा पूछने पर मना नही किया। भले हाँ भी नही किया। और माँ ने नौकरी ज्वाइन कर ली। पहले वे घर में कैद-सी ज़िन्दगी जी रही थीं। अब उन्हें कुछ नए रिश्ते बनाने का मौका मिला। हालाँकि घर और बाहर की जिम्मेदारियों से वे थक जातीं। लेकिन थकान में भी उन्हें सुकून मिलता था। वे अधिक खुश रहने लगीं थीं।

घर अब बेहतर जगह हो गया था। आशीष का जॉब लग गया था। माँ बेटे एक दूसरे को समझते थे। वक्त देते थे। बातें करते थे। पापा घर में अलूप से हो गए थे। ‘मेरा क्या है?’ वाला भाव हर वक्त उनके चेहरे पर पुता रहता। वास्तव में वे अपनी ही बीमार मानसिकता की गिरफ्त में बुरी तरह फँस चुके थे। परिवारों में संस्कार जन्य अंतर होते हैं। पर हर नया परिवार अमूमन माँ के संस्कारों की नींव पर खड़ा होता है। इस बात से इत्तफाक रखना न जाने क्यों वे अपनी तौहीन समझते थे। और तो और किसी मनोचिकित्सक की सलाह लेना भी अनुचित और गैर जरूरी मानते थे। आशीष और आशा ने उन्हें वे जैसे थे वैसे ही स्वीकार करना सीख लिया था। इधर आशीष की जिंदगी में रीना का प्रवेश हो गया था। दोनों बहुत खुश थे।
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कहते हैं न मनुष्य की सोच, कल्पना और ज़िन्दगी की हकीकत अक्सर मेल नहीं खाती। हम सोचते क्या हैं? और हो क्या जाता है! किसी ने नहीं सोचा था वैसा पूरी दुनिया में घटित होने लगा। न जाने कहाँ से कोविड 19 की महामारी ने पूरे देश को चपेट में ले लिया। लॉकडाउन लग गया। पापा का काम बिलकुल ही ठप्प हो गया। माँ की छोटी-सी नौकरी भी समाप्त प्राय सी हो गई। मेनेजमेंट ने कह दिया 'जब स्कूल ही नही लग रहा कैसी तनख्वाह ?' आन लाइन क्लासेस लेने का कुछ पैसा मिलता था। घर बचत पर परजीवी हो चला। ऐसे विकट समय में पापा और अवसाद ग्रस्त हो गए। अधिक जिद्दी व और ज्यादा हठी भी। अस्थमा उन्हें था ही। बस अड़ गए तो अड़ गए। फिर बात सही हो या गलत। दुनिया की कोई ताकत उन्हें नहीं समझा सकती।

“सुनो आप सामान लेने बाहर न जाएँ।” माँ कहतीं।

“.....”

“गर जा ही रहे हैं प्लीज मास्क लगा लें।” वे सलाह देतीं।

“नहीं लगाना मुझे मास्क-वास्क। ये सब फ़ालतू के चोंचले हैं। व्यक्ति खुली हवा में साँस भी न ले क्या?” पापा नहीं सुनते। अस्थमेटिक होते हुए भी बिना मास्क व सेनीटाईजेशन की सावधानी के निकल पड़ते घर से बाहर। उनकी ज़िद ने उन्हें पहले महीने में ही कोविड हॉस्पिटल पहुँचा दिया। आईसोलेशन वार्ड में अकेले पड़े रहते। माँ खाना देने जातीं।

“डाक्टर साहब ये ठीक हो जाएँगे न?”आशा ने डबडबाई आँखों से ड्यूटी डाक्टर मेहरा से पूछा।



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“आप पहले यहाँ बैठिए मिसेज सिसोदिया। हम आपके पति को बचाने की पूरी कोशिश कर रहे हैं। एक उनके फेफड़ों में इंफेक्शन काफी फैल चुका है। दूसरे अभी इस बीमारी का इलाज भी ट्रायल बेस्ड ही है। तीसरे पेशेंट का कोआपरेटिव होना बेहद ज़रूरी है। आप समझाएंगी मान जाएँगे।” डाक्टर ने प्यार और विस्तार से स्थिति स्पष्ट कर दी।
आशा के दिल में टीस सी उठी। वह क्या बताए डाक्टर को कि न सुनने की, अपनी ही करने की ज़िद कितनी बड़ी है इनकी। शायद जीने की जिजीविषा से भी बड़ी। वे चार महीने एडमिट रहे। अंतत: ज़िद ने जिंदगी लील ली। घर भांय- भांय कर उठा। मौत के आंकड़े, अखबारी प्रतिशत कुछ भी कहें, जिस घर पर गाज गिरती है उसकी पीड़ा और दर्द उस घर को ही भुगतना होता है। सो घर ने भुगता। पापा नहीं रहे। दिवंगतों की श्रेणी में पहुँच गए।

हाँ, पर अस्पताल के चक्कर लगने से आशा और डाक्टर मेहरा करीब आते गए। माँ के लिए यह बिलकुल ही नया अनुभव था कि कोई व्यक्ति उन्हें इतने सम्मान से पेश आए। वे मन से उनसे जुड़ती चली गईं। पापा के चलित उठावने में डाक्टर मेहरा घर भी आए। भीड़ के निकल जाने के बाद रुके रहे। माँ के करीब आ उन्हें सांत्वना दी। उनका फोन नम्बर लिया। वे फोन पर मानसिक संबल देते रहे। उन्हें आनलाइन ट्यूशन भी दिलवा दी।

“आशीष, मैँ आज शाम डाक्टर मेहरा को खाने पर बुलाना चाहती हूँ। बुला लूँ?” माँ ने पूछा।

हाँ माँ क्यों नहीं बिलकुल। मैं आ जाऊँगा डिनर तक।” आशीष ने ख़ुशी-ख़ुशी सहमती दी। वह चीजों, बातों, भावनाओं को समझता गया। उसे अच्छा लग रहा था कि माँ पहले के असामान्य जीवन और पापा की अकस्मात मौत से उबर रही हैं। तेजी से सामान्य जीवन की ओर लौट रही है। ऐसा जीवन जो उनके सामने पहली बार उद्घाटित हो रहा है।

डाक्टर मेहरा जब डिनर पर आए आशा ने कोफ्ते की सब्जी के साथ दाल चाँवल रायता और गुलाबजामुन भी बनाए। उन्होंने तारीफों के पुल बांधते हुए खाना खाया। आशीष ने देखा माँ की आँखों में ख़ुशी के आँसू झिलमिला रहे थे। और यह भी कि वे जो सिल्क की साड़ी गिफ्ट दे गए थे माँ उसे पहन काफी देर तक काँच के सामने खड़ी रहीं। सुबह जब आशीष उठा वे उसी साड़ी को ओढ़ पलंग पर किसी मासूम परी-सी सो रही थीं। उसे देखकर हड़बड़ा कर उठ बैठीं।

“माँ आप लेटो। मैं चाय बना लाता हूँ।” आशीष ने जाना माँ धीरे-धीरे प्यार की ओर बढ़ रही हैं। वह यह भी बूझ रहा था कि वे कदम आगे बढ़ाने से हिचक रही हैं। वही सामाजिक बेड़ियों, स्त्रियों के लिए बनाए गए अलिखित नियम कानून, संस्कार, परिपाटी, रस्मों रिवाजों के चलते। आशीष ने सोचा वह आज डाक्टर मेहरा से मिलेगा। और वह मिला भी।

आशीष ने शाम को रोज की तरह फेसबुक खोला। वह पूछता है ‘व्हाट्स आन योर माइंड।’ यूँ वह रोज पोस्ट लिखता है जन्मदिन की शुभकामनाएँ, बधाईयाँ, शोक सन्देश लिखता है। पर आज उसे लगा फेसबुक उसी से कुछ ख़ास पूछ रहा है। उसने सोचा क्यों न मैं अपने मन की बात फेसबुक पोस्ट में डाल दूँ। और पोस्ट लिखना शुरू कर दी। और उसे पब्लिक पोस्ट भी कर दी।

मित्रों,

मैं इस पोस्ट के माध्यम से पूरी दुनिया को यह बताना चाहता हूँ कि माँ प्रकृति की सबसे अनोखी रचना होती है। जीवन का सबसे बड़ा वरदान। उसका प्यार निशर्त होता है। वह बच्चों पर अपना सब कुछ न्यौछावर कर देती है। और बदले में कुछ भी नही मांगती। दरअसल यह हर माँ के लिए गढ़ी गई स्टीरिओटाइप इमेज भर है। जिसे वह अनजाने में आत्मसात कर लेती है। विचार ही नहीं करती अपने स्वयं की ज़िन्दगी व सपनों के बारे में।

हमारी ज़िन्दगी में प्रेम ना हो यह हमारे लिए बड़े दुख की बात होती है। लेकिन माँ की ज़िन्दगी में प्रेम के स्टेट्स की हम कभी परवाह नहीं करते। हम यह महसूस नहीं कर पाते कि हमारे आसपास की अकेली, तलाक़शुदा या विधवा माँओं ने अपना जीवन निचाट अकेले कैसे काटा होगा?

हम सोच नहीं पाते कि माँ सिर्फ माँ नहीं होती। एक औरत और इन्सान भी होती है। सुख-दुख, अकेलापन उसको भी सालता है। अगर पिता का जीवन प्रेम से खाली हो और वे अपने लिए प्रेम ढूंढ ले। कोई नाराज़ नहीं होता। सबको लगता है पिता को सुख का अधिकार है। किसी को नहीं लगता कि माँ को भी सुख का अधिकार है।

लेकिन जो अपने लिए कुछ नहीं चाहती क्या हम बच्चों को उसके लिए कुछ नहीं चाहना चाहिए? जो हमें निस्वार्थ भाव से प्रेम करती है क्या हमें कभी उसका प्रेम लौटाना नहीं चाहिए?

माँ, मैं आपका बेटा हूँ। मैंने आपको तकलीफ सहते हुए करीब से देखा है। आपने पूरे पच्चीस साल पापा के साथ निकाले हैं। पापा जो दिल के अच्छे इंसान थे। लेकिन गुस्सैल और बदजुबान भी थे। आप कहेंगी ‘बेटा दिवंगत आत्मा के लिए इस तरह नही कहा करते।’ पर माँ आज मुझे मेरे मन का गुबार लिख लेने दो। मुझे हल्का हो जाने दो। पापा न जाने क्यों इन्फ़िरिअरिटी काम्प्लेक्स से ग्रसित रहते थे? पता नहीं उन्हें जिन्दगी से असुरक्षा की भावना क्यों जोड़ रखी थी? और इसी से निजात पाने के लिए वे गुस्से की शरण लेते थे। जो फिर एक नई गलती हो जाती थी।

माँ, अब मैं बड़ा हो गया हूँ। मैं आपके साथ खड़ा हूँ। आप अनावश्यक द्वंद्व से उबर जाओ। मैंने आपकी नजरों में प्यार को पनपते देखा है। और आपको उसे छुपाने की नाकाम कोशिशें करते हुए भी। माँ, आप डाक्टर मेहरा से प्यार करने लगी हो। इसमें कुछ भी गलत नही। वे भी आपको चाहते हैं। मेरी उनसे बात हुई है। वे आपसे शादी करना चाहते हैं। मैं जानता हूँ कि आप भी यही चाहती हैं। बस झिझक रही हो। मैं आपके निर्णय को उचित समझता हूँ। आप को इसका पूरा हक है। मैं मानता हूँ कि प्रेम के आगे सिर झुकना चाहिए सम्मान में। फिर चाहे वह प्रेम माँ का ही क्यों न हो। मैं चाहता हूं जिन्दगी के उतरार्ध में आपको खिलती कलियों-सा सुख नसीब हो। आपको होने वाली शादी मुबारक हो माँ!
***

आशीष ने कभी सोचा नहीं था कि उसकी पहली पब्लिक पोस्ट एक ही दिन में इतनी लाइक्स बटोर लाएगी। उसने बस अपना दिल खोल कर रख दिया था। यह सोचते हुए कि भले अभी तक रीना ने उसकी बात का जवाब नहीं दिया है। पर वह खुद को स्वार्थी की श्रेणी में नहीं गिनना चाहता।

हाँ, पोस्ट लिखने से पहले उसने इतना जरुर सोचा था कि ‘मेरी अभी ज़िन्दगी की शुरुवात है। रीना अगर मुझे नहीं भी मिल पाई कोई बात नहीं। मुझे और मौके मिलेंगे। पर मेरी माँ की बची ज़िन्दगी में कदाचित यह पहला और आखिरी अवसर हो। मैं इसी तरह माँ का प्यार कुछ हद तक लौटा सकता हूँ। फिर मैं क्यों पीछे हटूँ? पहले माँ की शादी फिर मेरी यही ठीक रहेगा।’

न जाने किस धुन में आशीष के कदम बगीचे की ओर मुड़ गए। उसी झूमर की तरह लटकते, झूलते पीले फूलों वाले अमलतास के पेड़ के नीचे लगी बैंच की ओर। उसने देखा फ़िलहाल वहाँ पचपन वर्षीय डाक्टर मेहरा पचास वर्षीया माँ के साथ बैठे थे! यूँ अमलतास के फूलों में सुगंध नही होती लेकिन आज आशीष के नथुने सुवास से भर उठे। वह मुस्कुरा दिया। और फेसबुक पोस्ट खोलकर बढ़ती हुई लाइक और कमेन्ट देखने लगा। शायद कहीं रीना का नाम दिख जाए!
***

**परिचय**

प्राध्यापक, वनस्पति शास्त्र शासकीय होलकर विज्ञान महाविद्यालय इंदौर (मध्य प्रदेश)

चार एकल पुस्तकें 'अथवा', 'नो पार्किंग', 'नामायन', 'इंदु की स्लाइड', तथा चार साझा संकलनों में रचनाएँ प्रकाशित।

हिंदी पत्र-पत्रिकाओं में प्रकाशन, मराठी व गुजराती पत्रिकाओं और पुस्तकों में कहानियाँ अनूदित. कहानियों पर टेली फ़िल्में निर्मित, कहानियों के नाट्य रूपान्तर मंचित, आकाशवाणी इंदौर से कहानियाँ प्रसारित।
कादम्बिनी, कथाक्रम, कथादेश, कथाबिम्ब, कथा समवेत, अहा जिंदगी अमेज़न पेन टू पब्लिश आदि से रचनाएँ पुरस्कृत।

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# हिन्दी साहित्य – कथा-कहानी ☆☆ पंगत और 'चाँद-थाली' ☆☆ डा. किसलय पंचोली ☆

**डॉ किसलय पंचोली**



**परिचय**

- कहानी संग्रह "अथवा" रामकृष्ण प्रकाशन विदिशा म.प्र., "नो पार्किंग" दिशा प्रकाशन दिल्ली, नवजात शिशुओं के दस हजार से अधिक नामों का द्विभाषी कोष "नामायन" सुबोध प्रकाशन दिल्ली से प्रकाशित. ऑनलाइन कहानी संग्रह " इंदु की स्लाइड" अमेजन पर अपलोडेड . कहानी संग्रहों "बीसवीं सदी की महिला कथाकार", "जमीन अपनी अपनी", "मैं हारी नहीं" और 'कथा मध्य प्रदेश" में कहानियाँ चयनित व प्रकाशित. आकाशवाणी इंदौर से कहानियाँ प्रसारित.
- साहित्यिक पत्रिकाओं यथा ज्ञानोदय, कथादेश, कथन दिल्ली; कथाक्रम, लखनऊ, समावर्तन उज्जेन; अक्षरा, प्रबुद्ध भारती भोपाल; अक्षर पर्व रायपुर, मसिकागद रोहतक और समाचार पत्रों आदि में कहानियाँ, पत्र पत्रिकाओं में कविताएँ, विज्ञान पत्रिकाओं यथा विज्ञान प्रकाश, विज्ञान प्रगति दिल्ली, साइंस इण्डिया भोपाल आदि में विज्ञान गल्प प्रकाशित . मराठी व गुजराती साहित्यिक पत्रिकाओं और पुस्तकों में कहानियाँ अनुदित. कहानियों पर टेली फ़िल्में निर्मित. कहानियों के नाट्य रूपान्तर मंचित, कहानियाँ अनेक ऑनलाइन प्लेटफार्म पर उपस्थिति.

- कादम्बिनी, कथाक्रम, कथादेश, कथाबिम्ब, कथा समवेत, अहा जिंदगी अमेज़न पेन टू पब्लिश आदि से रचनाएं पुरस्कृत.

**☆ कथा-कहानी ☆ पंगत और 'चाँद-थाली' ☆ डा. किसलय पंचोली ☆**

मैं अनुमान लगा रही हूँ इस बार जन्मदिन पर अनुराग मुझे क्या गिफ्ट देगा? अं... शायद गोल्ड के इयरिंग...? यूनिट की पिछली कपल पार्टी में जब मैं मिसेज नाइक के इअरिंग की भूरी-भूरी प्रशंसा करते नहीं अघा रही थी तब उसकी आँखों में उन्हें खरीदने की ललक सोने से भी ज्यादा चमक रही थी।... पर ऐसी ही फीलिंग खूबसूरत हैदराबादी मोती-नेकलेस... के साथ भी मैंने पढ़ी थी। मुझे याद है मैं एक मेले में मोतियों के स्टाल पर ठिठक गई थी। उसने कहा था 'सारिका, ये मोती रियल होंगे या नहीं आई डाउट?' और हम आगे बढ़ गए थे।...हो सकता है वह इस बार मैसूर सिल्क की साड़ी...खरीद लाए। अनुराग को मुझे सिल्क साड़ी में देखना बहुत ही पसंद जो है। मैंने लपेटी कि वह दीवाना सा हो जाता है।... या संभव है वह मेरे लिए फेंटास्टिक पश्चिमी परिधान गिफ्ट में देना पसंद करे। ...उसे पता है कि मुझे वेस्टर्न कपड़े कितने भाते हैं।... कुल जमा बात यह बन रही है कि संभावित भेंट का हर ख़याल मुझमें ढेर सारी पुलक भर रहा है। खूब रोमांचित कर रहा है। और क्यों न करे? शादी उपरान्त मुझे पति कैप्टन अनुराग से हमेशा ख़ास उपहार जो मिलते रहे हैं। तभी घंटी बजी।

"तुम आ गए। व्हाट अ प्लीसेन्ट सरप्राइस!" कह मैं अनुराग से लिपट गई।

"कैसे न आता? आज तुम्हारा जन्मदिन है।" उसने मुझे प्रगाढ़ आलिंगन में भर लिया। आलिंगन, जिसमें एक दूसरे के प्रति सकारात्मक भावनाऐं, ऊर्जाऐं तरंगित हो उठीं। हम तरंगों की सवारी पर निकल पड़े। ऐसी सवारी, जब समय स्वयं ठिठककर प्यार की जादूगरी निहारता है। लगता है हम दो जन हैं ही नहीं। एकमेव हो चुके हैं। सुख और संतुष्टि के अदृश्य रेशमी बंधन हमें सहला रहे हैं। पूरी दुनिया में हम सबसे भाग्यशाली हैं। तरंगों के मद्धिम पड़ने पर कुछ समय बाद उसने कहा।

"सारिका, आँखें बंद करो।" मैंने कुछ बंद की। कुछ-कुछ खुली रखी।

" आई से नो चीटिंग, पूरी बंद करो।"

मैंने समीप की टेबल पर पड़े स्कार्फ से आँखों पर पट्टी बांधी और कुर्सी पर स्थिर बैठ गई।

"ओ के बाबा, लो पूरी बंद कर ली।" मेरी बंद आँखों के सामने तन चुके गहरे भूरे चिदाकाश के परदे पर रह-रहकर गोल्ड इयरिंग, हैदराबादी नेकलेस, सिल्क साड़ी, पश्चिमी परिधान दिप-दिपकर चमकने लगे। एक दूसरे से बार-बार प्रतिस्पर्धा सी करते, प्रकाश की गति से आने जाने लगे। गोल्ड इयरिंग की एक में एक फंसते छल्लों की डिजाइन हो या हैदराबादी नेकलेस की तीन लड़ों के मोतियों की क्रमश

घटती साइज या सिल्क साड़ी का सुआपंखी रंग या हाफ  शोल्डर वाला क्रीम कलर का पश्चिमी परिधान! कल्पना उनकी डीटेलिंग का काम पूरे मनोयोग से करने लगी।

अनुराग ने बहुत प्यार भरे स्पर्श से मेरे दोनों हाथ थामे। और गिफ्ट बॉक्स के ऊपर रखते हुए कहा।

“बूझो,  इस बार तुम्हारी बर्थडे गिफ्ट क्या है?”

मैं उपहार बाक्स के चिकने रेपर पर ऊपर से नीचे उँगलियाँ फेरती गई। अगल से बगल घुमाती गई। अच्छा ….काफी बड़ा है।… क्या हो सकता है?… मेरी झिलमिलाती ज्वेलरी और सिल्की या साटनी कपड़ों की संभावित गिफ्टस की पेकिंग इतनी बड़ी तो हो ही नहीं सकती।…  हूँ… कहीं फुट विअर के डब्बे तो नहीं? यस,  मेरे मुँह से एक बार निकला था ‘जूते चप्पल पुराने हो गए हैं।’ क्या पता…  नया लैपटॉप  हो?…हाँ मैंने  यह भी कहा था ‘मेरा लैपटॉप बार-बार हेंग हो जाता  है।’… उहूँ  छोटा माइक्रोवेव ओवन भी हो सकता है। मुझे कढाई में पेन केक बनाने की खट-खट करते देख अनुराग ने कहा था ‘अपन जल्दी ही माइक्रोवेव ओवन ले लेंगे।’..काफी भारी है गिफ्ट …? कहीं किताबें  तो नहीं …? मैंने जिओग्राफी में पी.जी. करने की इच्छा भी  जताई थी। आकार और वजन से जितने कयास लग सकते थे, मैंने सब लगा लिए। हर बार अनुराग हँसता गया और ना कहता गया। फिर मेरा सब्र जवाब देने लगा। मैं आँख की पट्टी खोल उसे दूर फेंकते हुए बोली।

“ बस बहुत हुआ। मेरा बर्थ डे है। तुमने मुझे गिफ्ट दी है। मैं ओपन कर रही हूँ।” और मैंने आनन-फानन में गिफ्ट बॉक्स का चिकना रेपर फाड़ फेंका। अलबत्ता मैं हमेशा इत्मीनान से उस पर चिपके सेलोटेप निकालती हूँ ताकि रेपर का रीयूस किया जा सके। और फिर दनाक से बॉक्स भी खोल डाला।

ओह …गिफ्ट बॉक्स क्या खुला?.. मानो समय तेजी से पीछे दौड़ पड़ा!.. मेरा बचपन फिर से जी उठा!.. स्मृतियाँ  सेल्फी लेने को आतुर हो उठीं ।…जैसे  ख़ुशी और आँसू  दोस्त बन बैठे।… पल भर में मैं कहाँ से कहाँ पहुँच गई!

वह एक ठीक ठाक बड़ा-सा हाल था, जिसके दरवाजे के बाहर जूते चप्पलों का अव्यवस्थित ढेर लगा था। बड़ी-बड़ी खिड़कियाँ थीं जिनमें ग्रिल नहीं लगी थी। नीला आसमान और हरा नीम मजे से हाल का जायजा ले रहे थे। अन्दर चार कतार में मेहरून पर दो पीले पट्टों वाली टाटपट्टियाँ बिछी थीं। बहुत से सांवले और काले, आदमी ही आदमी नंगे पैर  खड़े-खड़े बातें कर रहे थे। बातचीत का ख़ासा शोर था क्योंकि सभी का सुर ऊँचे तरफ ही था। ज्यादातर लोगों के सिर पर टोपी या पगड़ी थी। और बदन पर सफेद या मटमैले सफेद कुरते पजामें या धोती। कई पान या गुटका चबा रहे थे या मुँह में भरे हुए थे। मेरे सिवा वहाँ कोई लड़की थी ही नहीं। सिवाए जामुनी रंग और पतली लाल

किनोर की लांग वाली धोती बांधे, नाक के दोनों तरफ बड़े-बड़े कांटे पहने, दोनों हाथों से झाड़ू की मूठ पकड़े कोने में ऊँकडू बैठी सफाईकर्मी बुढ़िया के अलावा। लोग, मेरे मामाजी के पास आ-आकर हाथ जोड़ रहे थे। गर्मजोशी से मिल रहे थे। हर कोई आते-जाते मेरे भी पैर छू रहा था क्योंकि मैं वहाँ सबकी भान्जी थी।

हुआ यह था कि मैं माँ के साथ नानी के घर आई थी। गुमसुम-सी एक तरफ अकेली बैठी थी। मामा ने कहा था 'चल बिट्टो, तुझे घुमा लाऊँ। और वे मुझे अपने साथ यहाँ ले आए थे। इस बड़े से हाल में। दरअसल मेरे ये दाढ़ीवाले बड़े मामाजी जिन सेठ करोड़ीमल के यहाँ मुनीम थे, उन्होंने परिचितों और स्टाफ के लिए, पुत्र प्राप्ति पर भोज रखा था। मामा उनके दाहिने हाथ थे।

"सरु आ यहाँ बैठ।" मामा ने मेरे सिर पर प्यार से हाथ फेरा। कुछ ही देर में हमारे सहित सभी लोग महरून टाटपट्टियों पर बैठ गए।

"तूने कभी पंगत खाई है?" मामा ने मुझसे प्रश्न किया।

" पंगत? पंगत क्या कोई मिठाई होती है?" मैंने मासूमियत से पूछा था। जिसे सुन मामा ठठा के हँस पड़े थे। और अगल-बगल में बैठे लोगों को मेरा जवाबी प्रश्न सुना रहे थे। वे सब भी हँस रहे थे। 'बताओ बच्ची को पता ही नहीं पंगत क्या होती है। हो.. हो...क्या जमाना आ गया है।'

तभी हमारे सामने पन्नियों की पेकिंग से जल्दी से निकाल-निकालकर बेहद चमचमाती थालियाँ, कटोरियाँ, गिलास और चम्मच फटाफट रख दिए गए। मैं देख रही थी पन्नियों को कहीं भी बेतरतीबी से फेंका जा रहा था ... जो मुझे अजीब लग रहा था। वह बुढ़िया उन्हें गुडी-मुड़ी कर बटोर रही थी। हमारे सामने रखे गए बर्तनों की अनोखी चमक ने मुझे चमत्कृत कर दिया। और उनसे परावर्तित होते बिम्बों ने जैसे मेरा मन मोह लिया।... खिड़की से आते प्रकाश के नीचे रखाती थाली पर पड़ने से यदा कदा चमचमा उठते चमकीले खिंचते गोलाकारी बिम्ब, कमरे की दीवालों और छत पर जगर मगर, छोटा-मोटा तिलिस्म सा रच रहे थे। मैं उन्हें भौचक सी देखती रह गई।.. मुझे लगा मानो चाँद थाली बन गया हो। और वह भी इतनी बार... मैं थालियों से अभिभूत थी।... और अचंभित भी।.. 'क्या ये काँच की हैं?' सोचते हुए मैं थाली को बार-बार उठा-उठा कर, घुमा-घुमाकर, उलटने-पुलटने लगी।.. फिर झुक-झुककर उसमें अपना चेहरा निहारने लगी।.. मुझे यह बहुत अच्छा लगा था।...

बहुत से युवा लडके धड़-धडकर डोंगों और धामों में पूरी, सब्जी, लोंजी, रायता, मिठाई, परोसने आते तो मैं उनसे कहती 'बीच में मत डालो'। मैं चाहती थी कि में प्रिय चाँद थाली में अपना चेहरा और देर तक देखती रह सकूँ ।..पहली क्लास में पढ़ने वाली मुझ आठ साल की बच्ची के लिए कितने, कितने अनमोल ख़ुशी के पल थे वे।... फिर सब लोगों ने संस्कृत में मंत्रोचार किया और एक साथ खाना शुरू

हुआ। मामाजी थाली में से चुग्गा भर खाना बाहर की तरफ रखते और भोजन को पूजा-भाव से देखते हुए मुझे बता रहे थे 'ये जो हम यूँ आलथी-पालथी बनाकर पंक्तियों में जमीन पर नीचे बैठकर भोजन कर रहे हैं न, इसे ही पंगत कहते हैं बिटिया'। पर मैं पंगत से ज्यादा चमचमाती थाली की दीवानी हो चुकी थी। मुझे लग रहा था खाने का इतना अच्छा स्वाद इस चमकीली थाली के कारण ही आ रहा है। मैंने उस दिन खूब छककर भोजन किया था। न सिर्फ थाली, कटोरियों को भी उँगलियों से चाट-चाट कर साफ़ कर दिया था। मेरा मन कर रहा था मामाजी से कहूँ 'अपन ये थाली घर ले चलें ?'

"क्या हुआ सारिका कहाँ खो गई? क्या गिफ्ट पसंद नहीं आई?" मेरे हाथ में कसकर पकड़ी हुई गिफ्ट में मिले सलेम स्टेनलेस स्टील के डिनर सेट की 'चाँद-थाली' को छुड़ाते हुए अनुराग ने पूछा।

"नहीं, मुझे गिफ्ट बहुत-बहुत पसंद आई है अनुराग। यह अब तक की दि बेस्ट गिफ्ट है। सबसे कीमती और अनोखी गिफ्ट। कहते हैं समय कभी लौट के नहीं आता। पर तुम तो मेरे लिए ऐसी गिफ्ट लाए हो जिसमें स्वयं समय ही पैक है। ...कोई लौटा दे मेरे बीते हुए दिन।... सचमुच तुमने मुझे बीते हुए दिन की सौगात लौटाई है।... वो बचपन की कश्ती वो बारिश का पानी की तरह... वो 'पंगत का भोजन वो चमचमाती चाँद थाली' दे दी है। अहा! अद्भुत और कभी न भूलने वाली है यह गिफ्ट।" कह मैं उससे फिर लिपट गई।

ख़ुशी की तरंगो की पुन: हुई सवारी। मेरे मन के चिदाकाश से एक एक कर सभी अनुमानित गिफ्ट विदा हो गईं।... गोल्ड इयरिंग के छल्ले गायब हो गए।... हैदराबादी नेकलेस की तीन लड़ों के मोती बिखर कर तिरोहित हो गए।... सिल्क साड़ी का सुआपंखी रंग धुंधला गया।... पश्चिमी परिधान तो ध्यान ही नही आया।... रह गई तो बस बचपने में विशुद्ध निखालिस चमचमाहट वाली 'चाँद-थाली' में खाई पंगत की याद!

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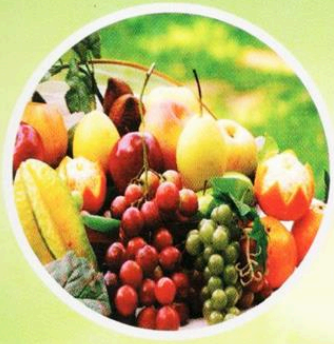
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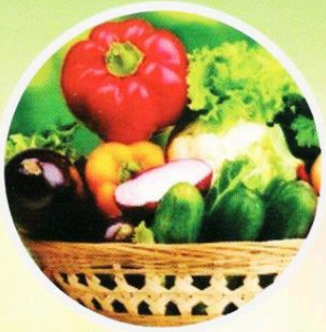
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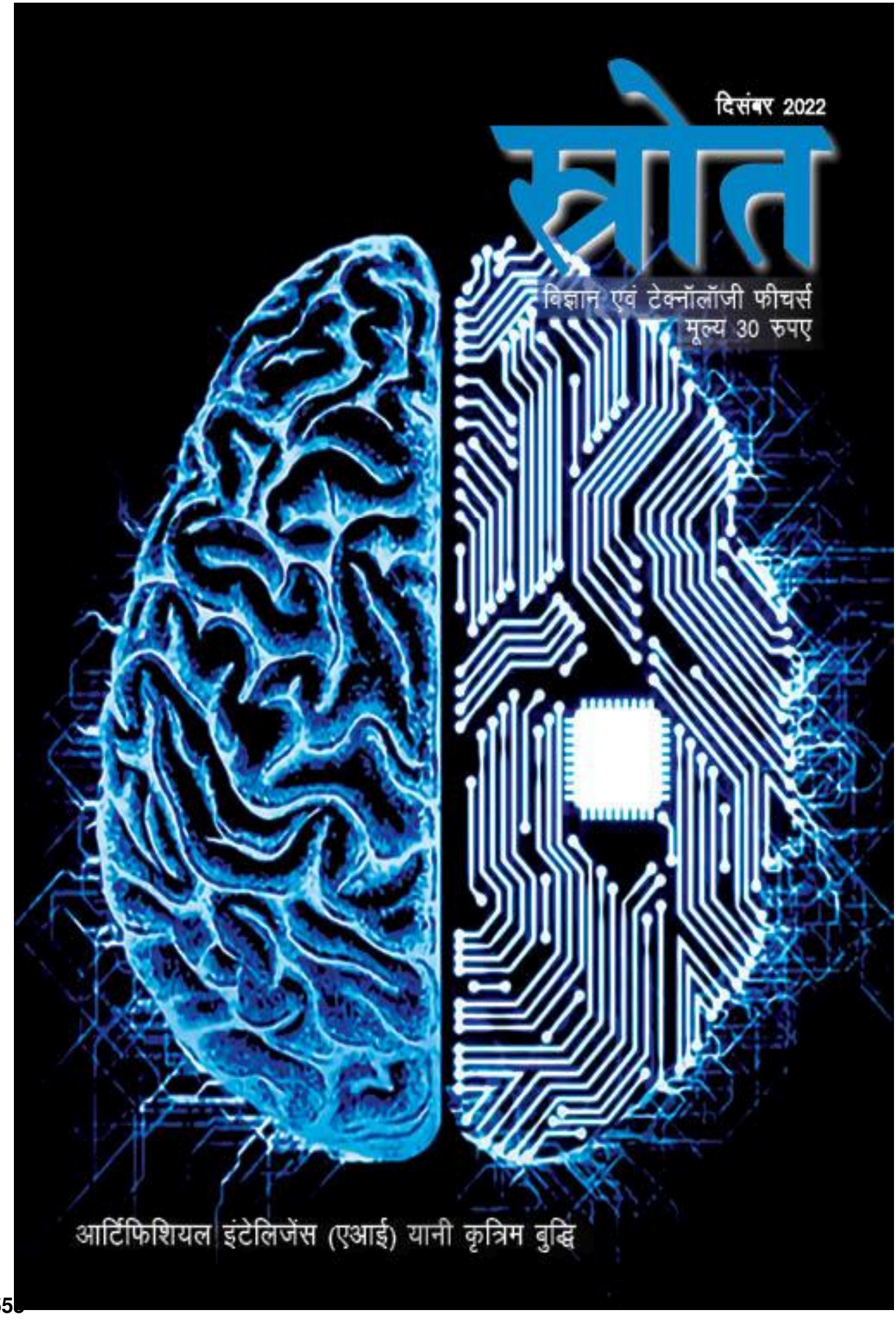
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मुद्रक :
कलम प्रिन्टर्स, इन्दौर


दिसंबर 2022
स्रोत
विज्ञान एवं टेक्नॉलॉजी फीचर्स
मूल्य 30 रुपए
आर्टिफिशियल इंटेलिजेंस (एआई) यानी कृत्रिम बुद्धि

# Srote - December 2022


1. वर्ष 2023 के ब्रेकथ्रू पुरस्कारों की घोषणा
2. क्या ट्यूमर में छिपी फफूंद कैंसर को गति देती हैं?
3. रोबोटिक कैप्सूल: दिलाएगा इंजेक्शन से निजात डॉ. विपुल शर्मा
4. लीवर 100 वर्षों से भी अधिक जीवित रह सकता है
5. कोविड-19 की एक और लहर की आशंका
6. अकेले रह गए शुक्राणु भटक जाते हैं डॉ. विपुल शर्मा
7. जीवन के नए रूपों से सीखना डॉ. डी. बालसुब्रमण्यन
8. जंतु बोलने लगे थे, जब कोई सुनने वाला न था
9. पहला निएंडरथल कुनबा खोजा गया
10. एक लैगून को व्यक्ति के अधिकार
11. मिश्रित प्लास्टिक से उपयोगी रसायनों का निर्माण
12. हरित ऊर्जा की ओर खाड़ी के देश
13. पौधों की सेहत पर भारी ओज़ोन प्रदूषण प्रदीप
14. केला: एक पौष्टिक फल डॉ. डी. बालसुब्रमण्यन
15. एक पौधे ने नाशी कीट को मित्र बनाया
16. आर्टिफिशियल इंटेलिजेंस (एआई) यानी कृत्रिम बुद्धि – 1 लाल्टू
17. आर्टिफिशियल इंटेलिजेंस (एआई) यानी कृत्रिम बुद्धि – 2 लाल्टू
18. आर्टिफिशियल इंटेलिजेंस (एआई) यानी कृत्रिम बुद्धि – 3 लाल्टू
19. आर्टिफिशियल इंटेलिजेंस (एआई) यानी कृत्रिम बुद्धि – 4 लाल्टू
20. नोबेल विजेता के शोध पत्रों पर सवाल
21. चंद्रमा और पृथ्वी का लगभग एक-सा अतीत

# रोबोटिक कैप्सूल: दिलाएगा इंजेक्शन से निजात

मुंह से ली जाने वाली प्रोटीनी-दवाइयां पाचन तंत्र में पहुंच कर वहां के वातावरण में नष्ट या विकृत हो जाती हैं। इसके अलावा पाचन तंत्र की म्यूकस (श्लेष्मा) झिल्ली दवा के अवशोषण को भी कम कर देती है। इसलिए हमें इस प्रकार की दवाओं को इंजेक्शन द्वारा लेना पड़ता है। इसका मतलब यह है कि इंसुलिन और अधिकांश अन्य 'जैविक दवाइयां' जिनमें प्रोटीन या न्यूक्लिक एसिड औषधियां शामिल हैं, उन्हें इंजेक्शन के रूप में देना होता है। किंतु इंजेक्शन का डर और उन्हें बार-बार लगाने की ज़रूरत मरीज़ के लिए असुविधाजनक होते हैं।

इस परेशानी का समाधान मैसाचुसेट्स इंस्टीट्यूट ऑफ टेक्नॉलॉजी की श्रिया श्रीनिवासन और गियोवानी ट्रावर्सो की टीम ने 'रोबोकैप कैप्सूल' बनाकर निकाला है। सम्बंधित शोध पत्र का प्रकाशन साइंस रोबोटिक्स नामक शोध पत्रिका में हाल ही में हुआ है। नया कैप्सूल एक दिन इंजेक्शन के इस्तेमाल से निजात दिला सकता है।



**क्या है रोबोकैप कैप्सूल?**

रोबोकैप कैप्सूल एक मल्टीविटामिन कैप्सूल के आकार का होता है। कैप्सूल के दो हिस्से होते हैं। पिछले हिस्से में दवा और अगले मुख्य हिस्से में सुरंग बनाने वाला रोबोटिक हिस्सा। कैप्सूल की सतह पर जिलेटिन का अस्तर होता है जो पाचन तंत्र की एक विशिष्ट अम्लीयता पर घुलनशील होता है।

कैप्सूल के रोबोटिक हिस्से में एक रोबोटिक कैप होती है जो छोटी आंत में पहुंचने पर श्लेष्मा की परत पर घूमती है और सुरंग बनाती है। इससे कैप्सूल में भरी दवा को आंतों की कोशिकाओं के बहुत करीब छोड़ दिया जाता है। इस प्रकार श्लेष्मा को उसकी जगह से हटाकर हम नियत क्षेत्र में दवा के प्रसार व अवशोषण को अधिकतम कर सकते हैं और दवा के छोटे और बड़े दोनों अणुओं का शरीर में अवशोषण बढ़ा सकते हैं।

शोधकर्ता बताते हैं कि रोबोटिक कैप्सूल का उपयोग इंसुलिन जैसे हार्मोन के अलावा वैन्कोमाइसिन व अन्य एंटीबायोटिक पेप्टाइड देने के लिए किया जा सकता है जिसे वर्तमान में इंजेक्शन द्वारा ही दिया जाता है।

Sustainable Practices in the Textile Industry

Chapter 1

# Extraction and Application of Natural Dyes

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## Summary

Environmental pollution and population explosion are becoming the world's biggest issues. Eco friendly products and practices are popularizing day by day due to present national and international awareness on environmental situations. Textile industries are one of the reasons of environmental pollution and affect all forms of life adversely. Textile dyeing process generally uses chemical dyes and synthetic mordants. Chemicals in the dyeing process began with the discovery of “Mauve” by WH Perkin in 1856. These synthetic dyes are manufactured from coal tar, petrochemicals and many other chemicals, which cause allergies such as contact dermatitis, respiratory diseases, skin irritation and cancer etc. Naturally dyed textile materials are in demand globally because of harmful effects of chemical dyeing and continuous efforts of researchers in this field. Natural dyes can be obtained from natural resources like plants, minerals, insects and fungi but most of the dyes are taken from plant parts i.e. leaves, barks, flowers, fruits and roots. Natural dyes have some special properties like soothing color, biodegradable, non-hazardous, non-carcinogenic and antimicrobial resistance etc. Natural dye extraction process requires plant parts and sometimes their by-products as a raw material. Natural dyeing practices enhance the cultivation of flowering crops, which provides an extra source of income to farmers. Thus, large scale production of naturally dyed fabric in future will solve the problem of human as well as environmental health.

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# Artificial Bee Colony-Based Approach for Privacy Preservation of Medical Data ⊗

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## Abstract

A large amount of data is generated through healthcare applications and medical equipment. This data is transferred from one piece of equipment to another and sometimes also communicated over a global network. Hence, security and privacy preserving are major concerns in the healthcare sector. It is seen that traditional anonymization algorithms are viable for sanitization process, but not for restoration task. In this work, artificial bee colony-based privacy preserving model is developed to address the aforementioned issues. In the proposed model, ABC-based algorithm is adopted to generate the optimal key for sanitization of sensitive information. The effectiveness of the proposed model is tested through restoration analysis. Furthermore, several popular attacks are also considered for evaluating the performance of the proposed privacy preserving model. Simulation results of the proposed model are compared with some popular existing privacy preserving models. It is observed that the proposed model is capable of preserving the sensitive information in an efficient manner.

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# 1. Introduction

In last two decades, there is tremendous growth in the field of medical data science. Large number of e-healthcare systems are developed for the help of practitioners, hospital management and doctors. The main task of these system is to process the medial and health care data for finding meaningful information (Wang et al., 2015). Nowadays, cloud computing paradigm is widely adopted in healthcare for transferring and storing the data at cloud layer. Moreover, cloud computing provides pervasive data access for on demand services with reduced cost Wang et al., (2015); Zhang et al., (2014). It is also seen that electronic health records (EHR) are widely used for improving health of patients in different healthcare and medical services Gardner et al., (2013). These systems determine the need of patients on the basis of medical assembling and information relationship. A multi-disciplinary team of specialist and professional can access the information and provide a clear and structured description with minimized medical errors. It is observed that during the communication process, some security threats such as privacy, security, confidentiality are one of the major concerns of the users (Majeed, 2019; Wang et al., 2012). These threats can increase when information is outsourced from individual user account or cloud (Demir & Tugrul, 2018; Wang et al., 2018). General procedure for securing the medical data is to encrypt the medical data before sending Perera et al., (2011); Tamersoy et al., (2012). The encryption of data also having some performance issues such as cost of communication, computational complexity, maintenance etc. One of the possible solution of aforementioned problems is data anonymization (Gao et al., 2017; Poulis et al., 2017). It can be described as data sanitization and it can be acted as privacy preserving. Privacy preserving can be described as the process of encrypting or hiding the sensitive information from the dataset prior to communication. It can be achieved through concealed or mask data or arbitrary sequence of data. Through this, privacy of information or data can be preserved by minimizing the link to sensitive data or individual information. Hence, anonymization process can be beneficial for privacy of data that ensure the protection of individual end user data Newhauser et al., (2014). Most of anonymization algorithms work in two steps (Li et al., 2010; Otgonbayar et al., 2018). In first step, tuple troops are designed which can optimize the utility and privacy of data and further, imposes an anonymization principle. In second step, k-anonymity is considered as privacy measure (Amin et al., 2016; Zhao et al., 2018). Various optimization methods are used to develop anonymization algorithms. These algorithms can be described as single objective, multi objective and constrained algorithms. The objective of these algorithm is to attain supreme utility and privacy of sensitive information or data. But, none of algorithm can maintain utility and privacy preserving of information as desired. Hence, there is a need for an effective anonymization model to preserve the medical data.

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RESEARCH ARTICLE | SEPTEMBER 13 2021

# Preface: National Conference on Physics and Chemistry of Materials (NCPCM 2020)

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**Preface: National Conference on Physics and Chemistry of Materials (NCPCM 2020)**

National Conference on Physics and Chemistry of Materials (NCPCM) has been organized in every two years by Department of Physics, Government Holkar (Model, Autonomous) Science College, Indore. This conference provides an ideal platform and opportunity to share research ideas with the eminent scientists, academicians, industrialists and policy makers working in the various fields of science and technology. The conference scope ranges from development in basic science to applied science and technology. This conference cover various fields of physics and chemistry, such as, condensed matter physics, nano materials, thin films technology, solar energy, computational physics and chemistry, analytical chemistry, etc.

This year due to the unprecedented coronavirus pandemic, as well as guidance issued by government authorities, the conference was conducted through online platform. Papers were presented live, online through video conferencing in the form of keynote lecture, invited talks and contributed oral presentations. Participants have given adequate opportunity for live discussion with the speakers. The conference was attended by approximately 300 participants from various universities, higher education institutions and research centers across the world.

We acknowledge the support received from handful persons from various institutions, without which this event would have not been possible:
1. MP Council of Science and Technology, Bhopal
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We extend our heartiest thank to all the participants, members of advisory committee, organizing committee, technical coordinators, session chairs, judges, reviewers and all supporting staff for their herculean support.

Indore, 24 February 2021

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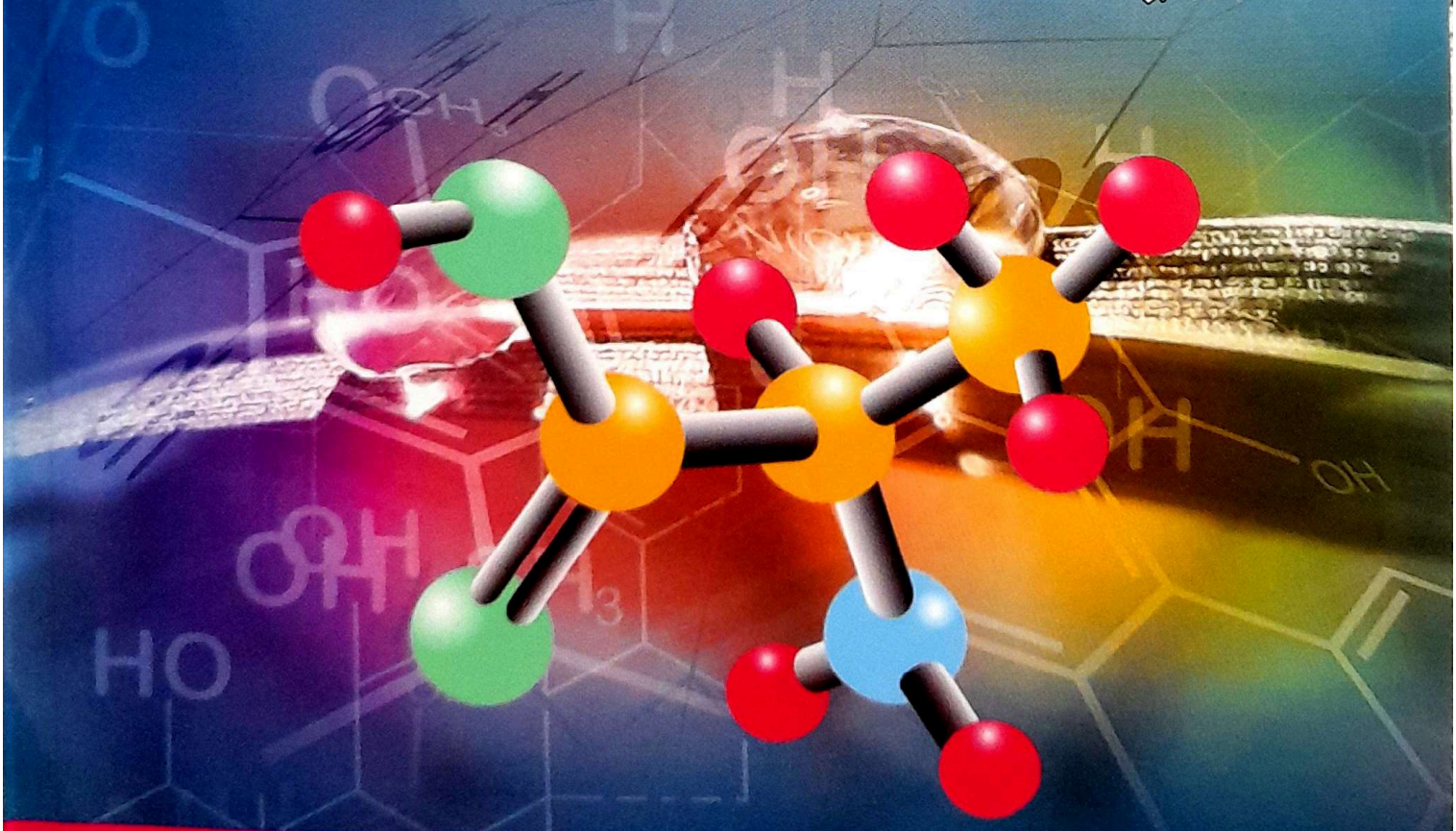
राष्ट्रीय शिक्षा नीति के पाठ्यक्रमानुसार

# रसायन

## CHEMISTRY

प्रथम वर्ष

डॉ. आर. सी. सारस्वत | डॉ. डी. डी. मिश्रा | डॉ. ब्रजेन्द्र राय



राम प्रसाद एण्ड संस

आरपी यूनीफाइड

# रसायन

# CHEMISTRY

राष्ट्रीय शिक्षा नीति, बी.एस-सी. प्रथम वर्ष पाठ्यक्रमानुसार

**प्रथम प्रश्नपत्र : रसायन विज्ञान के आधारभूत सिद्धांत**
**द्वितीय प्रश्नपत्र : विश्लेषणात्मक रसायन विज्ञान**

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# सैद्धांतिक प्रश्नपत्र के पाठ्यक्रम

## भाग अ - परिचय

**कार्यक्रम** : प्रमाण पत्र **कक्षा** : बीएससी **वर्ष** : प्रथम वर्ष **सत्र** : 2021-2022

**विषय** : रसायन विज्ञान

| | | | |
|---|---|---|---|
| 1. | पाठ्यक्रम का कोड | S1 - CHEMIT | |
| 2. | पाठ्यक्रम का शीर्ष | रसायन विज्ञान के आधारभूत सिद्धांत (प्रश्न पत्र 1) | |
| 3. | पाठ्यक्रम का प्रकार | कोर कोर्स | |
| 4. | पूर्वापेक्षा (यदि कोई हो) | इस पाठ्यक्रम का अध्ययन करने के लिए विद्यार्थियों के पास कक्षा+2 या समकक्ष में रसायन विज्ञान विषय होना चाहिए। | |
| 5. | पाठ्यक्रम अध्ययन की परिलब्धियां (कोर्स लर्निंग आउटकम) (CLO) | इस पाठ्यक्रम के उपरान्त विद्यार्थी रसायनशास्त्र विषय के निम्न आयामों का ज्ञान प्राप्त कर लेंगे:<br>● प्राचीन भारतीय रासायनिक तकनीक।<br>● परमाणु संरचना को प्रकट करने के लिए लागू विभिन्न सिद्धांत एवं अवधारणाएं।<br>● क्वांटम संख्याओं का महत्व।<br>● तत्वों के आवधिक गुणों की अवधारणा।<br>● रासायनिक बंधन से संबंधित सिद्धांत।<br>● अम्ल-क्षार अवधारणा, pH, बफर।<br>● कार्बनिक अणुओं की क्रियाशीलता के लिए उत्तरदायी कारक।<br>● रासायनिक बलगतिकी की आधारभूत अवधारणाएँ एवं क्रियाविधि।<br>● विद्युत अपघट्य (इलेक्ट्रोलाइट्स) के गुण। | |
| 6. | क्रेडिट मान | 4 | |
| 7. | कुल अंक | अंधिकतम अंक : 25+75 | न्यूनतम में उत्तीर्ण अंक : 33 |

## भाग ब - पाठ्यक्रम की विषयवस्तु

व्याख्यान की कुल संख्या- टयूरोरियल - प्रायोगिक (प्रति सप्ताह घंटे में) : L-T-P :

| इकाई | विषय | व्याख्यान की संख्या |
|---|---|---|
| I | (ए) प्राचीन भारत में रासायनिक तकनीकः सामान्य परिचय।<br>(बी) रसायन विज्ञान में प्राचीन भारतीय वैज्ञानिकों का योगदान<br>उदाहरणार्थः धातुविज्ञान, रंग, रंगद्रव्य, सौन्दर्य प्रसाधन, आयुर्वेद।<br>(सी) **परमाण्विक संरचनाः** (i) बोहर के सिद्धांत एवं उसकी सीमाओं की समीक्षा। हाइड्रोजन परमाणु का स्पेक्ट्रम। कण एवं तरंग की द्वैतीप्रकृति, डी ब्रोगली समीकरण, हाइजेन बर्ग का अनिश्चितता सिद्धांत एवं इसका महत्व। (ii) क्वांटम संख्याएँ एवं उनका महत्व। विभिन्न कक्षकों में इलेक्ट्रॉनों को भरने के नियम, पाउली का अपवर्जन सिद्धांत, हुंड का अधिकतम बहुलता का नियम, औफबाऊ का सिद्धांत एवं इसकी सीमाएँ, परमाणु क्रमांक के साथ कक्षीय ऊर्जा का परिवर्तन। परमाणुओं के इलेक्ट्रॉनिक विन्यास। आधे भरे एवं पूरी तरह से भरे हुए कक्षकों की स्थिरता, विनिमय ऊर्जा की अवधारणा। परमाणु कक्षकों की सापेक्ष ऊर्जा, असामान्य इलेक्ट्रॉनिक विन्यास।<br>**सार बिंदु (कीवर्ड)/टैग:** धातु विज्ञान, सौंदर्य प्रसाधन, चरक संहिता, हाइड्रोजन परमाणु का स्पेक्ट्रम, पाउली का अपवर्जन सिद्धांत, हुंड का नियम, औफबाऊ सिद्धांत। | 2 + 6 |
| II | **आवर्त सारणी में s & p समुदाय (ब्लॉक) तत्वों के संदर्भ में तत्वों के निम्नलिखित गुणों की प्रारंभिक अवधारणा।**<br>● प्रभावी परमाणु क्रमांक (EAN), परिरक्षण या स्क्रीनिंग प्रभाव, स्लेटर नियम, आवर्त सारणी में प्रभावी परमाणु आवेश का परिवर्तन। | 6 |

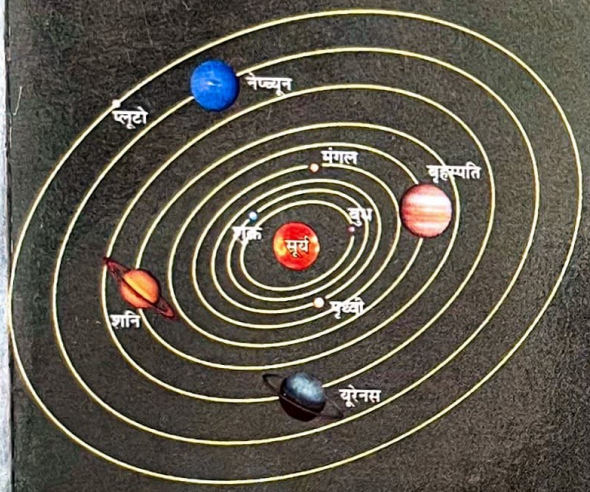
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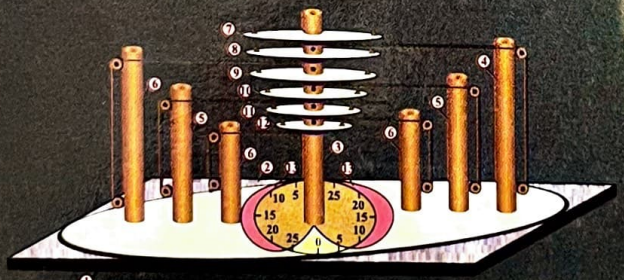
# भौतिकी

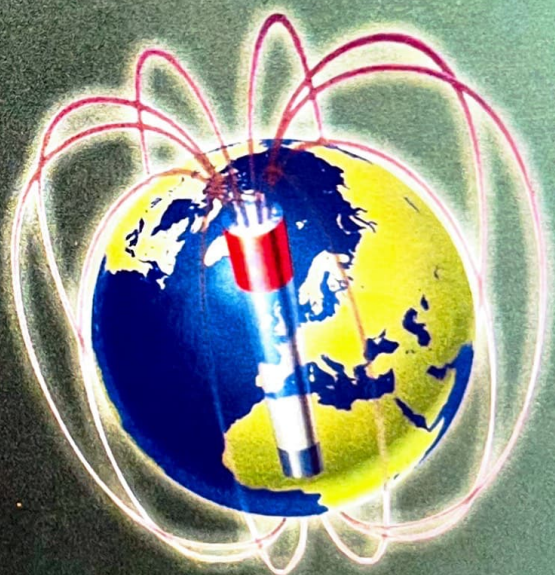
बी.एस-सी. (प्रथम वर्ष)

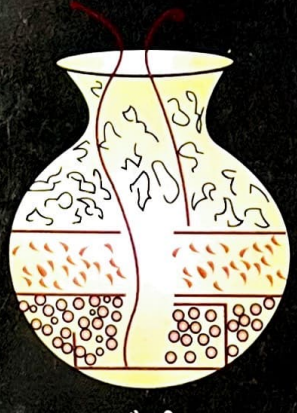
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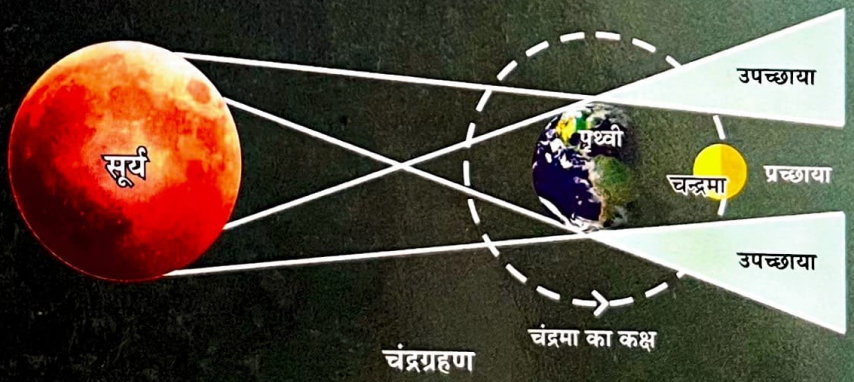


सूर्य तथा सौरमंडल


भारद्वाज का वर्णक्रममापी


भूचुंबकत्व


बैटरी

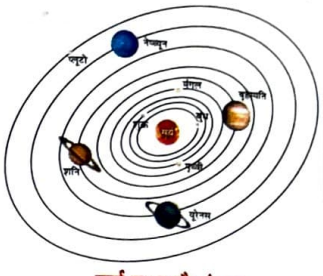


चंद्रग्रहण

## प्राचीन भारत में भौतिकी

# प्राचीन भारतीय भौतिकी

**1. सूर्य तथा सौरमंडल**—कोपरनिकस पहला व्यक्ति था, जिसने यह पता लगाया कि पृथ्वी सूर्य की परिक्रमा करती है, न कि सूर्य पृथ्वी की, परंतु हमें यह जानकर बहुत ही आश्चर्य होगा कि कोपरनिकस के जन्म से हजारों वर्ष पूर्व ही वैदिक ऋषियों को इन सारे तथ्यों की जानकारी थी। सूर्य को प्राचीनकाल से ही देवता स्वरूप पूजा जाता है तथा यह माना जाता था कि यह जगत सूर्य देव के ही कारण से है। समस्त जीवों को उनकी शक्ति तथा ऊर्जा सूर्य से ही प्राप्त होती है। (तैत्तिरीय आरण्यकम् 3–11)



सूर्य तथा सौरमंडल

यह तथ्य कि सूर्य ही ऊर्जा का स्रोत है, भारतीयों को प्राचीन वैदिककाल से ज्ञात था कि सूर्य ही सौर प्रणाली का केंद्र है, "सूर्य ही पृथ्वी सहित अन्य आकाशीय पिंडों का आधार है, सूर्य सभी विशालकाय भारी पिंडों का आकर्षण बल है।" (तैत्तिरीय संहिता 3·4·10·3–4)

प्राचीन वैदिक ऋषि-मुनियों को पृथ्वी का वास्तविक आकार तथा अन्य उपग्रहों के बारे में भलीभाँति ज्ञात था। वे यह भी जानते थे कि पृथ्वी सपाट नहीं है, अपितु गोल है तथा बिना किसी सहारे के अपनी अक्ष पर अंतरिक्ष में चारों ओर घूमती है। पश्चिमी जगत को इस तथ्य की जानकारी बहुत बाद में कोपरनिकस द्वारा हुई, परंतु फिर भी इस तथ्य की खोज का श्रेय हमारे ही लोगों द्वारा कोपरनिकस को ही दिया जाता है।

**2. भारद्वाज का वर्णक्रममापी**—महर्षि भारद्वाज प्राचीनकाल के एक विद्वान ऋषि थे। उन्होंने वैज्ञानिक तथ्यों से संबंधित एक पुस्तक 'अंशुबोधिनी' की रचना की थी, जिसमें 12 अध्याय हैं। वर्तमान में संपूर्ण पुस्तक उपलब्ध नहीं है परंतु, इसका पहला अध्याय सम्पूर्ण व्याख्या के साथ बड़ौदा के ओरियंटल इंस्टीट्यूट के पुस्तकालय में उपलब्ध है। इसकी व्याख्या बोधानंद के द्वारा की गई है। प्रथम अध्याय का नाम 'सृष्टयाधिकार' (ब्रह्मांड का विकास क्रम) है। इस पुस्तक में प्रकाश तरंग के विभिन्न भागों अवरक्त (गूढ़तम), दृश्य (तम) तथा पराबैंगनी (अंधतम) क्षेत्रों के वर्णक्रम मापन के लिये, पाँच वर्णक्रममापी उपकरणों का वर्णन है।

इनमें से एक प्रमुख यंत्र है—'ध्वंतप्रमापक यंत्र' जिसका निर्माण ऋषि भारद्वाज ने किया था। इसका चित्र मुख्य पृष्ठ पर दिया गया है। इसका विस्तारपूर्वक वर्णन डॉ. एन. जी. डोंगरे ने किया है। (इंडियन जर्नल ऑफ हिस्ट्री ऑफ साइंस 25 (4), 1994 ई., पृष्ठ 611–626) इस उपकरण के विभिन्न भाग तथा प्रचालन विधि नीचे दी जा रही है—

इस उपकरण के द्वारा जिस वर्णक्रम क्षेत्र का अध्ययन किया जाना है, उसके लिये संधान लेंस, प्रिज्म और अभिदृश्यक (Objective) लेंस आदि को चुनते एवं उनके ऊर्ध्वाधर संरेखण (Alignment) की सुविधायें हैं। उदाहरण के लिये, दृश्य विकिरण (Visible radiation) के अध्ययन के लिये निम्न अवयवों को सीध में लाया जाता है। संधान लेंस-प्रभाकर मणियुक्त दिवाकर दर्श चक्र (अवयव –7) पर आपतित विकिरण को दाहिने स्तंभ से लगी घिर्री को घुमाकर शंक्वाकार प्रिज्मकिरण ग्राहक मणियुक्त निशाकर दर्श चक्र (अवयव 8) पर पड़ने दिया जाता है, जिसे बाँये स्तंभ की घिर्री से समंजित किया जाता है। प्रभाकर दर्श चक्र (अवयव 11) को दाँये स्तंभ 6 की सहायता से संरेखित किया जाता है। अब यह प्रकाश छाया प्रकर्षण दर्श की अंशांकित गोल प्लेट पर वर्णक्रम बना देता है। इन वर्णक्रम वलयों के प्रतिच्छेद कोणों तथा अंशांकित गोल प्लेट से तरंगदैर्घ्य का मापन होता है। इसकी ऊर्ध्वाधर डिजाइन तारकीय (Stollar) विकिरण के अध्ययन के लिये विशेष रूप से उपयोगी है। इसमें विभिन्न विकिरण भागों के अध्ययन के लिये विभिन्न खिड़कियों व प्रिज्मों का प्रयोग होता है।

भारद्वाज वर्णक्रममापी के विभिन्न भागों के नाम निम्नानुसार हैं—

| क्षेत्र | संस्कृत नाम | अँग्रेजी नाम | हिन्दी नाम |
|---|---|---|---|
| (1) | चतूर | Square base | वर्गाकार आधार |
| (2) | धायाप कर्षणादर्श | A thin circular *uv* transparent glass sheet | पतली गोल पराबैंगनी काँच की पट्टी |
| (3) | मेरूस्तंभ (शंकु) | Central pillar (Rod) | मध्यस्तंभ |
| (4, 5, 6) | दंड व चक्रकील | Rods and pully system | दंड व घिर्री तंत्र |
| (7) | प्रभाकर मणियुक्त दिवाकर दर्श चक्र | Collimating element and graduated circular plate | संधान अवयव व अंशांकित गोल प्लेट |
| (8) | किरणग्राहक मणियुक्त निशाकर दर्श चक्र | A conical prism with a circular glass plate | शंक्वाकार प्रिज्म व अंशांकित गोल प्लेट |
| (9) | धर्मापहारक मणियुक्त ऊष्माकर्ष कोणानुफलक चक्र | Infrared absorbing element with graduated circular plate having heat transparent coating | अवरक्त अवशोषक अवयव एवं ऊष्मा पारदर्शी लेपन युक्त अंशांकित गोल प्लेट |
| (10) | तभोगर्भ मणियुक्तछाया मुखादर्श चक्र | Ultraviolet radiation transmitting element and a graduated circular plate | पराबैंगनी विकिरण उत्सर्जक अवयव एवं अंशांकित गोल प्लेट |
| (11) | प्रभामणियुक्त प्रभामुखादर्श चक्र | Focussing lens and a graduated circular plate | फोकसन लेंस व अंशांकित गोल प्लेट |
| (12) | वल्लभमणियुक्त प्रकाश स्तंभन चक्र | Focussing lens with a circular plate, opaque to visible radiation | फोकसन लेंस एवं दृश्य विकिरण अपारदर्शी गोल प्लेट |
| (13) | छाया प्रभाविभाजक पट्टिका | Ultraviolet and visible differentiating plate | पराबैंगनी एवं दृश्य विभाजन प्लेट। |

उच्च शिक्षा विभाग मध्यप्रदेश शासन द्वारा राष्ट्रीय शिक्षा नीति के परिप्रेक्ष्य में
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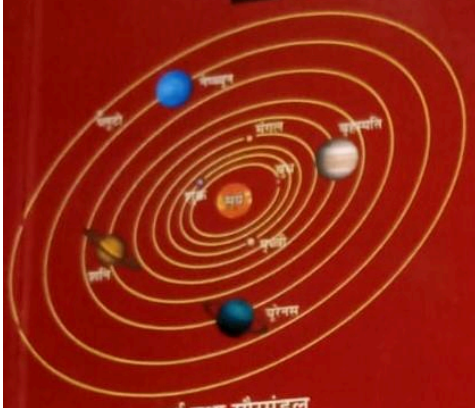
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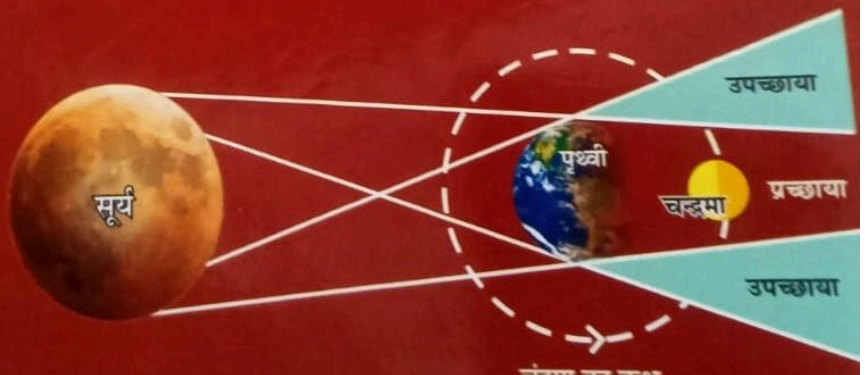
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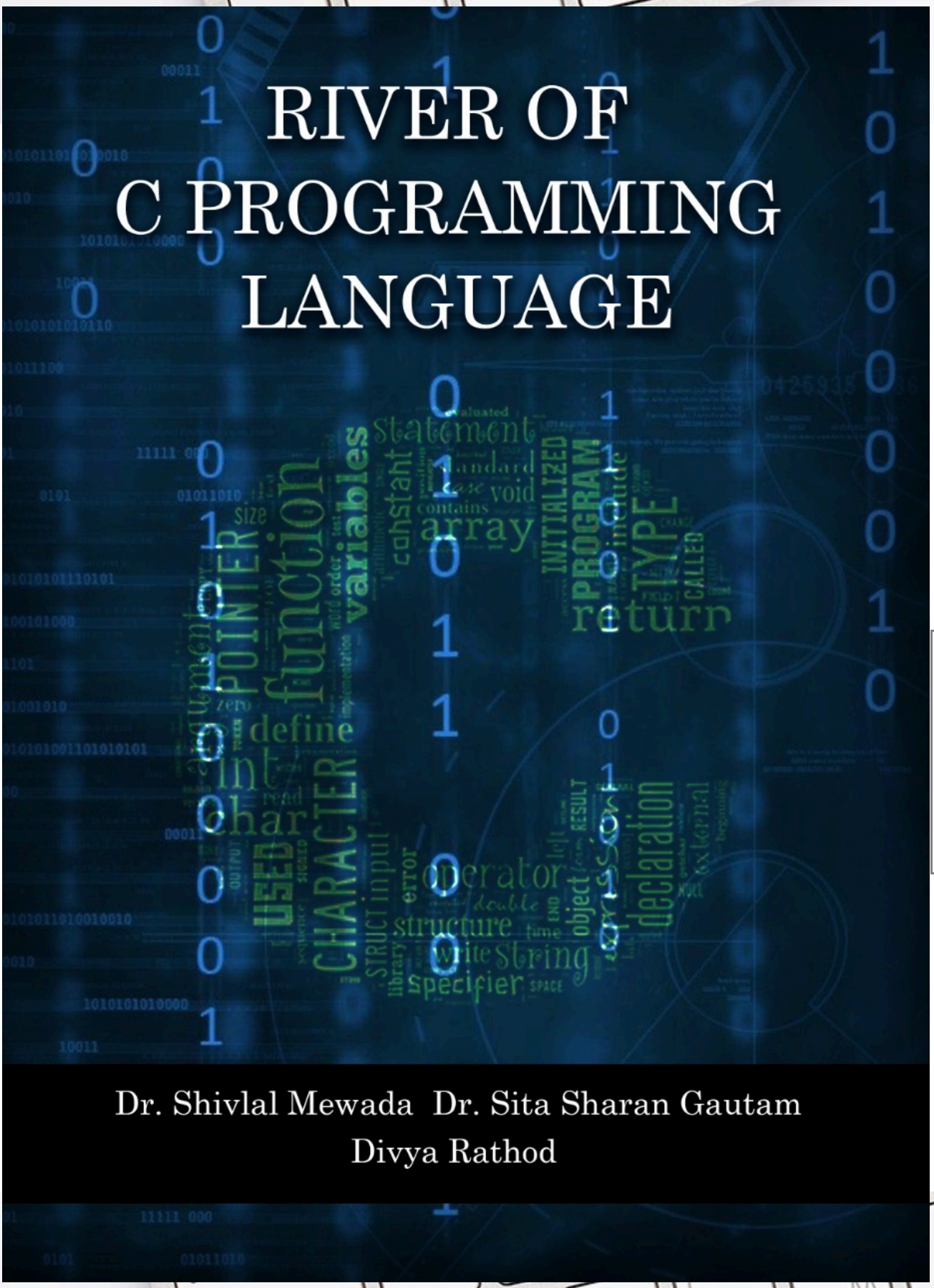
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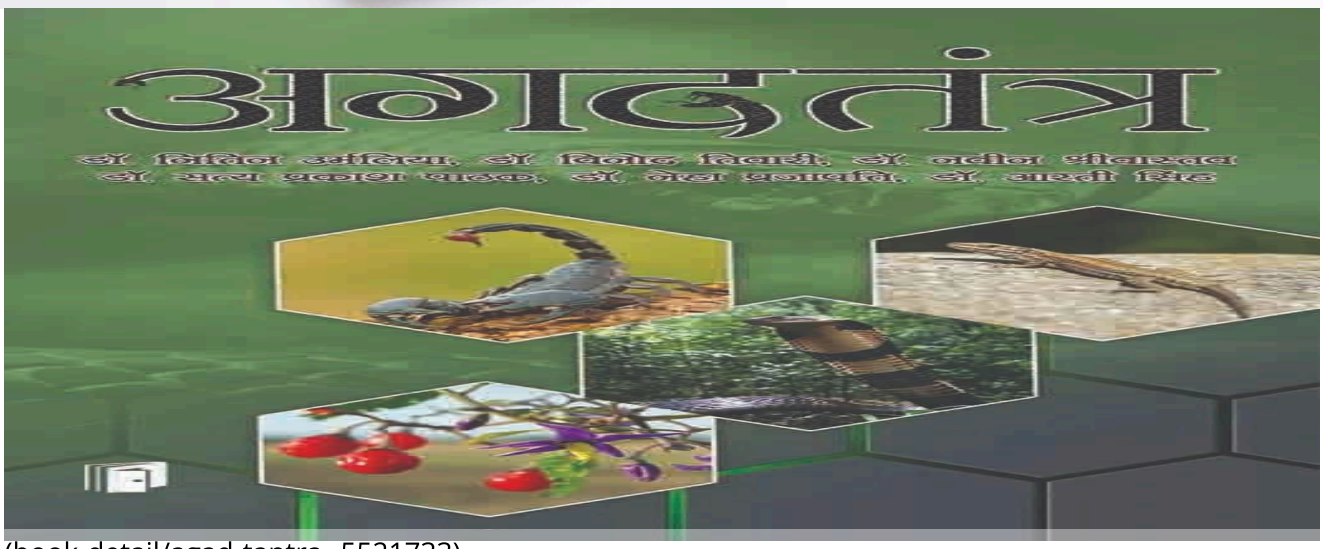
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Editors

R.K. Goyal

Mahesh K. Gaur

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# QGIS-Based Drastic Modeling for Assessing Groundwater Vulnerability in Dewas Watershed (Madhya Pradesh)

**Pramod Dubey, D.C. Gupta, J.P. Shukla and Shailesh Chaure**

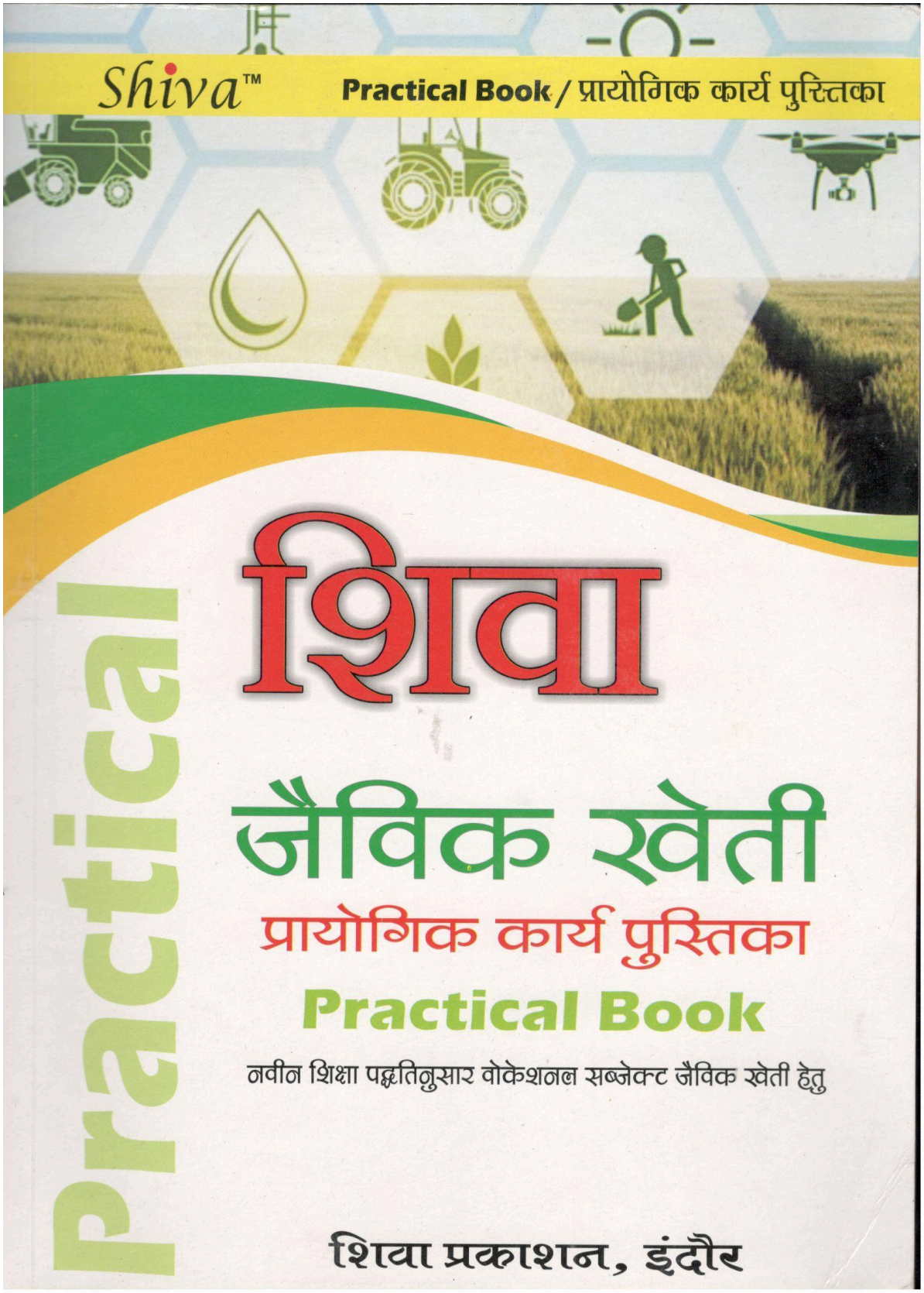
## Introduction

Groundwater has been considered as an important source of water supply due to its relatively low susceptibility to pollution in comparison to surface water, and its large storage capacity (US EPA, 1985). However, there are significant sources of diffuse and point pollution of groundwater from land use activities, particularly agricultural practices. The concept of groundwater pollution vulnerability was first introduced in France by the end of the 1960s to create awareness of groundwater contamination (Vrba and Zoporozec, 1994). Dewas is an industrial city of the Madhya Pradesh. It has many medium-sized and small industries. For the present work, a small watershed (sub-watershed of Kshipra Watershed Code 09) covering Dewas town was taken and using the various geological, hydrological and geomorphological parameters a groundwater. The study area is bounded by Latitude 22°57'35.112" – 22°57'31.112"N and Longitude 75°56'26.901" - 76°05'4.129"E, on Survey of India topographical map sheet No. 46N/13 and 55B/1. Total geographical area of the watershed is 67.71 $km^2$ shown in Figure 1a.

## Material and Methodology

The DRASTIC method (Aller *et al.,* 1987) developed by U.S. Environmental Protection Agency, has been widely used to identify the area where groundwater supplies are most susceptible to contamination. The DRASTIC method has been widely used by various researchers in the United State including Hearne *et al.,* (1992), Atkinson and Thomlinson (1994). GIS-based groundwater pollution hazard assessment by the DRASTIC model has been conducted by Merchant (1994). The method has been used for assessment of aquifer vulnerability (Napolitano *et al.,* 1996).

A DRASTIC model applied in a GIS environment was used to evaluate


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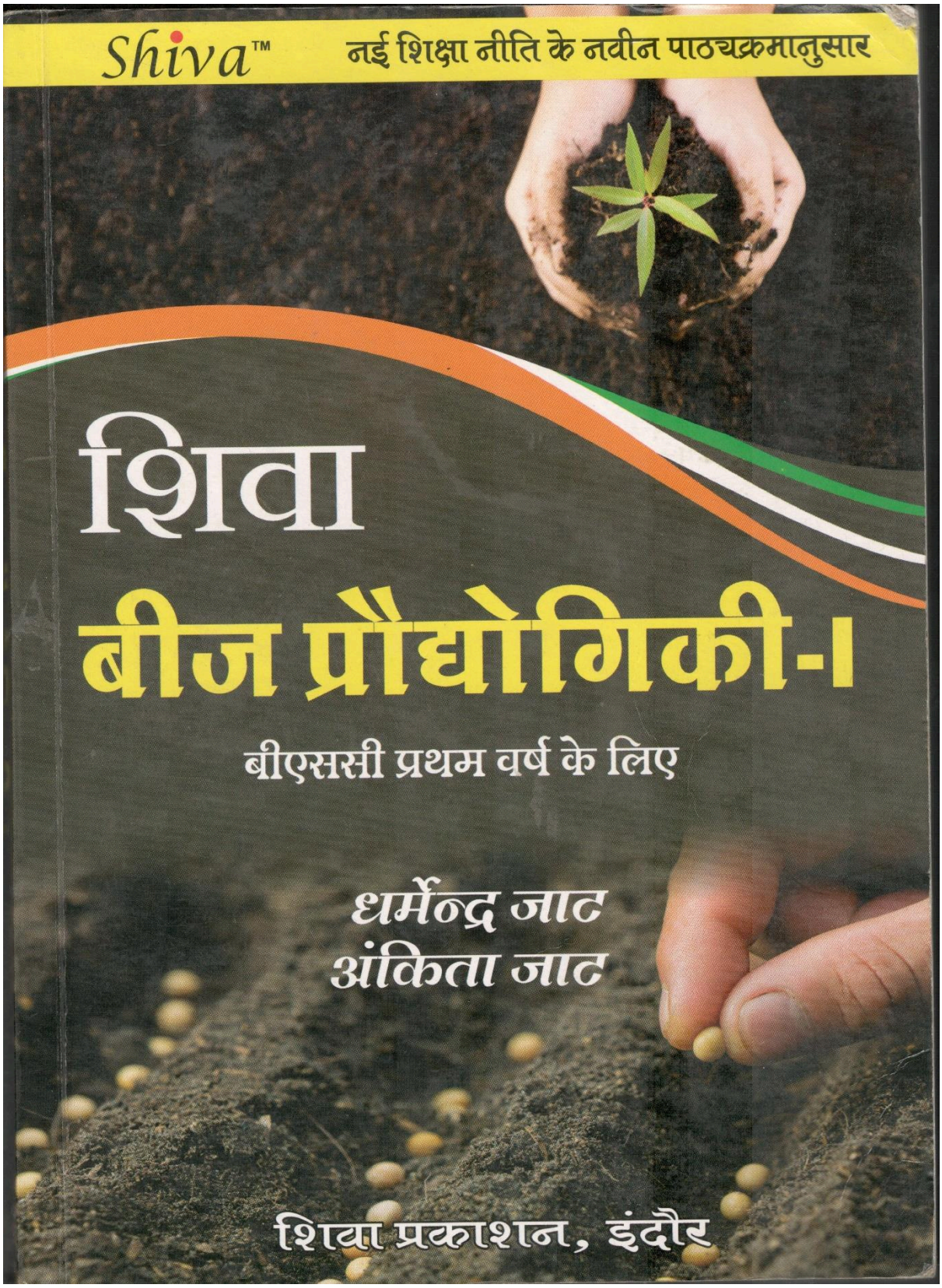
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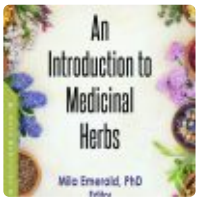
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# Table of Contents

Preface

Chapter 1. A Sustainable Approach for Cultivation of High Valued Herbs
(Ravindra Verma, Dinesh K. Sharma and Prakash S. Bisen-School of Studies in Biotechnology, Jiwaji University, Gwalior, India, et al.)

Chapter 2. Use and Agroecology Efficiency of Medicinal Plants in Plant Production
(Vladimir Filipović, Vladan Ugrenović, Vera M. Popović, Slobodan Popović, Snežana Mrđan, Ana Dragumilo and Milan Ugrinović-Institute for Medicinal Plant Res. “Dr Josif Pančić,” Republic of Serbia, et al.)

Chapter 3. Economic Justification Application of Medicinal Plants in Cosmetic and Pharmacy for the Drugs Discovery
(Vera M. Popović, Ljubica Šarčević-Todosijević, Bojana Petrović, Maja Ignjatov, Dragana B. Popović,

(Nora Kováts, Bettina Eck-Varanka and Katalin Hubai-Center for Natural Sciences, University of Pannonia, Veszprém, Hungary)

Chapter 5. Culinary Herbs: The Regulator of Gut Microbiome
(Suganya Chandrababu and Dhundy Bastola-School of Interdisciplinary Informatics, University of Nebraska at Omaha, Omaha, NE, USA)

Chapter 6. Medicinal Herbs for Metabolic Disorders
(L. V. Lenchyk, I. V. Senyuk and R. M. Lysiuk-National University of Pharmacy, Kharkiv, Ukraine, et al.)

Chapter 7. Herbal Remedies in the Treatment of Anxiety Disorders
(Bojana Petrović, Predrag Vukomanović, Vera M. Popović, Zoran Jovović, Milica Nikolić, Ljubica Šarčević-Todosijević and Slavoljub Jović-Medical Sanitary School of Applied Sciences “Visan”, Belgrade, Republic of Serbia, et al.)

Chapter 8. Mucuna pruriens – A Wonder Herb for Degenerative Disorders
(Ravindra Verma and Prakash S. Bisen-School of Studies in Biotechnology, Jiwaji University, Gwalior, India)

Chapter 9. Biology, Biochemistry and Biotechnology of a Critically Endangered Indian Medicinal Herb-Safed Musli (Chlorophytum borivilianum Sant. Et Fernand)
(N. Habibi, N. Joshi and S. D. Purohit-Plant Biotechnology Laboratory, Department of Botany, Mohanlal Sukhadia University, Udaipur, Rajasthan, India, et al.)

Index

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### भाग अ - परिचय

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### विषय : रसायन विज्ञान

| | | | |
|---|---|---|---|
| 1. | पाठ्यक्रम का कोड | S1 - CHEM2T | |
| 2. | पाठ्यक्रम का शीर्षक | विश्लेषणात्मक रसायन विज्ञान (प्रश्न पत्र II) | |
| 3. | पाठ्यक्रम का प्रकारः (कोर कोर्स/इलेक्टिव/ जेनेरिक इलेक्टिव/ वोकेशनल/....) | कोर कोर्स | |
| 4. | पूर्वापेक्षा (Prerequisite) (यदि कोई हो) | इस पाठ्यक्रम का अध्ययन करने के लिए विद्यार्थियों के पास कक्षा+2 या समकक्ष में रसायन विज्ञान विषय होना चाहिए। | |
| 5. | पाठ्यक्रम अध्ययन की परिलब्धियां (कोर्स लर्निंग आउटकम) (CLO) | इस पाठ्यक्रम के उपरान्त विद्यार्थी रसायनशास्त्र विषय के निम्न आयामों का ज्ञान प्राप्त कर लेंगेः<br>● रसायनज्ञों के लिए गणित की आधारभूत अवधारणाएँ।<br>● विश्लेषणात्मक रसायनविज्ञान के आधारभूत और विश्लेषण में शामिल तरीके।<br>● रसायनज्ञों के लिए कंप्यूटर का आधारभूत ज्ञान।<br>● रासायनिक साम्य की आधारभूत अवधारणाएँ।<br>● वर्णलेखिकी (क्रोमैटोग्राफी) और वर्णलेखन (क्रोमैटोग्राफिक) तकनीकों के सिद्धांत।<br>● स्पेक्ट्रोस्कोपिक विश्लेषण की विभिन्न तकनीक। | |
| 6. | क्रेडिट मान | 4 | |
| 7. | कुल अंक | अधिकतम अंक : 25+75 | न्यूनतम में उत्तीर्ण अंक : 33 |

### भाग ब - पाठ्यक्रम की विषयवस्तु

व्याख्यान की कुल संख्या- टयूरोरियल - प्रायोगिक (प्रति सप्ताह घंटे में) : L-T-P :

| इकाई | विषय | व्याख्यान की संख्या |
|---|---|---|
| I | **रसायनज्ञों के लिए गणितः**<br>सरल रेखा समीकरण, लघुगणकीय सम्बन्ध, वक्र आलेखन, रेखीय ग्राफ व ढाल का परिकलन, अवकलन, $k_x, e^x, x^n, \sin x, \log x$ फलनों के अवकलन, उच्चिष्ठ व निम्नष्ट, आंशिक अवकलन, कुछ उपयोगी व सार्थक फलनों के समाकलन।<br>**सार बिंदु (कीवर्ड)/टैगः** रेखीय ग्राफ, अवकलन, समाकलन। | 10 |
| II | **आधारभूत विश्लेषणात्मक रसायनः** विश्लेषणात्मक रसायन का परिचय और इसकी अंतर्विषयक प्रकृति। प्रतिदर्शी (sampling) की अवधारणा। विश्लेषणात्मक मापन में यथार्थता (accuracy), परिशुद्धता (precision) और त्रुटि के स्रोतों का महत्व। प्रायोगिक डेटा और परिणामों की प्रस्तुति, सार्थक अंकों के दृष्टिकोण से सांख्यिकीय शब्दावली- माध्य, माध्य विचलन, माध्यिका, मानक विचलन, संख्यात्मक प्रश्न।<br>**विश्लेषणात्मक रसायन में प्रयुक्त गणनाएँः**<br>माप की कुछ महत्वपूर्ण इकाइयाँ– SI इकाइयाँ, द्रव्यमान व भार के बीच अंतर, मोल, मिलीमोल व संख्यात्मक प्रश्न। विलयन और उनकी सांद्रता– मोलरता, मोललता और नॉर्मलता की अवधारणा। भाग प्रति मिलियन (ppm), भाग प्रति बिलियन (ppb), में सांद्रता को व्यक्त करना। संख्यात्मक प्रश्न। | 10 |



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फिर भी मैंने रात के भोजन को लगाने की जिम्मेदारी मेरे बच्चों दीपाली और दीपेश पर छोड़ रखी है। सो वे दोनों डाइनिंग टेबल पर खाना लगा रहे थे।

आपस में हँसी-मजाक और बराबरी कर रहे थे। उन्होंने ताजा बना भोजन थालियों में परोस दिया था। मैं पहुँची। फ्रिज खोला तो देखा एक ठंडी रोटी बची है। मैंने वह आदतन अपनी थाली में डाल ली।

दीपाली ने देखा मैंने ऐसा किया, उसने रोटी उठाई चार टुकड़े किए और सबकी थालियों में पाव रोटी के एक-एक टुकड़े परोस दिए।

मैंने देखा इनकी आँखों में अँगीठियाँ सुलग आईं। मैं समझ गई कि इन्हें बेटी की यह हरकत सिरे से नागवार गुजरी है। तभी वे कहने लगे 'आइंदा जो भी ठंडा बचे मेरी थाली में पटक दिया करो।'

'नहीं पापा या तो ठंडा खाना बराबर बटेगा या गाय को डाल देंगे।' इनकी आँखों की अँगीठियों का धुँआ जैसे कह रहा था- डाइनिंग टेबल नहीं हुई हाईकोर्ट की बेंच हो गई। बेटी नहीं हुई मानों चीफ जज हो गई। यह सब मेरी नासमझी और बेजा शिक्षा का नतीजा है। मैं कुछ बोल क्यों नहीं रही बेटी से कि इस तरह का व्यवहार तुम्हें शोभा नहीं देता। दूसरे घर जाओगी और ऐसा करोगी तो हमारी नाक कटवाओगी।

लेकिन मैंने ऐसा कुछ नहीं कहा। मुझे ठंडी पावरोटी भी खासी गर्म लगी। सो मैंने क्रांति की चिंगारी पर राख नहीं डाली। मैंने देखा कि दीपेश का चेहरा नया पाठ पढ़ चुका था।

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रचनाओं में व्यक्त विचार लेखकों/पाठकों के हैं। सम्पादक का इससे सहमत होना आवश्यक नहीं है। पत्रिका सम्बन्धी किसी भी विवाद का न्यायालय क्षेत्र सुलतानपुर (उ०प्र०) होगा

जिन सदस्यों की सदस्यता समाप्त हो गयी है अथवा नई ली जानी है वे कृपया कथा समवेत के नाम चेक भेजें या बड़ौदा उ.प्र. ग्रामीण बैंक, शाखा चीनी मिल, सुलतानपुर के खाता सं० 51260100003865, IFSC - BARBOBUPGB में स्थानान्तरित करें।

## रचना-अनुक्रम

पृ०सं०

- संदर्भ...
  जिद की हदें लाँघते आन्दोलन — डॉ० शोभनाथ शुक्ल 01
- पत्रांश.... 05
- प्रतियोगिता पर एक नजर — साक्षी शुक्ला 11
- अभिमत
  समय के सवालों से जूझती कहानियाँ — चित्रेश 13
- निर्णायकों का मत
  (एक) आत्मीयता और गहरे सम्बन्धों की मिठास के ताने–बाने पर बुनी गई कहानियाँ — डॉ० सुरेन्द्र विक्रम 17
  (दो) दीवारों के बीच कैद जीवन का यथार्थपरक चित्रण करती कहानियाँ — रामेश्वर काम्बोज 'हिमांशु' 19
  (तीन) समाज में व्याप्त विसंगतियों के प्रति आक्रोश एवं मानव मूल्यों के प्रति संवेदनशीलता की कहानियाँ — शशि भूषण बड़ोनी 21
- पुरस्कृत कहानियाँ
  (एक) आलमारी का एक खाना — डॉ० किसलय पांचोली 23
  (दो) गुम्मा — मीनाक्षी दूबे 28
  (तीन) टूटे दरख़्त पर उगी कोंपलें — आशीष दलाल 32
  (चार) नाच — अश्विनी कुमार 'आलोक' 38
  (पाँच) कौन हैं आप — डॉ० नीहारिका 42
  (छः) उलझन — प्रमोद कुमार 'सुमन' 51
- अन्य कहानियाँ
  (सात) अंधेरी रात में वह था कौन — श्रीलाल कोठारी 58
  (आठ) केशव, कोरोना और वे सब — श्यामनारायण श्रीवास्तव 64
- लघुकथा
  (एक) जुगाली — ज्योत्सना कपिल 16
  (दो) सही कदम — ज्योत्सना कपिल 73
- संस्मरण
  कथाकार सुनील कौशिश — रूप सिंह चन्देल 69
- डायरी
  लॉक डाउन का सातवाँ दिन — कमलेश भट्ट 'कमल' 74
- समीक्षा
  (एक) 'अँगूठे पर वसीयत': सामाजिक त्रासदी का सम्यक आख्यान — डॉ० हरेराम पाठक 79
  (दो) लोक जीवन के विभिन्न रंगों को उकेरती कहानियाँ — अरुण कुमार कैहरबा 81
- गतिविधि
  'अंगूठे पर वसीयत' उपन्यास का लोकार्पण तथा उपन्यास केन्द्रित संगोष्ठी — अवनीश त्रिपाठी 84
- प्रतियोगिता–सूचना 22
- सदस्य–सूची 87

1984 से प्रकाशित

## माँ धनपती देवी-स्मृति कथा साहित्य सम्मान 2020
## प्राप्त पुरस्कृत (प्रथम स्थान) कहानी

# आलमारी का एक खाना

☐ डॉ0 किसलय पांचोली




जन्म : 15 सितम्बर 1960

शिक्षा : एम.एस-सी. (वनस्पति विज्ञान), पी-एच.डी.

प्रकाशन : अथवा, नो पार्किंग कहानी संग्रह के साथ अनेक साझा संकलनों में कहानी प्रकाशित। ज्ञानोदय, कथादेश, कथन, कथाक्रम, समावर्तन, अक्षरा, अक्षर पर्व आदि पत्रिकाओं में रचनाएं प्रकाशित। मराठी और गुजराती भाषा में रचनाओं का अनुवाद। कुछ कहानियों पर टेलीफिल्म।

सम्मान : माँ धनपती देवी-स्मृति कथा साहित्य सम्मान 2020 (सुलतानपुर)।

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सम्पर्क : एफ-8, रेडियो कॉलोनी, रेजीडेंसी एरिया, इंदौर (म0प्र0)-452001,

मोबाइल : 9926560144


मेरी खुद से बातचीत जारी है।... अब शरीर साथ नहीं देता। मैं जल्दी थक जाती हूँ। पुराना वक्त होता तो अभी तक सब कुछ पूरी तरह व्यवस्थित जमा चुकी होती। दसियों बार घर बदले। बीसियों बार दिवाली पर सफाई की। कभी ऐसा अनुभव नहीं हुआ जो इस बार हो रहा है। थकान है कि जा ही नहीं रही।

इस तीन दिन की मूसलाधार बारिश ने मानो सब कुछ धो डाला है। लगता है तन की थकान से ज्यादा मैं मन की थकान से परेशान हूँ। बुरी तरह क्लांत हूँ। जीवन साथी के साथ की अहमियत बुढ़ापा ही महसूस करवाता है। युवावस्था तो काम ही काम और नींद में बीत जाती है। मुझे इनकी बहुत याद आ रही है। ये होते तो थोड़ी मानसिक राहत मिलती। सच बुढ़ापे में अकेले पीछे रह जाने से त्रासद जिंदगी में और कुछ नहीं होता। इस दर्द को वही समझ सकता है जिसने इसे भोगा हो।

-"दादी, खाना लग गया है। आप आ जाइए।" पोती ने आवाज लगाई। खुली आलमारी के पट बंद करते-करते मेरी नज़र दीवार घड़ी पर गई। ओह... एक डेढ़ घंटे से मैं आलमारी खोले खड़ी थी। मेरी खाली आलमारी के सामने जो मेरे आज के जीवन की तरह खाली है।

मशीन की तरह मैंने अपने आप को डाइनिंग टेबल तक घसीटा। वहाँ बेटा अतुल, बहू मीरा, पोती दर्शना और बहू की माँ कमला जी खाना खा रहे थे। मेरे आने से हर किसी के चेहरे पर जुदा-जुदा भावों के रंग छा गए। अतुल के चेहरे पर हल्की-सी तसल्ली, मीरा के मुख पर खीज छुपाने की नाकाम कोशिश, कमला जी के चेहरे पर नापसंदगी और दर्शना के मुख पर छलछलाती खुशी के रंग! यकायक मुझे पुराने गाने के बोल याद हो आए। 'लाख छुपाओ छुप न सकेगा... दिल की बात बता देता है असली-नकली चेहरा।'

मेरे आते ही मीरा ने बातचीत के वे सिरे खोल लिए जिनमें मैं कुछ बोल नहीं सकती। बेटा सिविल इंजीनियर है और वह आर्किटेक्ट। जैसे कि... 'हवा बंगले वाले क्लाइंट ने क्या डिमांड की है?'... 'पॉलीहाउस प्रोजेक्ट में मेटिरिअल कहाँ से मंगवाना सस्ता पड़ेगा?' 'क्यों न हम वास्तु में भी कोई डिप्लोमा कर लें। वास्तु विशेषज्ञों को देने वाला पैसा बचेगा।... आजकल यह बहुत इन है।' आदि-आदि।

कोरोना काल

# ज़िंदगी ज़िंदाबाद

(महिला सृजन - 2021)



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सहायक संपादक : ख़ुदेजा ख़ान

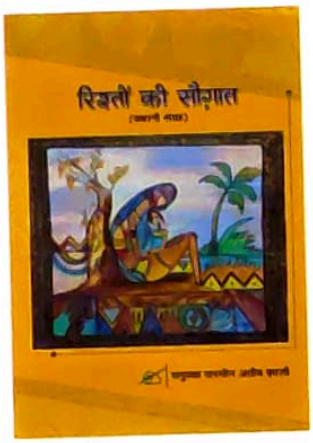


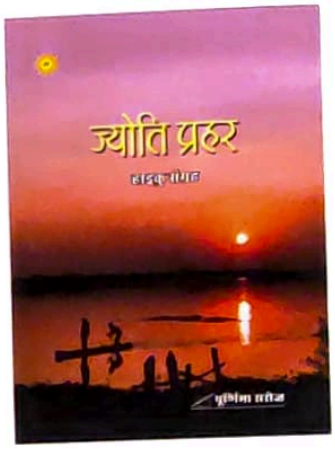


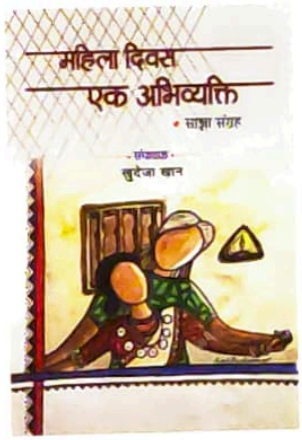

- कुछ मेरी क़लम से
  ✍ **सौ. कल्पना सेठी** 114
- वटवृक्ष
  ✍ **कल्याणी दुबे** 115
- कोरोना का संदेश- सादगी में ही सुख है।
  ✍ **डॉ. कल्याणी कबीर** 118
- संकल्प और दृढ़ हुआ
  ✍ **करमजीत कौर** 120
- 'मुश्किल वक़्त में परिवार का साथ'
  ✍ **डॉ. कशिश क़ाज़ी** 121
- कोरोना का क्या रोना
  ✍ **डॉ. कविता परिहार** 123
- अधूरा सफ़र
  ✍ **डॉ. कविता शनवारे** 124
- दो औरतें
  ✍ **कविता वर्मा** 125
- कोरोना से मुठभेड़
  ✍ **ख़ुदेज़ा ख़ान** 126
- मन की बात
  ✍ **किरण मुंदड़ा** 128
- कोरोना - एक संदेश
  ✍ **किरण पारख टाटिया** 130
- हौसले की जीत
  ✍ **किरण वर्मा** 131
- कोरोना - मेरे विचार
  ✍ **किसलय पंचोली** 133
- कोरोना काल
  ✍ **डॉ. कुमकुम गुप्ता** 134
- रूम नम्बर 637
  ✍ **मधु गुप्ता** 135
- परी हूँ मैं
  ✍ **मधु पाटोदिया** 137
- चुनौतियाँ जीवन का श्रृंगार है
  ✍ **मधुसिंघी** 139
- कोरोना काल के अनुभव
  ✍ **मधुबाला श्रीवास्तव** 141
- औरतें
  ✍ **माधुरी राऊलकर** 142
- कोरोना को हराना ज़रूरी
  ✍ **मालिनी शर्मा** 143
- आपदा को अवसर में बदला तो ज़िंदगी फिर गुनगुनाने लगी
  ✍ **मनीषा शर्मा** 144
- लापरवाह ना बनें
  ✍ **मनीषा तरण** 146
- यूं ही बीत गया साल ऐसा रहा कोरोना काल
  ✍ **मंजू लुंकड़** 147

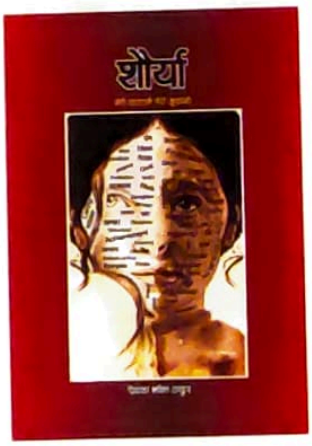
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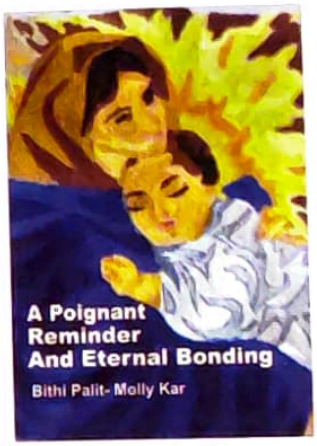


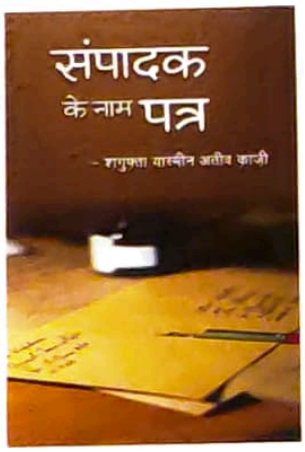



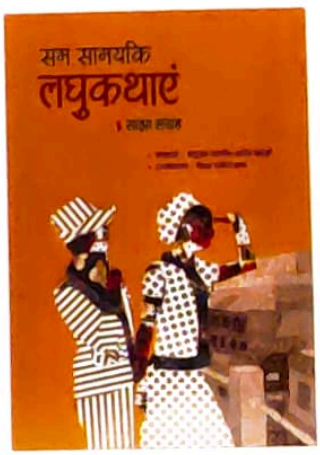







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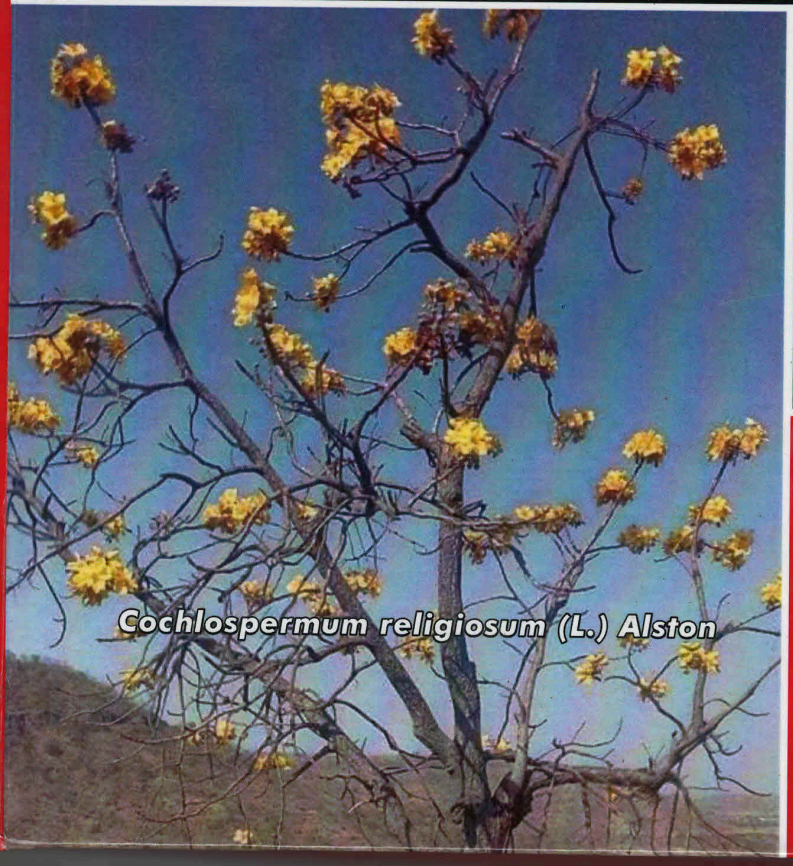
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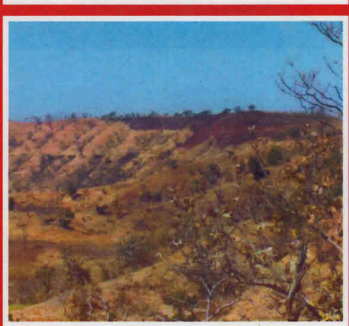
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Dr. Kiran Surage

## Major Threats to Forest Floral Diversity


Fuelwood Headloads


Unsustainable Removal of NTFP


Forest Fires


Forest Encroachments


illicit felling


Unregulated Grazing

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1. कोविड-19 का अंत कैसे होगा ?
2. विश्व एक साथ कई महामारियों से जूझ रहा है
3. कोविड और गंध संवेदना का ह्रास
4. कोविड-19: क्लस्टर-बस्टिंग तकनीक की सीमा
5. स्कूल खोलें या न खोलें डॉ. सुशील जोशी
6. आपातकालीन टीका: वैज्ञानिकों की दुविधा
7. कोरोनावायरस के चलते मिंक के कत्ले आम की तैयारी
8. पराली जलाने की समस्या का कारागार समाधान डॉ. डी . बालसुब्रामण्यन
9. तंबाकू उद्योग की राह पर वैपिंग उद्योग
10. असाधारण कैंसर रोगियों से कैंसर उपचार में सुधार
11. शोध में लिंग और जेंडर शामिल करने का संघर्ष
12. नासा का मिशन मंगल प्रदीप
13. क्यों कुछ सब्जियां गले में खुजली पैदा करती हैं? जितेश शेल्के एवं कालू राम शर्मा
14. आनुवंशिक विरासत को बदल देता है एपिजेनेटिक्स डॉ. डी. बालसुब्रामण्यन
15. हरित पटाखे, पर्यावरण और स्वास्थ्य सुदर्शन सोलंकी
16. सर्पदंश के मृतकों के स्मारक कालू राम शर्मा
17. क्या व्हेल नौकाओं पर हमला करती हैं?
18. घुड़सवारी ने बनाया बहुजातीय साम्राज्य
19. घुड़दौड़ जीतने का गणित
20. एक बच्चा-चोर जंतु: नैकेड मोल रैट डॉ. विपुल कीर्ति शर्मा
21. नारों को युद्ध करने पर मजबूर करती मादाएं डॉ. विपुल कीर्ति शर्मा
22. पतंगों का ध्वनि-शोषक लबादा

# एक बच्चा-चोर जंतु: नैकेड मोल रैट

पूर्वी अफ्रीका के शुष्क घास के मैदानों के नीचे भूल-भूलैया जैसी सुरंगों में एक प्रकार की बदसूरत छछूंदर, नैकेड मोल रैट(Heterocephalusglaber) पाई जाती है। त्वचा पर बाल नहीं होते, इसलिए इन्हें नग्न मोल रैट कहते हैं। अधिकांश कृंतकों के विपरीत ये सामाजिक होती हैं। इनके समूहों में सदस्यों की संख्या 300 तक हो जाती है। पूरे समुदाय में केवल एक प्रजननशील जोड़ा रहता है और शेष सभी मज़दूर होते हैं।



हाल ही के शोध में पाया गया है कि चींटी और दीमकों के समान ही यह मोल रैट भी भोजन की उपलब्धता और इलाके में विस्तार करने के लिए आसपास मौजूद अन्य मोल रैट कॉलोनियों पर आक्रमण करते हैं और उनके बच्चों को चुराकर अपने समूह के मज़दूरों की संख्या में वृद्धि करते हैं। इनके इस व्यवहार से छोटी एवं कम एकजुटता वाली मोल रैट कॉलोनियां सिकुड़ती हैं और आक्रामक कॉलोनियों का विस्तार होता जाता है।

कीन्या के मेरु राष्ट्रीय उद्यान में शोध टीम को उपरोक्त व्यवहार नैकेड मोल रैट की गतिविधियों के अध्ययन के दौरान संयोगवश देखने को मिला। एक दशक से चल रहे शोध में शोधकर्ताओं ने इनकी गतिविधियों पर नज़र रखने के लिए दर्जनों कॉलोनियों से मोल रैट पकड़-पकड़कर उनकी त्वचा के नीचे एक बहुत छोटी रेडियो फ्रिक्वेन्सी ट्रांसपॉन्डर चिप लगा दी थी। नई कॉलोनी के सदस्यों में चिप लगाने के दौरान शोधकर्ताओं को वहां पड़ोसी कालोनी के वे सदस्य दिखाई दिए जिन पर वे पहले ही चिप लगा चुके थे। आगे खोजबीन करने पर ज्ञात हुआ कि नई कॉलोनी की रानी के चेहरे पर युद्ध के दौरान बने घाव थे। शोध से जुड़े सेन्ट लुईस की वाशिंगटन युनिवर्सिटी के स्टेन ब्राउडे के लिए यह बात आश्चर्यजनक और नई थी क्योंकि इनकी कॉलोनियों के बीच प्रतिस्पर्धा की कोई बात ज्ञात ही नहीं थी बल्कि उन्हें तो आपसी सहयोग की भावना से रहने वाले जीव ही माना जाता था। ब्राउडे और उनके साथियों ने शोध के दौरान पाया कि 26 कॉलोनियों ने अपनी सुरंग की सरहदों को विस्तार देकर पड़ोसी कॉलोनियों पर अधिकार जमा लिया है। आक्रमण के आधे मामलों में तो छोटी कॉलोनी के सभी मोल रैट बेदखल कर दिए गए थे तथा आधे मामलों में छोटी कॉलोनी के सदस्यों को सुरंगों के किनारों तक खदेड़ दिया गया था। इसी अध्ययन के दौरान वैज्ञानिकों को ऐसा लगा कि हमले के दौरान छोटी कॉलोनी के बच्चों को भी चुरा लिया गया है। परंतु तब उन्नत जेनेटिक तकनीक के अभाव में वंशावली ज्ञात कर पुख्ता तथ्य परखना कठिन था। लेकिन बाद के वर्षों में ज्ञात हुआ कि अन्य कॉलोनियों के बच्चे मज़दूर बनकर बड़ी कॉलोनी के अंग बन गए थे। वैज्ञानिकों ने इन पर निगाह रखी और इनके जेनेटिक विश्लेषण से ज्ञात हुआ कि ये दूसरी कॉलोनी के चुराए हुए बच्चे थे। इन छछूंदरों के सामाजिक जीवन के अध्ययन से वैज्ञानिक यह जान पाए हैं कि इनके लिए सुरंगें बहुत मूल्यवान होती है। सुरंगों को खोदने के दौरान ही ज़मीन में पाए जाने वाले कंद इनका आहार होते हैं। कॉलोनी में जितने ज़्यादा मज़दूर होंगे सुरंगें उतनी ही बड़ी होंगी और अधिक भोजन उपलब्ध करा पाएंगी। इसलिए ये आस-पड़ोस की कॉलोनियों पर आक्रमण करके वयस्क सदस्यों को बेदखल कर देते हैं और केवल निश्चित उम्र के बच्चों को ही चुरा कर अपने समूह में सम्मिलित कर लेते हैं जो बड़े होकर इनके लिए मज़दूरी कर सकें।**(स्रोत फीचर्स)**


नया साल
मुबारक
2021
जनवरी 2021
स्रोत
विज्ञान एवं टेक्नॉलॉजी फीचर्स
मूल्य: ₹ 30.00
पूसा डिकम्पोसर
PUSA DECOMPOSER
पराली जलाने की समस्या
का कारगर समाधान

# Srote - January 2021

1. कोविड-19 का अंत कैसे होगा ?
2. विश्व एक साथ कई महामारियों से जूझ रहा है
3. कोविड और गंध संवेदना का ह्रास
4. कोविड-19: क्लस्टर-बस्टिंग तकनीक की सीमा
5. स्कूल खोलें या न खोलें डॉ. सुशील जोशी
6. आपातकालीन टीका: वैज्ञानिकों की दुविधा
7. कोरोनावायरस के चलते मिंक के कत्ले आम की तैयारी
8. पराली जलाने की समस्या का कारागार समाधान डॉ. डी . बालसुब्रामण्यन
9. तंबाकू उद्योग की राह पर वैपिंग उद्योग
10. असाधारण कैंसर रोगियों से कैंसर उपचार में सुधार
11. शोध में लिंग और जेंडर शामिल करने का संघर्ष
12. नासा का मिशन मंगल प्रदीप
13. क्यों कुछ सब्जियां गले में खुजली पैदा करती हैं? जितेश शेल्के एवं कालू राम शर्मा
14. आनुवंशिक विरासत को बदल देता है एपिजेनेटिक्स डॉ. डी. बालसुब्रामण्यन
15. हरित पटाखे, पर्यावरण और स्वास्थ्य सुदर्शन सोलंकी
16. सर्पदंश के मृतकों के स्मारक कालू राम शर्मा
17. क्या व्हेल नौकाओं पर हमला करती हैं?
18. घुड़सवारी ने बनाया बहुजातीय साम्राज्य
19. घुड़दौड़ जीतने का गणित
20. एक बच्चा-चोर जंतु: नैकेड मोल रैट डॉ. विपुल कीर्ति शर्मा
21. नारों को युद्ध करने पर मजबूर करती मादाएं डॉ. विपुल कीर्ति शर्मा
22. पतंगों का ध्वनि-शोषक लबादा

# नरों को युद्ध करने पर मज़बूर करती मादाएं

जब बेन्डेड नेवलों की दो सेनाएं आमने-सामने आती हैं तो उनके बीच वैसा ही युद्ध होता है जैसा मानव प्रतिद्वंद्वियों के बीच होता है। अक्सर विजेता समूह हारने वाले समूह के अड़ियल नेवलों को घेरकर खून से लथपथ कर देते हैं। जब नर युद्धरत होते हैं, एक मादा नेवला चुपके से अपने बच्चों के जीन में विविधता तथा जीवित रहने की संभावना बढ़ाने के लिए दुश्मन गुट में से अपना प्रजनन साथी तलाश लेती है।



प्रोसीडिंग्स ऑफ दी नेशनल एकेडमी ऑफ साइंसेस में प्रकाशित शोधपत्र के मुताबिक अफ्रीकी बेन्डेड नेवलों (मंगोस मंगो) के गुटों में आपसी संघर्ष आम घटना है। परंतु आश्चर्यजनक बात तो यह है कि इन लड़ाइयों के पीछे एक मादा नेवला होती है। नेवलों के इस झगड़े में हमेशा मादा के दोनों हाथों में लड्डू होते हैं। एक तो नरों के कत्लेआम के चलते उनकी आबादी संतुलित रहती है। दूसरा, मादा को दुश्मन गुट के बहादुर नरों से प्रजनन करके बेहतर जीन्स प्राप्ति का फायदा मिलता है।

उपरोक्त नतीजे युगांडा के क्वीन एलिज़ाबेथ नेशनल पार्क में 20 वर्षों के अध्ययन से मिले हैं। सवाना में पाए जाने वाले बेन्डेड नेवले औसतन 20-20 सदस्यों के समूहों में रहते हैं जिनमें नर, मादा एवं बच्चे सम्मिलित होते हैं। इनका आवास भूमिगत सुरंगों में होता है जिसके बहुत से द्वार होते हैं। ये अपने मूल गुट में बने रहते हैं। निष्कासन अथवा सदस्यों की अधिक संख्या के कारण समूह के कुछ सदस्य नए गुट बनाते हैं। मूल गुट के साथ बने रहने से सदस्यों की सुरक्षा तो होती है किंतु एक ही समूह में प्रजनन होने के कारण आनुवंशिक विविधता की हानि होती है। ऐसे में गुट की मादाएं प्रजनन के लिए दूसरे गुटों के नरों की ओर आकर्षित होती हैं। अपनी प्रजाति और संतति के अस्तित्व को सुनिश्चित करने के लिए मादा अक्सर प्रतिद्वंद्वी समूहों के उपयुक्त नरों से प्रजनन करने के लिए अपने समूह के नरों को दूसरों के इलाके में ले जाकर युद्ध शुरू करवा देती है।

जब कोई मादा नेवला प्रजननशील होती है तो गुट के चौकीदार उसकी चौबीसों घंटे सुरक्षा करते हैं और गुट का प्रमुख नर ही उससे प्रजनन करता है। चौकीदारों की उपस्थिति में मादा का बाहरी गुट के नरों से प्रजनन करना असंभव होता है। ऐसी परिस्थितियों में चौकीदार नरों को दुश्मन गुट के इलाके में ले जाकर मादा उन्हें युद्ध में झोंक देती है। वैज्ञानिकों ने पाया कि प्रजननशील मादाएं गुट के फैसलों को नरों की तुलना में अधिक प्रभावित करती हैं। मादा के नरों के साथ इस अनुचित व्यवहार को वैज्ञानिक 'शोषणमूलक नेतृत्व' कहते हैं, जहां मादा को शायद ही कभी नुकसान होता है और कई बार बहुत सारे नर मारे जाते हैं। वयस्क नरों में से 10 प्रतिशत की मृत्यु अक्सर इसी प्रकार होती है। जैव विकास के नज़रिए से मादा की करतूत उचित लगती है। वैज्ञानिकों का आकलन है कि गुट के बाहर के नरों से उत्पन्न बच्चों के जीवित रहने की संभावना समूह के नरों से उत्पन्न बच्चों से अधिक होती है। अन्य किसी सामाजिक स्तनधारी में ऐसी घटना नहीं देखी गई है। प्लिस्टोसिन तथा होलोसिन युग के प्रारंभ में मानव की शिकारी आबादी में भी 'शोषणमूलक नेतृत्व' के कारण गुटीय युद्धों के दौरान 14-18 प्रतिशत नर मारे जाते थे। क्या अफ्रीकी बेन्डेड नेवले के समान मनुष्यों में भी शीर्ष नेतृत्व,

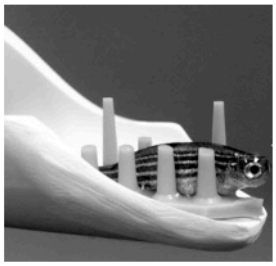

फरवरी 2021
स्रोत
विज्ञान एवं टेक्नॉलॉजी फीचर्स
मूल्य: ₹ 30.00
अनलॉकडाउन

# Srote - February 2021


1. कोविड और 2020: एक अनोखा वर्ष
2. नोवावैक्स के टीके का परीक्षण अंतिम चरण में
3. कोरोना की चुनौतियों से जूझता विज्ञान जगत चक्रेश जैन
4. विज्ञान नीति और कोरोना टीका बनाने की ओर बढ़ा भारत चक्रेश जैन
5. कोविड-19 टीका: उम्मीद और असमंजस
6. बदले हुए वायरस से खलबली
7. कोरोनोवायरस अपने चिंह छोड़ जाता है
8. कोविड-19 की गंभीरता बढ़ाता पुरातन जीन
9. नई लार ग्रंथियों की खोज स्निग्धा दास
10. स्पर्श अनुभूति में एक प्रोटीन की भूमिका
11. पैरों तले विशाल जैव विविधता
12. शोरगुल में साफ सुनने की तकनीक
13. सूक्ष्मजीव को ब्रेड बनाने के लिए पालतू बनाया था
14. कीमोथेरपी - कैंसर का उपचार या सज़ा ऋषि राज राय
15. ज़ेब्राफिश और रेटिना का इलाज डॉ. विपुल कीर्ति शर्मा
16. सर्पदंश से अनमोल जीवन की क्षति
17. छिपकली द्वारा परागण का अनूठा मामला डॉ. किशोर पंवार
18. नर चीतों के भी अड्डे होते हैं
19. हयाबुसा-2 की कार्बन युक्त नमूनों के साथ वापसी

# ज़ेब्राफिश और रेटिना का इलाज

छिपकलियों की पूंछ टूटती है और कुछ ही दिनों में बिना हड्डी वाली नई पूंछ बन जाती है। कुछ विकसित रीढ़धारियों में क्षतिग्रस्त अंगों में पुन:निर्माण (रीजनरेशन) की क्षमता होती है। अकशेरुकी प्राणियों में तो कई ऐसे उदाहरण हैं जो अपने शरीर के अंग या पूरे शरीर को भी फिर से बना सकते हैं। स्पंज और प्लेनेरिया नामक जीव के छोटे-छोटे टुकड़ों से पूरे जीव का निर्माण हो जाता है। स्टारफिश की भुजा कटकर अलग हो जाने पर फिर से नई भुजा आ जाती है। इस प्रक्रिया को यदि मानव में प्रयुक्त किया जा सके तो दुर्घटनाओं या अन्य कारणों से नष्ट हुए अंगों को पुन: उत्पन्न किया जा सकता है।



**ज़ेब्राफिश में पुन:निर्माण**

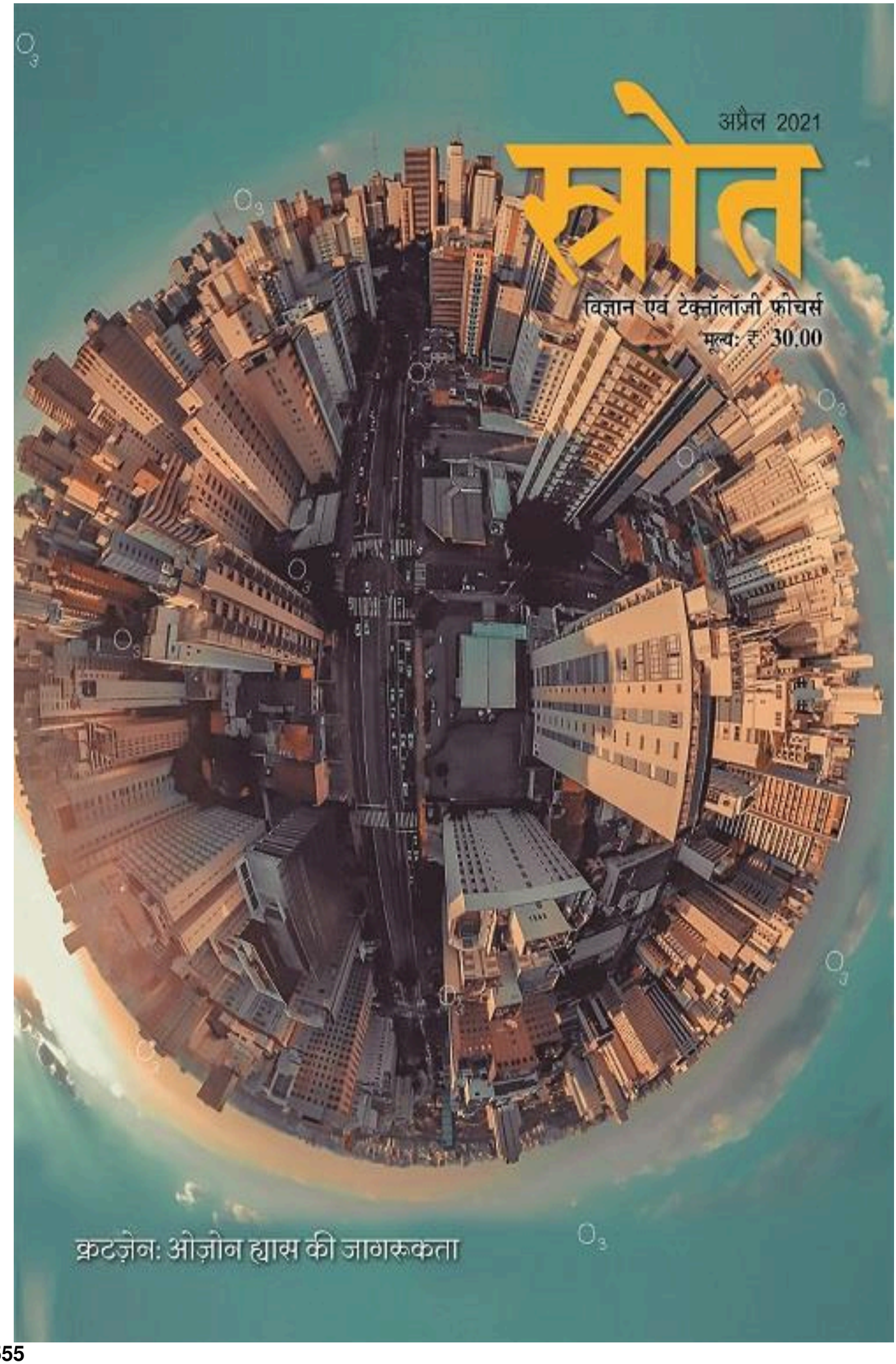
मानव के लिए उपयोगी चिकित्सा सम्बंधी 95 प्रतिशत शोध पारंपरिक रूप से चूहों या माउस पर किए जाते हैं। पिछले कुछ वर्षों में इस प्रवृत्ति में बदलाव आया है और ज़ेब्राफिश शोधकर्ताओं की पहली पसंद बन गई है। करीब 6 से.मी. लंबी ज़ेब्राफिश दक्षिण-पूर्व एशिया (भारत, पाकिस्तान, बांग्लादेश, नेपाल और बर्मा) में पाई जाती है। मनुष्य की बीमारियों पर शोध के लिए बर्मिंगहैम के अलबामा विश्वविद्यालय में ही 20 शोध परियोजनाओं में इनका उपयोग किया जा रहा है। कैंसर, हृदय रोग, मोटापा, मस्क्यूलर डिस्ट्रॉफी और नेफ्रोलेप्सी जैसी बीमारियों में इन पर किए गए शोध के परिणाम मूल्यवान हैं।

ज़ेब्राफिश का उपयोग तेजी से बढ़ने का कारण कम लागत, तेज़-वृद्धि तथा भ्रूण का पारदर्शी होना है। ज़ेब्राफिश प्रति सप्ताह 100-500 अंडे देती है जिनमें 45 मिनट में भ्रूणीय विकास दिखने लगता है। सबसे महत्वपूर्ण खोज तो यह है कि वयस्क ज़ेब्राफिश हृदय और मस्तिष्क के चोटग्रस्त भाग का भी पुन:निर्माण कर लेती है। मनुष्यों में तो केवल त्वचा और कुछ ही अन्य अंगों को पुन: बनाने की क्षमता होती है।

हमारे मस्तिष्क तथा मेरु-रज्जू बनाने वाली तंत्रिका तंत्र की कुछ कोशिकाएं तो एक समय बाद कोशिका विभाजन के लिए आवश्यक सामग्री फेंक देती हैं। इससे उन कोशिकाओं के विभाजन से नई कोशिकाओं के निर्माण की संभावनाएं लगभग समाप्त ही हो जाती हैं।

आंखों के भीतर तंत्रिका कोशिकाओं से बना दृष्टिपटल (रेटिना) भी बीमारी या चोट के कारण यदि क्षतिग्रस्त हो जाए तो वह आजीवन अंधा बना देता है क्योंकि रेटिना में हुए नुकसान की पूर्ति नहीं होती। आंखों के लेंस तथा कॉर्निया की क्षति के कारण उत्पन्न अंधत्व को तो प्रत्यारोपण से ठीक किया जा सकता है परंतु रेटिना की क्षति का कोई इलाज अभी तक उपलब्ध नहीं है।

**ज़ेब्राफिश का रेटिना**


अप्रैल 2021
स्रोत
विज्ञान एवं टेक्नॉलॉजी फीचर्स
मूल्य: ₹ 30.00
क्रटज़ेन: ओज़ोन ह्रास की जागरूकता

# Srote - April 2021

1. क्रटज़ेन: ओज़ोन ह्रास की जागरूकता के प्रणेता
2. उत्तराखंड आपदा पर वाटर कॉनफ्लिक्ट फोरम का वक्तव्य
3. न्यूनतम समर्थन मूल्य यानी एमएसपी क्या है? सोमेश केलकर
4. पर्यावरणीय न्याय: मरीचिका की तलाश रिनचिन
5. जलवायु बदलाव के दौर में कृषि भारत डोगरा
6. गर्भनाल में मिला माइक्रोप्लास्टिक डॉ. विपुल कीर्ति शर्मा
7. रसायन विज्ञान सुलझाएगा प्लास्टिक प्रदूषण की समस्या
8. पृथ्वी के चुंबकीय क्षेत्र में फेरबदल प्राचीन वृक्ष में कैद
9. फूलों की गंध खुद के लिए हानिकारक
10. गर्माती दुनिया में अलग-अलग जंतुओं पर प्रभाव
11. जीवन ज़मीन पर कैसे आया
12. कुत्तों को पालतू किसने, कब बनाया?
13. कोविड के रुोत की जांच अभी भी जारी
14. अधिक संक्रामक कोविड-19 वायरस से खलबली
15. क्या टीकों का मिला-जुला उपयोग हो?
16. क्या टीके की दूसरी खुराक में देरी सुरक्षित है?
17. त्वरित डैटा ट्रांसमिशन संकलन: संजय गोस्वामी
18. महामारी में वैज्ञानिक मांओं ने अधिक चुनौतियां झेलीं
19. न्यूटन की प्रिंसिपिया मैथमैटिका नीलाम संकलन: संजय गोस्वामी
20. दुनिया का सबसे ऊष्मा-सह पदार्थ संकलन: संजय गोस्वामी

# गर्भनाल में मिला माइक्रोप्लास्टिक

माइक्रोप्लास्टिक प्लास्टिक के पांच मिलीमीटर से छोटे कण होते हैं। ये व्यावसायिक प्लास्टिक उत्पादन के दौरान और बड़े प्लास्टिक के टूटने से उत्पन्न होते हैं। रोज़मर्रा के जीवन में प्लास्टिक के अधिक इस्तेमाल के कारण माइक्रोप्लास्टिक ने पूरी पृथ्वी को अपनी चपेट में ले लिया है। प्रदूषक के रूप में माइक्रोप्लास्टिक पर्यावरण, मानव और पशु स्वास्थ्य के लिए अत्यंत हानिकारक हो सकता है।

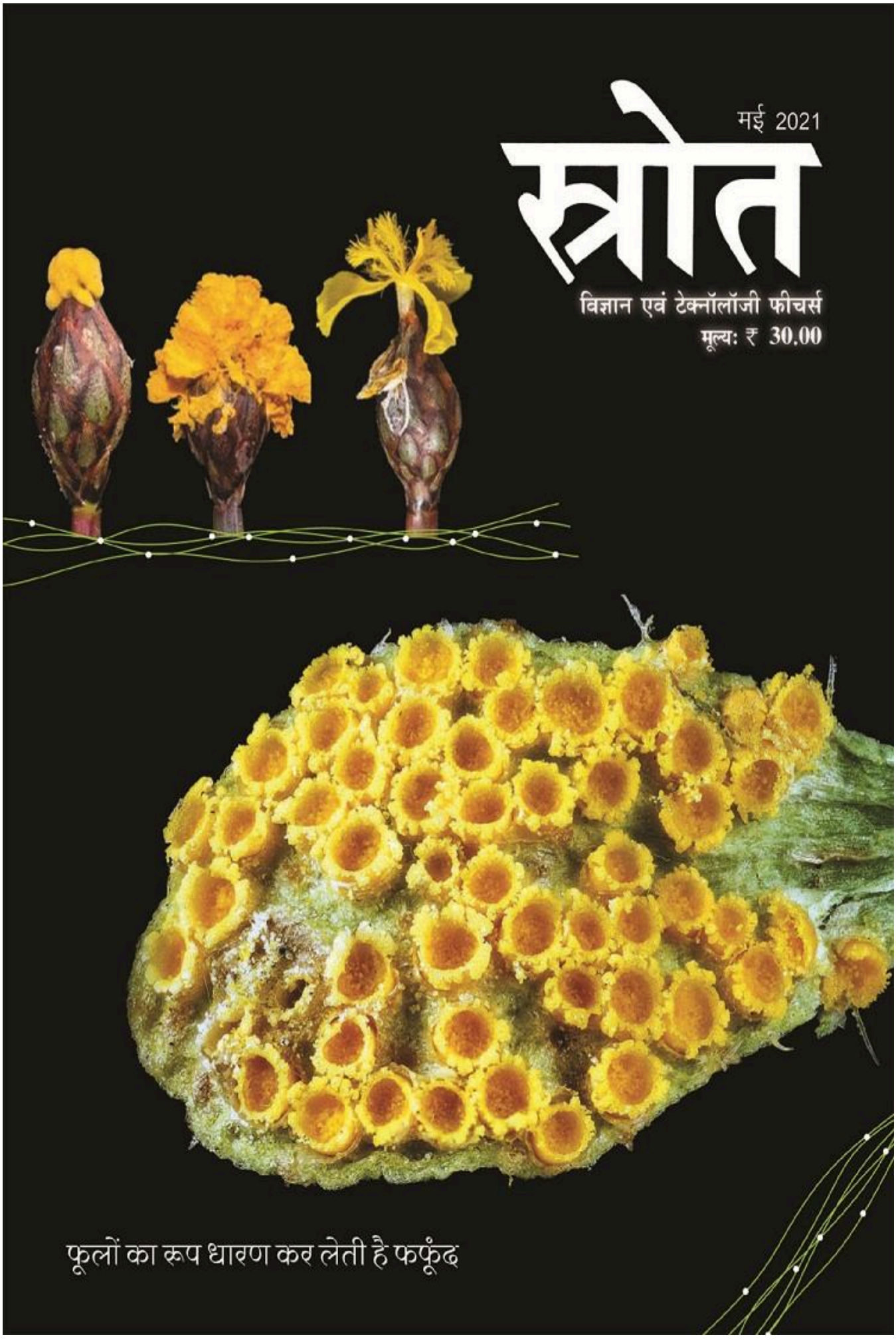


हाल ही में वैज्ञानिकों ने गर्भवती महिलाओं के गर्भनाल में माइक्रोप्लास्टिक्स पाया है। यह बेहद चिंता का विषय है। नए शोध में गर्भनाल के नमूनों में अनेक प्रकार के सिंथेटिक पदार्थ भी पाए गए हैं। इटली में हुए एक अध्ययन में महिलाओं की प्रसूति में कोई जटिलता नहीं पता चली है और इसलिए छोटे प्लास्टिक के कणों का शरीर पर प्रभाव निश्चित तौर पर अभी तक ज्ञात नहीं हो पाया है। हालांकि, विशेषज्ञों का मानना है कि प्लास्टिक के रसायन गर्भस्थ शिशु की प्रतिरक्षा प्रणाली को नुकसान अवश्य पहुंचा सकते हैं।

रोम के फेटबेनफ्रेटेली के प्रसूति और स्त्री रोग विभाग के शोध प्रमुख एंटोनियो रागुसा तब आश्चर्यचकित हो गए जब उन्होंने बच्चों के जन्म के बाद माताओं द्वारा दान में दिए गए छह में से चार गर्भनाल में 12 माइक्रोप्लास्टिक टुकड़े पाए। अनुमान है कि माओं के शरीर में माइक्रोप्लास्टिक भोजन या सांस के साथ प्रवेश कर गए होंगे। अध्ययन के लिए प्रत्येक गर्भनाल से केवल तीन प्रतिशत ऊतक का नमूना लिया गया था, और उसमें भी इतनी अधिक मात्रा में माइक्रोप्लास्टिक टुकड़ों का मिलना बेहद गंभीर मामला है। शोध पत्र में कहा गया है कि सभी प्लास्टिक के कण रंगीन थे। तीन नमूनों को पॉलीप्रोपायलीन के रूप में पहचाना गया, जबकि अन्य नौ अन्य नमूनों के केवल रंग की पहचान ही संभव हो पाई।

एनवायरनमेंट इंटरनेशनल नामक जर्नल में प्रकाशित एक शोध में शोधकर्ताओं ने बताया है कि पिछली सदी में ही प्लास्टिक का वैश्विक उत्पादन प्रति वर्ष 32 करोड़ टन तक पहुंच गया था। उत्पादन में हुई 40 प्रतिशत की वृद्धि का उपयोग एकल-उपयोग पैकेजिंग के रूप में किया जाता है। उपयोग हो जाने पर इसे कचरे के रूप में फेंक दिया जाता है।

गर्भनाल गर्भस्थ शिशु से अपशिष्ट पदार्थ को निकालने के साथ-साथ बच्चे को ऑक्सीजन और पोषण भी प्रदान करता है। 10 माइक्रॉन (0.01 मि.मी.) के माइक्रोप्लास्टिक रक्त प्रवाह में पहुंचकर मां से गर्भस्थ शिशु में भी पहुंच जाते हैं। शरीर में पहुंचते ही ये माइक्रोप्लास्टिक्स शिशु के शरीर में प्रतिरक्षा तंत्र को सक्रिय करके प्रतिरक्षा प्रतिक्रिया उत्तेजित करते हैं। माइक्रोप्लास्टिक्स पर्यावरणीय प्रदूषकों और प्लास्टिक योजक सहित अन्य रसायनों के वाहक के रूप में भी कार्य कर सकता है, जिससे शरीर को अत्यधिक हानि होती है। माइक्रोप्लास्टिक्स गर्भनाल के भ्रूण और मातृ दोनों हिस्सों में पाए गए थे। ये कण शिशुओं के शरीर में प्रवेश कर गए होंगे, हालांकि वैज्ञानिक शिशु के अंदर इनका पता लगाने में असमर्थ थे। भ्रूण पर माइक्रोप्लास्टिक्स के संभावित

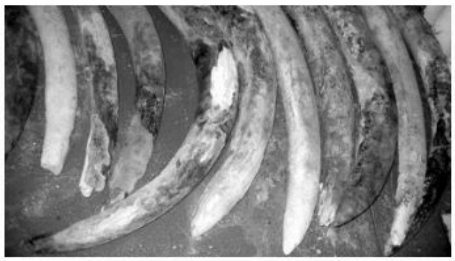

मई 2021
स्रोत
विज्ञान एवं टेक्नॉलॉजी फीचर्स
मूल्य: ₹ 30.00
फूलों का रूप धारण कर लेती है फफूंद

# Srote - May 2021


1. टीके की प्रभाविता का क्या मतलब है?
2. कोविड के बढ़ते मामले और टीकाकरण
3. क्या फ्रोज़न वन्य जीवों से कोविड फैल सकता है?
4. टीबी ने हमारी प्रतिरक्षा प्रणाली को कैसे बदला
5. फूलों का रूप धारण कर लेती है फफूंद डॉ. किशोर पंवार एवं डॉ. भोलेश्वर दुबे
6. ग्वारपाठा के जीनोम का खुलासा
7. सज़ायाफ्ता की रिहाई के लिए वैज्ञानिकों की गुहार
8. क्षुद्रग्रह की रिकॉर्ड संख्या
9. पृथ्वी के भीतर मिले चंद्रमा निर्माण के अवशेष
10. अतीत में पृथ्वी एक जलीय ग्रह था
11. गर्मी में गर्म पेय ठंडक पहुंचा सकते हैं!
12. पुरातात्विक अध्ययनों में नए जेंडर नज़रिए की ज़रुरत
13. मध्यकालीन प्रसव-पट्टे के उपयोग के प्रमाण
14. प्लास्टिक का कचरा और नही प्लास्टिक अर्थव्यवस्था सोमेश केलकर
15. पर्यावरण अनुकूल प्लास्टिक बनाने का प्रयास
16. पीपीई किट से जन्मी नई समस्या सुदर्शन सोलंकी
17. आर्सेनिक विषाक्तता को कम करने के उपाय
18. सटीक और भरोसेमंद खबर के लिए इनाम तो बनता है
19. हाथी दांत से अफ्रीकी हाथी के वंशजों की कहानी डॉ. विपुल कीर्ति शर्मा
20. भारतीय बाघों में अंत: जनन के खतरे
21. गुबरैला बताएगा स्थानीय निवासियों की पहचान
22. साथ-साथ रहते हुए पक्षी दो प्रजातियों में बंटे

# हाथी दांत से अफ्रीकी हाथी के वंशजों की कहानी

वर्ष 2008 में नामीबिया के तट पर खनन करने वाले मजदूरों ने मिट्टी में दफन एक खजाना खोज निकाला था - एक व्यापारिक पुर्तगाली जहाज़ बोम जीसस। वर्ष 1533 में भारत की यात्रा पर निकला यह जहाज़ दुर्घटनाग्रस्त हो गया था। जहाज़ में सोने-चांदी के सिक्कों के अलावा अन्य मूल्यवान सामग्री भरी थी। लेकिन पुरातत्वविदों और जीव विज्ञानियों की एक टीम के लिए तो बोम जीसस का सबसे कीमती खज़ाना था 100 से अधिक हाथी दांत, जो अफ्रीकी हाथी दांत का अब तक का सबसे बड़ा पुरातात्विक जानकारी का भंडार था।



हाथी दांत का आनुवंशिक और रासायनिक विश्लेषण करने पर हाथियों की उन नस्लों का पता लगा है जो कई अलग-अलग समूहों में पश्चिम अफ्रीका में सदियों पूर्व विचरण करते थे। करंट बायोलॉजी में प्रकाशित शोध पत्र के अनुसार वैज्ञानिकों का मानना है कि यह अध्ययन अफ्रीका के हाथियों की 500 वर्ष पुरानी आबादी और हाथी दांत व्यापार सम्बंधी बहुमूल्य जानकारी दे रहा है।

लगभग 500 वर्षों तक समुद्र की तलछट में दबे रहने के बावजूद हाथी दांत अविश्वसनीय रूप से अच्छी तरह से संरक्षित थे। जब जहाज़ समुद्र में डूबा तो डिब्बों में हाथी दांत के ऊपर जमी तांबे और सीसे की सिल्लियों ने हाथी दांतों को समुद्र में नीचे धकेल दिया और वे मिट्टी में धंस कर नष्ट होने से बच गए। यह भी अनुमान है कि अटलांटिक के इस क्षेत्र से ठंडा महासागरीय प्रवाह भी चलता है, जिसने डीएनए के संरक्षण में मदद की होगी।

44 हाथी दांत के डीएनए के अध्ययन में पाया गया कि ये हाथी दांत घास के मैदानों की प्रजाति (लोक्सोडोंटा अफ्रीकाना) की बजाय अफ्रीकी जंगली हाथियों (लोक्सोडोंटा साइक्लोटिस) के थे।

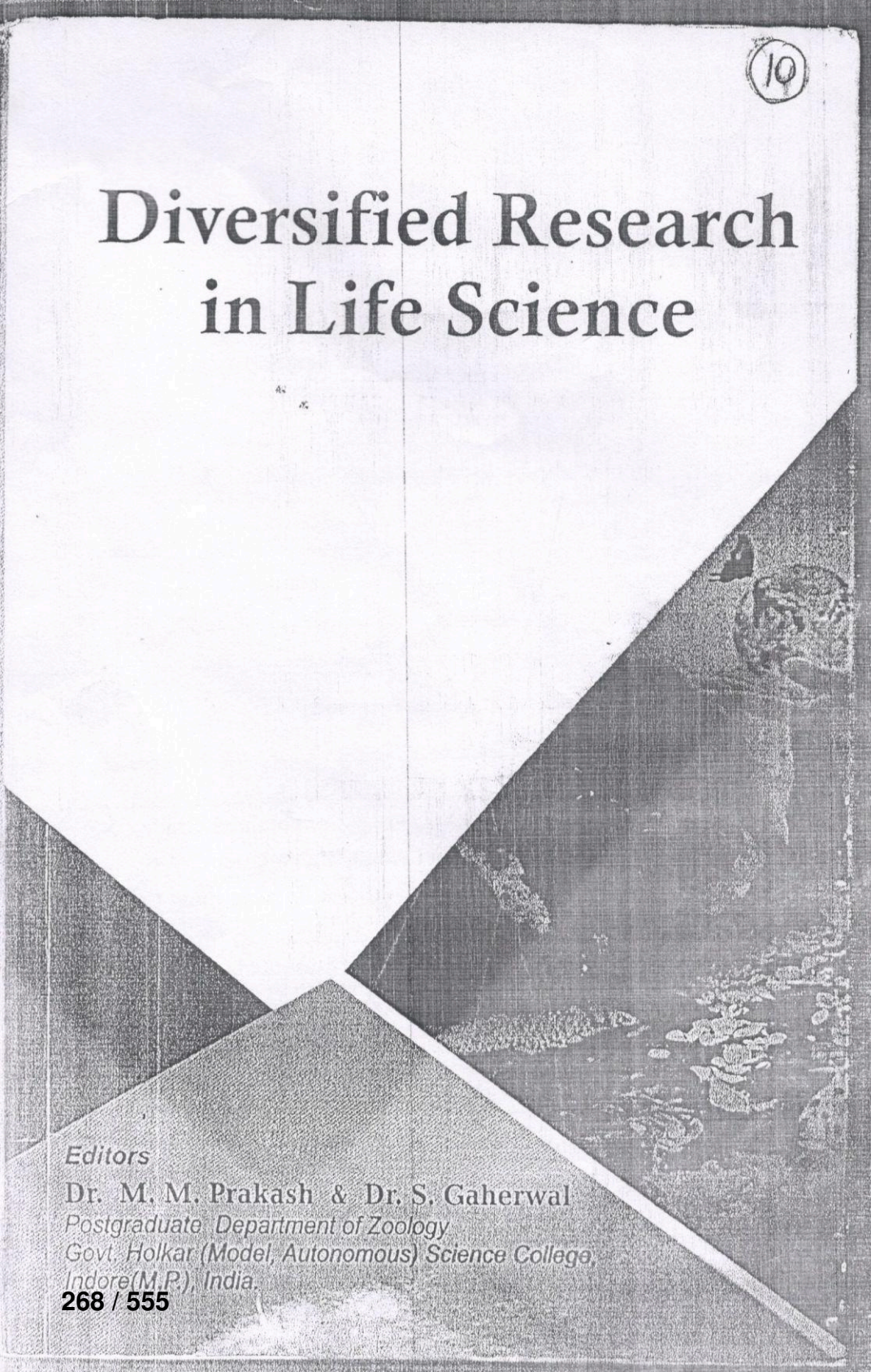
पहले से ज्ञात आबादियों के डीएनए से तुलना करके टीम ने निर्धारित किया कि बोम जीसस से प्राप्त हाथी दांत पश्चिम अफ्रीका में कम से कम 17 अलग-अलग आनुवंशिक समूहों के हाथियों के थे, जिनमें से केवल चार वर्तमान में मौजूद हैं। हाथी दांत में पाए गए कार्बन और नाइट्रोजन के समस्थानिकों ने इन हाथियों के आवास के बारे में अधिक जानकारी उपलब्ध कराई है।

भोजन और पानी के माध्यम से कार्बन और नाइट्रोजन ताउम्र हाथी दांत में जमा होते रहते हैं। कार्बन और नाइट्रोजन के विभिन्न समस्थानिकों की सापेक्ष मात्रा इस बात का संकेत है कि किसी हाथी ने अपना अधिकांश समय किसी वर्षा-वन में बिताया है या किसी शुष्क घास के मैदान में। बोम जीसस के हाथी दांत के समस्थानिकों से पता चला कि ये हाथी जंगलों और घास के मैदानों के मिश्रित प्रकार के आवास में रहते थे।

परंतु वैज्ञानिक शोध परिणाम से बहुत हैरान थे क्योंकि उनका अनुमान था कि वनों में रहने वाले हाथी 20वीं सदी में पहली बार जंगल से घास के मैदानों

(19)

# Diversified Research in Life Science



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268 / 555



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**Chapter-2**

# COMPARATIVE STUDY OF WORM RECOVERY IN NEMATOSPIROIDES DUBIUS INFECTED MICE TRETATED WITH DOSE CONCENTRATIONS OF DORAMECTIN AND IVERMECTIN

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***Abstract***

*Helminth infection is a main health problem of grazing livestock. Chemotherapy is most widely used method to control the nematodes. Synthetic drug Doramectin and Ivermectin possessed antiparasitic activity. The present study was to investigate the worm recovery in the infected experimental mice were exposed with 100□g/kg (ITDC1), 150□g/kg (ITDC2) and 200 □g/kg (ITDC3) dose concentrations of Doramectin respectively. Similarly, the worm recovery in the infected experimental mice was exposed with 150□g/kg (ITIC1), 200□g/kg (ITIC2) and 250 □g/kg (ITIC3) dose concentrations of Ivermectin respectively. The worm recovery efficacy were found minimum (37.48% and 50.21%) in ITDC1 and maximum (100%) in ITDC3at larval and adult stage respectively with Doramectin dose. The order of efficacy was ITDC3>ITDC1. The worm recovery efficacy with Ivermectin dose were observed minimum (21.49% and 39.48%) in ITIC1 and maximum (98.22% and 100%) in ITIC3 at larval and adult stage respectively. The order of efficacy was ITIC3>ITIC1. It was also observed that there was drug Doramectin is more effective in comparison to the drug Ivermectin in inhibiting the growth of pathogens understudy.*

**Key words:** *Nematospiroides dubius,* worm recovery, Doramectin, Ivermectin, Chemotherapy

**********

**Introduction**

Infections by gastrointestinal (GI) helminth parasites of livestock are among the most common and economically important diseases of grazing livestock (Perry *et al*., 2002). Helminth Infection is an important factor in the health productivity of livestock throughout the world (Githiori *et al.,* 2006; Bizimenyera *et al*., 2008). *Nematospiroides dubius* is a Trichostrongyloid nematode. Adults of *N. dubius* are spirally coiled, found attached to duodenal mucosa; eggs are fully embryonated when evacuated with faeces and hatch at 20-30ºc. The lack of a specific remedy for trichostrongylide infection has evoked a certain amount of speculation regarding the type of drug that would best suit the clinical needs. Only a few of the available anthelmintic agents fulfill requirements of an ideal drug. Their nematicidal activity is variable and nearly all have sideeffects.

The most widely used method for control of nematode parasites has been the use of chemical anthelmintics both as a preventative or curative treatment. However, the evolution of resistance in helminth parasites against these anthelmintics has posed a great threat to successful use of these chemical agents in farm animals (Sangster, 1999; Miller and Horohov, 2006). Anthelmintic resistance affects the nematodes of many host species though primarily small ruminants and all three classes of commercially available broad spectrum anthelmintic (Borgsteede *et al.,* 2007).

Modern broad-spectrum anthelmintics are active in three classes of compounds. These are the Benzimidazoles (BZ), Imidazothiazoles and the Macro cyclic lactones. The Benzimidazoles are a relatively old group and include Thiabendazole, Albendazole, Fenbendazole and oxfendazole.The group of Imidazothiazoles includes three common products i.e., Levamisole, Morantel citrate and Pyrantel. The newest group of compound is the macrocyclic lactones which include Doramectin, Ivermectin, and Moxidectin. The BZ acts

by binding to the nematode tubulin inhibiting the formation of microtubules within the intestinal cells. This binding interferes with nutrient absorption by the parasite and leads to starvation (Barragry, 1984a and 1984b).Current estimates suggest that 90-100% of small ruminants and horses have benzimidazoleresistance.

Doramectin (Garg *et al*., 2007 and Compbell, 2007) is the most recent synthetic drug that possessed antiparasitic activity. Doramectin was produced in the Pfizer laboratories as a result of induced mutation of *S.avermitilis*. After mutation, the actinomylete produced a range of avermectins, one of which was doramectin. After treatment, infective nematode larvae have been failed to establish infection in host for prolonged periods. The pharmacokinetic property of doramectin is characterized by a large area under plasma concentration Vs time curve (AUC) and thus a longer mean residual time allowing prolonged contact between drug and parasites.

Ivermectin has been used for more than 15 years as the treatment of choice for human Onchocerciasis, particularly in Africa as an integral part of the Onchocerciasis Control Programme (OCP). Ivermectin is known to paralyze the somatic musculature of larvae and adults of parasitic namatodes and also to inhibit feeding in adults at physiologically relevant concentrations. Of these effects feeding is more sensitive target. Schnieder *et al.,* (1996) reported that protective immunity was developed against gastrointestinal nematode and lung-worm infection after use of ivermectin. Chemotherapy with ivermectin (Fisher and Jacobes, 1995 and Claerebout *et al.,* 1999) and doramectin (Saeki *et al.,* 1997) was also found to provide protective immunity against nematode infections in cattle.

**Materials and Methods**

**Experimental Animals:**

The *Swiss* albino mouse, *Mus musculus aibinus* was selected as an experimental animal for the present investigations. The mice were obtained from the College of Veterinary Science and Animal

Husbandry, Mhow (M. P.) and were kept in the animal house under local conditions of light, temperature, ventilation and food. Female mice of 6–8 weeks old and 15–25 gm. in weight were used according to the need of the experimental design.

**Maintenance of *N. dubius* strain in mice:** The *N. dubius* strain was originally obtained from Department of Zoology, Govt. H.S.C., Indore (M.P.) and was maintained in the Helminthes lab by infecting fresh batches of mice with 300 larvae / mouse after every three months . Third stage infective filariform larvae were obtained by the petridish method of Van Zandit (1961) in this laboratory. Faecal pallets from infected mice were collected on a damp filter paper. Two pieces of Whatman filter paper no. 40 were placed in sterilized culture Petri-dished with the pallets placed in the centre and covered with thoroughly washed activated charcoal (carbon grade,cc /8-16 granular, patco chemical industries , Bharoch ).The mixture was kept moist by 0.5 % saline, aerated during the entire culture period daily for 30 minutes and incubated at 21– 30 ºc for about 6 days by the end of which larvae were flushed out into a jar containing distilled water . Residue was allowed to settle for sometime; the supernatant was discarded in distilled water and stored incold.

**Preparation of inoculums for infection:** A larval suspension of about 100 ml. was prepared in a glass stoppered measuring cylinder of 100 ml. capacity. The numbers of actively motile larvae were counted by the dilution method of Scott (1928). After vigorous shaking 1 ml. of the suspension was pipetted out and transferred on to several glass slides (with squares already made on their reverse with a glass marking pencil) and the larvae in all squares were carefully counted under a dissecting microscope(100x). Several such counts were repeated and the average count in 1 ml. was multiplied by the total volume to get the total number of the larvae. An inoculum containing the desired number of actively motile larvae was orally inoculated directly with the desired number of larvae (300) by 1 ml. syringe having a blunt 18 gauge feeding needle. After inoculation mice were

kept in cages in groups of six and labelled according to the design of experiments and were fed routinely with the same standarddiet.

**Larval Recovery:** Larvae from gastrointestinal tract on 5$^{th}$ day post infection were isolated according to the method of Soh (1958). At necropsy, stomach and small intestine (anterior, middle and posterior regions) were cut separately into small pieces, finally minced and placed in surgical gauge cones which were tied and kept into suitable beakers containing artificial gastric juice pepsin 5.0 gm., NaCl 8.5 gm., HCl 7.0 ml in 1000ml distilled water at 37ºC for 3 hours. After digestion, the contents of the beakers were transferred to Baermann's apparatus separately for 18 hours. Sediment containing the larvae from each funnel of the apparatus was taken into tubes and allowed to settle for 4 hours. The supernatant was discarded and aliquots of 1 ml of the sediment were pipetted and spread on large glass slides, finally larvae were counted under the dissecting microscope 100x.

**Adult Worm Recovery:** The adult mature worms were obtained from the gastrointestinal tract on day 16$^{th}$ of post infection (p.i). The entire gut was cut into various regions i.e. anterior, middle and posterior of the small intestine. After dissection, gut was open and worms were separated and counted under a binocularmicroscope.

**Test Drugs Detail**

Synthetic (**Doramectin and Ivermectin) drugs** were used.

**Doramectin (Pfizer, Inc.)**

**Generic name**: Doramectin 1% injectable solution.

**Trade name**: Dectomax R injectable solution.

Effect of supplement: New claims for persistent control of gastrointestinal roundworms and lungworms in cattle.

**Dosage**

A. **Dose Form**:
DECTOMAX injectable solution is a sterile 1% solution containing 10 mg Doramectin /ml.

B. **Route of administration** :
DECTOMAX injectable solution may be administered subcutaneous orintramuscular.

C. **ApprovedDosage**:

Doramectinisformulatedtodelivertherecommendeddosage(200 mcg/kg of body weight) when given by subcutaneous (SC) or intramuscular (IM) injection at the rate of 1 mL/110 lb of body weight.

**Activity**

Acaricides (avermectin acaricides), Insecticides (avermectin insecticides)

**Ivermectin**

Ivermectin is the 22, 23-dihydro derivative of avermectin B1, a macrocyclic lactone produced as fermentation product by *Streptomyces avermitilis*, a soil *actinomycete*. Ivermectin 1.0% w/v sterile solution derived from the avermectins is a family of highly active, broad - spectrum antiparasitic agents. It is the breakthrough injectable parasiticide for cattle and sheep. Discovered and developed by scientists from Merck, Sharp and Dohme Research Laboratories.

**Anthelmintic Action**

Ivermectin paralyses and ultimately kills the parasitic nematodes, arachnids and insects by a unique effect on the nervous system. At therapeutic doses, it is well tolerated by cattle and sheep since it does not readily penetrate the central nervous system. It is structurally unrelated to any of the presently available parasiticides.

**Absorption, Fate and Excretion**

The drug is absorbed rapidly on oral administration. Faecal excretion is the major pathway of drug elimination (a very small amount excreted in the urine).

**Toxicity and Side Effects**

The drug has a wide safety margin. Side effects include ataxia, bradypnoea and tremors.

## Results and Discussion

**Table -1 : Worm recovery in *N. dubius* post infected mice treated with different dose concentrations of Doramectin**

| GROUP NO. | GROUP OF EXPERIMENTS | LARVAL RECOVERY ON 5th DAY OF POST INFECTION | | | ADULT WARM RECOVERYON 16th DAY OF POST INFECTION | | |
|---|---|---|---|---|---|---|---|
| | | Mean Recovery ±S.E.M. | % Infection | % Efficacy | Mean Recovery ±S.E.M. | % Infection | % Efficacy |
| 1 | INTC | 112.6 ±1.96 | 37.53 | – | 96.0 ±1.34 | 32.00 | – |
| 2 | 100µg/kg ITDC1 | 70.4 ±1.44 | 23.47 | 37.48 | 47.8 ±1.23 | 15.93 | 50.21 |
| 3 | 150µg/kg ITDC2 | 55.0 ±1.83 | 18.33 | 51.15 | 21.5 ±1.48 | 7.17 | 77.6 |
| 4 | 200µg/kg ITDC3 | 0.0 ± 0.00 | 0.0 | 100.0 | 0.0 ± 0.00 | 0.0 | 100.0 |

INTC ------ Infected Non TreatedControl

ITDC1-3-- Infection Treated With Doramectin Concentration S.E.M ---------- Standard Error ofMean

**Table -2: Statistical comparison of worm recovery in *N. dubius* post infected mice treated with different dose concentrations of Doramectin**

't' values are obtained from the data given in Table : 01

| GroupNo. | Group Comparison | 't' value of larval recovery on 5th day PI | 't' value of adult worm recovery on 16th day PI |
|---|---|---|---|
| 1 | 1 vs 2 | 19.399 | 29.740 |
| 2 | 1 vs 3 | 24.016 | 41.790 |

| | | | |
|---|---|---|---|
| 3 | 1 vs 4 | 64.23 | 80.398 |
| 4 | 2 vs 3 | 7.394 | 15.305 |
| 5 | 2 vs 4 | 54.659 | 43.626 |
| 6 | 3 vs 4 | 33.602 | 16.242 |

Standard ' t' table value at 5% level with 8 d.f. is 2.306

* Denotes insignificant 't' value PI - Post Infection

**Fig. 1: Showing worm recovery in *N. dubius* post infected mice treated with different dose concentrations of Doramectin**

**Data have been expressed as mean ± SEM (P <0.05 )**

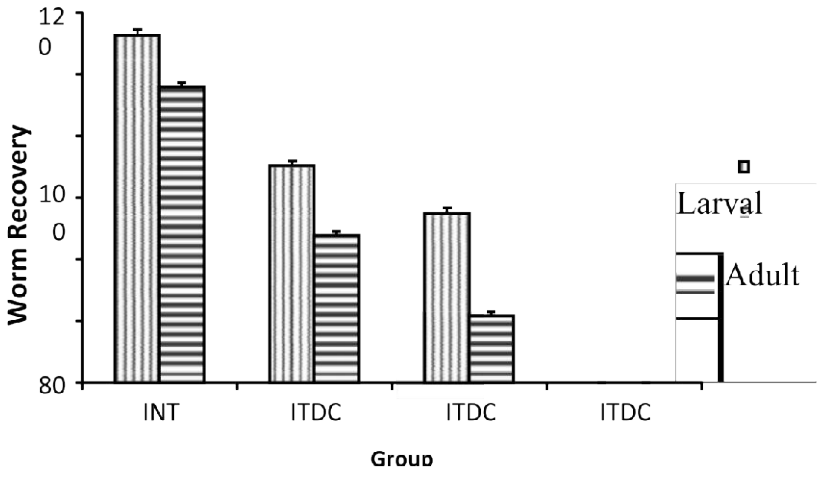


**Table -3: Worm recovery in *N. dubius* post infected mice treated with different dose concentrations of Ivermectin**

| GROUP NO. | GROUP OF EXPERIMENTS | LARVAL RECOVERY ON 5th DAY OF POST INFECTION | | | ADULT WARM RECOVERY ON 16th DAY OF POST INFECTION | | |
|---|---|---|---|---|---|---|---|
| | | Mean Recovery ±S.E.M. | % Infection | % Efficacy | Mean Recovery ±S.E.M. | % Infection | % Efficacy |
| 1 | INTC | 112.6 ±1.96 | 37.53 | – | 96.0 ±1.34 | 32.00 | – |
| 2 | 150 µg/kg ITIC1 | 88.4 ±1.06 | 29.47 | 21.49 | 58.1 ±1.23 | 19.37 | 39.48 |
| 3 | 200 µg/kg ITIC2 | 45.0 ±1.93 | 15.0 | 60.04 | 35.6 ±1.48 | 11.87 | 62.92 |
| 4 | 250 µg/kg ITIC3 | 2.0 ± 0.15 | 0.67 | 98.22 | 0.0 ± 0.00 | 0.00 | 100.0 |

INTC ----- Infected Non TreatedControl

ITIC1-3 --Infection Treated With IvermectinConcentration

S.E.M-----Standard Error ofMean

**Table -4: Statistical comparison of worm recovery in *N. dubius* post infected mice treated with different dose concentrations of Ivermectin**

't' values are obtained from the data given in Table : 03

| Group No. | Group Comparison | 't' value of larval recovery on 5th day PI | 't' value of adult worm recovery on 16th day PI |
|---|---|---|---|
| 1 | 1 vs 2 | 12.155 | 26.044 |
| 2 | 1 vs 3 | 27.476 | 35.368 |

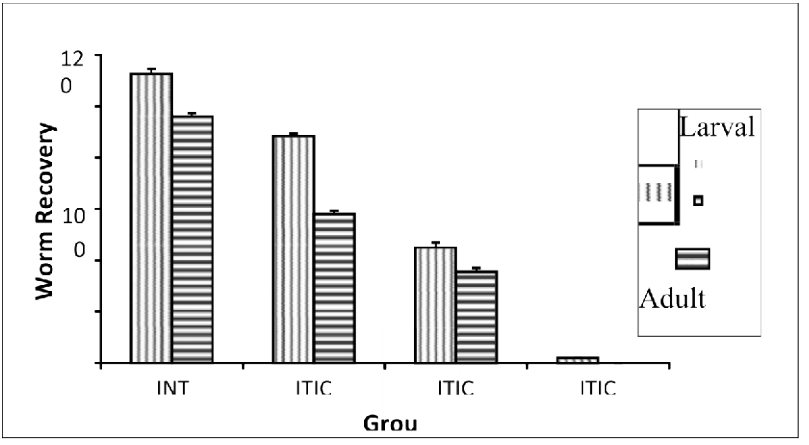
| | | | |
|---|---|---|---|
| 3 | 1 vs 4 | 62.917 | 80.398 |
| 4 | 2 vs 3 | 22.061 | 15.23 |
| 5 | 2 vs 4 | 90.709 | 69.847 |
| 6 | 3 vs 4 | 24.841 | 29.159 |

Standard ' t' table value at 5% level with 8 d.f. is 2.306

* Denotes insignificant 't' value PI - Post Infection

**Fig. 2: Showing worm recovery in *N. dubius* post infected mice treated with different dose concentrations of Ivermectin**

**Data have been expressed as mean ± SEM (P < 0.05)**




In the study infected mice were treated with different dose concentration of doramectin. It showed the maximum 100% efficacy in worm recovery both at larval (5th day of p.i.) and adult (16th day of p.i.) stage in ITDC3. Therapeutic as well as protective efficacy of Doramectin was also demonstrated by Fischer and Jacobes (1995). Hooke *et al*. (1997) studied the influence of Doramectin on protective immunity to nematodes in cattle.

Ivermectin is highly effective in reducing the numbers of *H. polygyrus* in mice. The anthelmintic efficacy of ivermectin against gastrointestinal nematodes in cattle was observed as a significant reduction in infections (Barth *et al*., 1997; Taylor *et al*., 1997; Allerton *et al*., 1998; Costa *et al*., 1998; Eysker *et al*., 1998; Quterbridge and Taylor, 1998; Rehbein *et al*., 1998). Schnieder *et al*. (1996) reported that protective immunity was developed against gastrointestinal nematode and lung-worm infection after use of ivermectin. In the present study when mice treated with ivermectin, the efficacy of larval and adult worm recovery was maximum in ITIC3, which support the finding of previous workers.

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**Chapter-3**

# TOXICOLOGICAL IMPACTS OF ARSENIC TRIOXIDE EXPOSURE ON HAEMATOLOGICAL AND BIOCHEMICAL PROFILE IN CATFISH, CLARIAS BATRACHUS

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***Abstract***

*In modern age, Arsenic is a major environmental pollutant and its exposure occurs through agricultural, environmental, medicinal and occupational sources. Arsenic is a widespread ubiquitous toxicant in the world and its toxicity in inorganic forms being referred more toxic than the organic form. The impact of toxicity of arsenic trioxide on certain haematological and biochemical parameters (SGPT and SGOT) of the catfish, Clarias batrachus has been analysed following exposure of lethal concentration ($LC_{50}$ value-84 mg/l) of arsenic trioxide for 24, 48, 72 and 96 hours. The 50 fishes were selected for haematological and biochemical studies and blood samples collected from cardiac puncture for the next 96 hours in the regular interval of 24 hours. The result indicates that the RBC, Hb, Platelets, PCV, MCV and MCH value were decreased, fluctuation in differential leucocytes count and increased in the number of WBC, value of serum glutamate oxaloacetate transaminase (SGOT) and serum glutamate pyruvate transaminase (SGPT) were observed in both control and arsenic trioxide exposed catfish. The level of SGOT and SGPT in experimental group were significantly increased during the exposure of arsenic trioxide. The haemopoietic cells and their activities were decreased due to arsenic contamination. The higher number of white blood cell counts present some abnormalities may be due to physical stress, damage or infection in body tissues and leukaemia also. In biochemical study, SGPT and SGOT are extremely specific indices of hepato-cellular injury. These enzymes exhibit two*

*types of response i.e., initially the SGPT and SGOT level increases as a protective response against toxicity and stress by increasing the rate of metabolism. The investigation indicates that arsenic trioxide exposure may affect the haematological and biochemical profiles.*

**Keywords:** Arsenic trioxide, *Clarias batrachus*, RBC, WBC, SGPT and SGOT.

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## Introduction

The heavy metals are toxic substance when relatively dense metalloid. Heavy metal toxicity define as an overabundance of required amount or it is unwanted which were found naturally on earth, and still concentrated as a result of anthropogenic activities, entering in the animal, plant and human tissues via inhalation, diet and handling and interfere with the working of vital cellular components (Asati *et al.,* 2016; Pichhode and Nikhil, 2015). Arsenic trioxide ($As_2O_3$) is an effective compound in India which is contaminated with arsenic (List, 2002).

Arsenic trioxide bio accumulates in various organs like tissue, kidney, liver etc. Blood parameters have been widely employed as patho physiological indicators to diagnose the structural and functional status of fishes exposed to a variety of toxicants (Adhikari *et al.,* 2004). Haematological report like red blood corpuscles (RBC), haemoglobin (Hb), white blood corpuscles (WBC), differential leucocyte count (DLC), packed cell volume (PCV), mean corpuscular haemoglobin (MCH) and mean corpuscular volume (MCV) have regularly been used to assess the toxicity of arsenic trioxide in blood as well as an indicator of metal pollution in aquatic environment (Shah and Altindag, 2004).The analysis of serum biochemical parameters especially useful to identify target organs of toxicity as well as the general health status of animals, and is advocated to provide early signs of critical modifications in stressed organisms (Folmar, 1993; Jacobson-Kram and Keller, 2001). Hence, the present investigation aimed to study the changes due to arsenic trioxide

exposure in haematological and biochemical parameters of the blood of host exposed *Clarias batrachus*.

## Material and Methods

### Experimental Animal

The healthy catfish *Clarias batrachus* were used as an experimental animal and it was collected from local fish market of Indore and acclimatized in the laboratory for one week.

### Test Chemical

The analytical grade arsenic trioxide ($As_2O_3$) (CAS No.: 1327- 53-3) (Anhydrous) of 98% purity was taken from Spectrum chemical mfg. corp., Mumbai, India and was used without further purification for the experiment.

### Determination of Lethal Concentration of Arsenic trioxide

The lethal concentration ($LC_{50}$) was calculated (24 hrs.) with method given by Kumari *et al.* 2017.

### Collection of Blood Sample

The blood collected by disposable syringe and needles from cardiac puncture of *Clarias batrachus* and kept in sterilized appropriate vials then processed for various biochemical analyses (Dacie and Lewis, 1975).

### Experimental Design and Duration

In the present investigation experimental fishes were divided into two groups i.e. control and arsenic trioxide treated group. Ten (10) fishes were kept in control group and exposed to normal water and in experimental group forty (40) fishes were exposed to concentration of arsenic trioxide at different time intervals. In both control and experimental group fishes were exposed to maximum 96 hours.

**Haematological Analysis**

RBC, WBC, platelets, PCV, MCV and MCH were counted by Haemocytometer method (Sharma and Singh, 2000). Hb concentrations were estimated by Sahil's method (Ratan, 1978), differential leucocyte count by Leishmann method (Rumke, 1960).

**Biochemical Analysis (Estimation of SGOT and SGPT)**

The activity of serum glutamate oxaloacetate transaminase (SGOT) and serum glutamate pyruvate transaminase (SGPT)were determined by adopting the method of Boyer (2000). The activities of SGOT and SGPT were expressed as μmole/l.

**Results**

**Haematological Estimation**

In control group haematological values were, RBC (3.53 million/cmm), total WBC (106.80 $x10^3$/cmm), Hb (10.64 g/dl), Neutrophils (2.18%), Eosinophils (5.32%), Lymphocytes (93.12%), Basophils (0.82%), Monocytes (6.00%), Platelets (162 cells/cmm), PCV (33.36%), MCV (126.20 fl) and MCH (38.64 pg).

Haematological values in Arsenic trioxide (84 mg/l) exposed fishes were at the 24 hrs. RBC (3.39 million/cmm), total WBC (122.43 $x10^3$/cmm), Hb (10.32 g/dl), Neutrophils (3.06%), Eosinophils (4.84%), Lymphocytes (94.82%), Basophils (0.78%), Monocytes (6.70%), Platletes (141.20 cells/cmm), PCV (32.72%), MCV (128.40 fl) and MCH (37.80 pg).

Moreover, in the present investigation at the 48 hrs. haematological values were RBC (2.71 million/cmm), total WBC (126.64 $x10^3$/cmm), Hb (9.96 g/dl), Neutrophils (3.40%), Eosinophils (4.74%), Lymphocytes (96.10%), Basophils (0.78%), Monocytes (7.14%), Platletes (134.60 cells/cmm) , PCV (30.48%) , MCV (120.4 fl ) and MCH (36.34 pg).

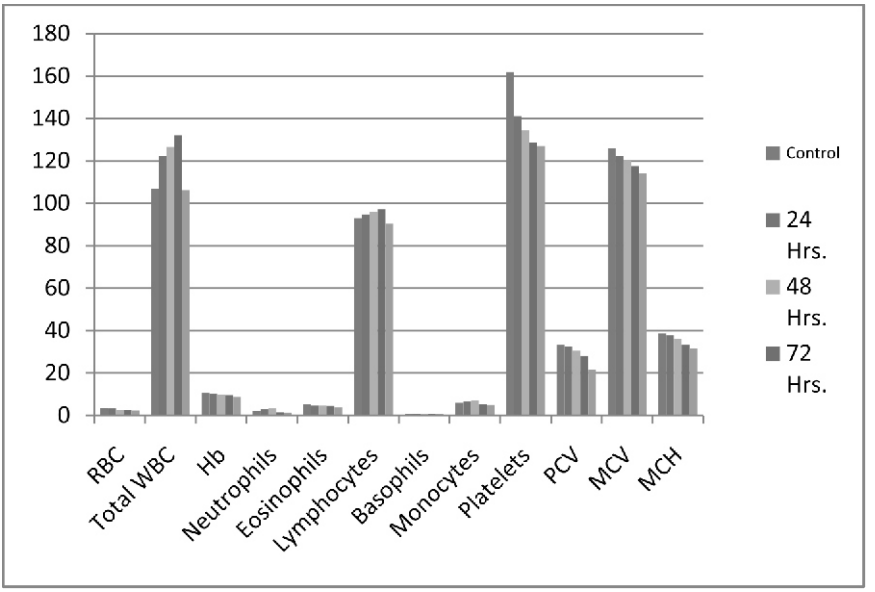
In the present experiment at the 72 hrs. haematological values were RBC (2.58 million/cmm), total WBC (132.18 x$10^3$/cmm), Hb (9.60 g/dl), Neutrophils (1.42%), Eosinophils (4.66%), Lymphocytes (97.44%), Basophils (0.76%), Monocytes (5.28%), Platelets (128.80 cells/cmm) , PCV (28.18%), MCV (117.60 fl) and MCH (33.32 pg).

– In the present investigation at the 96 hrs. haematological values were RBC (2.37 million/cmm), total WBC (106.50 x$10^3$/cmm), Hb (8.68 g/dl), Neutrophils (1.28%), Eosinophils (3.92%), Lymphocytes (90.42%), Basophils (0.72%), Monocytes (4.92%), Platelets (127.20 cells/cmm) , PCV (21.80%), MCV (114.20 fl) and MCH (31.50 pg).

The experimental investigation showed that due to effect of arsenic trioxide RBC, Hb, Eosinophils, Basophils, Platelets, PCV, MCV and MCH value were decreased as compared to control value at 24, 48, 72 and 96 hours. Total WBC, Neutrophils, Lymphocytes values were increased at 24, 48, 72 hours and then decreased at 96 hours. Monocytes were also increased at 24 and 48 hours and then decreased at 72 and 96 hours as compared to control value.The effect and variation on haematological values of control and arsenic trioxide treated fish were represented by graph.

**Graph 1: Showing haematological changes in *Clarias batrachus* due to arsenic trioxide**

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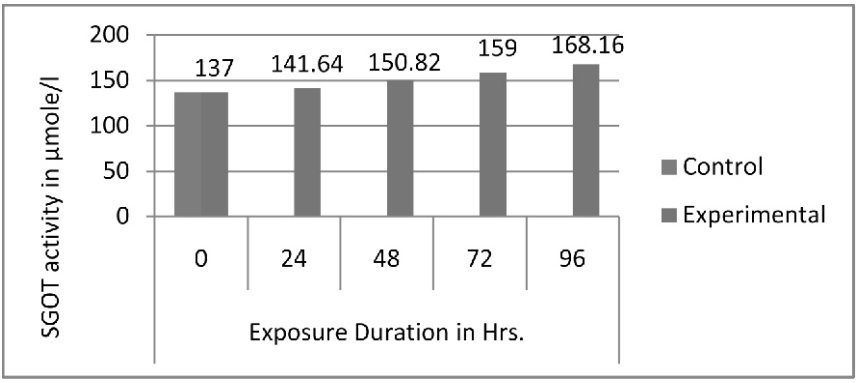

**Biochemical Estimation**

The biochemical parameters selected were SGOT (serum glutamate oxaloacetate transaminase) and SGPT (serum glutamate pyruvate transaminase). There values in control fishes were 137.00 µmole/l and 42.42 µmole/l respectively.

**Serum Glutamate Oxaloacetate Transaminase Activity (SGOT) of Arsenic Trioxide Treated Group**

The SGOT activity was found increased as the duration of exposure of arsenic trioxide increased. The increased SGOT activity after 24, 48, 72 and 96 hrs.of exposure of arsenic trioxide was 141.64, 150.82, 159.00 and 168.16 µmole/l respectively.

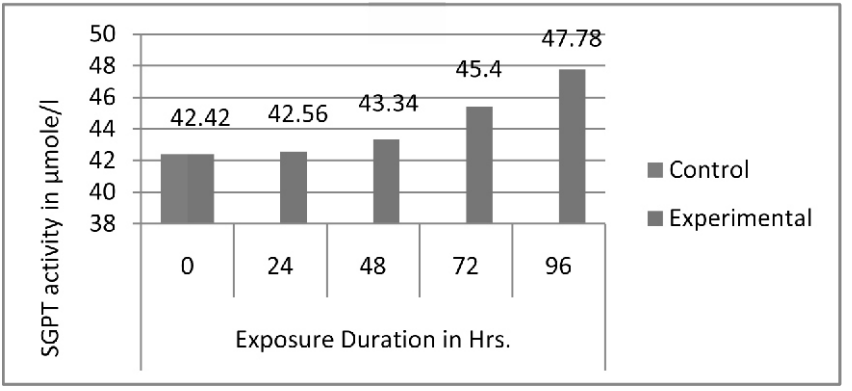
**Graph 2: Showing SGOT activity of *C. batrachus* exposed to arsenic trioxide for different duration**




**Serum Glutamate Pyruvate Transaminase Activity (SGPT) of Arsenic Trioxide Treated Group**

The SGPT activity was also found increased as the duration of exposure of arsenic trioxide increased. The increased SGPT activity after 24, 48, 72 and 96 hrs.of exposure of arsenic trioxide was 42.56, 43.34, 45.40 and 47.78 µmole/l respectively.

**Graph 3: Showing SGPT activity of *C. batrachus* exposed to arsenic trioxide (84 mg/l) for different duration**



**Discussion**

The basic function of WBC is regulation of immunological function, maintenance and their increase numbers as a supportive and protective response in fish to stress. High white blood cell count indicates damage due to severe physical stress, infection of body tissues and as well as leukaemia. Leukocytes are involved in the control of immunological activity and the changes in WBC counts after continuous toxicant exposure may express decrease in non-specific immunity in the fish. Mostly increased number of WBC in fish exposed to lethal and chronic doses express Leucocytosis (Sinha *et al.,* 2000). The white blood cell counts were found increased by arsenic trioxide exposure in present experimental investigation. The decreased values of mean corpuscular haemoglobin concentration interpreted as an incapability of the haematopoietic system to produce haemoglobin, with inflammation of the erythrocytes. The abnormalities of MCV and MCHC parameters are indicative of anaemia, when decreased values of MCV known as microcytic anaemia due to effect of arsenic which is validate by decreased values of RBC counts, haemoglobin concentration and packed cell volume. MCV, MCH and PCV were also decreased in number by acute effect of arsenic trioxide in the present investigation (Carvalho and Fernandes, 2006).

The changes in enzyme activities in arsenic trioxide treated fish are due to increased permeability of the cell as well as the direct effect of the compound on the tissues (Roy, 2002). Therefore, substantial depletion of enzymes in the *Clarias batrachus* exposed to arsenic trioxide may be attributed to increased level of arsenic in the tissues. Moreover, the accumulation of arsenic in muscles and liver could be the conceivable reason for variation of enzyme activities. In fishes, liver is the prime location of biotransformation. The liver is responsible for removal of harmful substances in blood with assist of specific enzymes after their metabolic detoxification. SGPT and SGOT are extremely specific indices of hepato-cellular injury. These

enzymes exhibit two types of response i.e., initially the SGPT and SGOT level increases as a protective response against toxicity and stress by increasing the rate of metabolism but for chronic exposure the activity level of these enzymes was found decreased on account of hepato-cellular disturbance (Babu and Jothi Narendiran 2016; Susan *et al.,* 1999).

**Conclusion**

The fishes, which is an important component of aquatic fauna, appears to be susceptible to toxicity of arsenic through gills and intake of arsenic-contaminated food. The result of present study indicates that arsenic is toxic even in small dose. The main source of arsenic in aquatic resource is seems to be arsenic is base pesticide. Hence, authors suggest complete ban or reduction in arsenic based agricultural pesticide. So that the fish farm can be saved from their ill effects.

**Acknowledgement**

The authors are thankful to Dr. M.M.P. Shrivastava, Head, Department of zoology, Govt. Holkar (Model, Autonomous) Science College, Indore, Madhya Pradesh, India for the suggestions, scientific and intellectual supports.

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**Chapter-13**

# EVALUATION OF FOUR SITES OF INDORE CITY (M.P.) IN TERMS OF AVIFAUNAL SPECIES RICHNESS AND TEMPORAL VARIATION

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***Abstract***

*A study was conducted from Jan-Dec 2018 to record the number of individuals of avian fauna observed in Meghdoot Garden, Nehru Park, Lalbagh and Pipliyapala Regional Park. During this study, species richness (D) with respect to seasonal changes was recorded. Highest Species richness was recorded in Regional Park (D = 2.3348) and lowest was observed in Nehru park (D = 1.6160). The maximum numbers of individuals were observed in summer season (Regional Park), followed by 452 in Lalbagh (summer) and least were recorded in Nehru park (277) in Rainy season. The temporal variation was also seen to study the fluctuation in the number of species with the change in seasons. Interestingly, highest number of birds was recorded in the summer season in Regional park (52) and Lalbagh (39). On the other hand, least number of terrestrial avian diversity was recorded in Lalbagh (35) and Nehru Park (30) in rainy season. Thus, the present study pinnacles the activity of bird watching and tourism in these spaces as it generates revenue, which is further used in the maintenance and development. So, these study sites are of great importance in terms of sustentation of avian diversity in the city.*

**Key Words:** Temporal variation, Line transects Indore and Seasonal, Species Richness, Individuals, winter, summer and Rainy.

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**Introduction**

There are several ways by which avian diversity can be protected and enhanced. These following measures can increase species richness. Firstly, maintaining and replanting understory vegetation, removing grazing stock and allowing native grasses and legumes to grow, conserving or preserving mixture of local trees and shrubs. Old trees should be maintained and if this is not viable then nest boxes should be provided. Flowering plants must be grown to attract many species. Fallen trees and plant debris should be allowed to break down naturally and lastly, trees must be grown in larger number having maximum canopy area at the periphery of the desired area where conservation is required (Barrett *et al.,* 1994). Bird species richness is probable to be enhanced by increasing site area and imparting rough grass and water bodies in urban green spaces (Chamberlain et *al.,* 2007). Green spaces and trees confer to a number of environmental functions in urban environments, such as the endurance of urban dwelling species (e.g. bird species). There is a correlation between green space quality (structural and spatial attributes) and the diversity of avian fauna (Sharma and Shukla, 2015). The most important parameters of the bird study are the species richness, their density and diversity (Krebs, 1985). The bird assemblages are affected by various factors like food availability, the size of the wetland and the inorganic changes in the wetland (Lagos *et al.,* 2008). As the seasonal changes proceeds there is increase and decrease in food resources respectively. These changes led to the seasonal and temporal variation in avian diversity. Favorable temperature urges birds for local migration and adding of migratory birds in the area (Joshi and Shrivastava, 2012). As the temperature rises, there is decrease in diversity of birds, but there are few exceptions which include birds like egret because their population increases with increase in temperature, as it becomes easier for them to catch fishes in shallow water (Balapure *et al.,* 2012). The central idea of the proposed study is to find out the species richness and

temporal variation of avian fauna and its diversity in Indore city and to highlight importance of green spaces.

**Materials and Methods**

**Study sites:**All the study sites were confined to the Indore city of Madhya Pradesh.

1. Meghdoot Garden 2. Nehru Park 3. Lal Bagh4. Pipliyapala Regional Park

**Study period:** The study was conducted for a period of one year. The surveys (10 in each season) were conducted in morning and evening in each site respectively.

**Identification aids:** Camera and binoculars were used to locate and count birds with the help of Birds of the Indian Subcontinent by Richard Grimmett, Carol Inskipp and Tim Inskipp (2014).

**Study and survey method:** Point count method was used. In this method the observers sits at different stations within a study site for equal time intervals and records the observed species and its individuals (Bibby, 2000).

**Species Richness:** Species richness (D) was calculated from the following formula:

$$\boldsymbol{D = S \div \sqrt{N}}$$

Where, D is Species Richness; S is the number of species and N is the total number of individuals recorded.

**Results**

In the present study, point count methods adopted for counting the total number of bird species in all three seasons (winter, summer and rainy season) from January – December 2018.

**Species richness in Meghdoot Garden:** In winter season total 341 individuals were observed which belonged to thirty five species out of which Blue rock pigeon were highest and Cattle egret was in least number. In summer season this number increased to 431individuals which belonged to thirty six bird species; in which Blue rock pigeon and Red wattled lapwing were in maximum number

and Thick billed flowerpecker was one in number. In rainy season, 298 individuals of thirty five bird species were recorded out of which Red vented bulbul were maximum in count and White throated fantail flycatcher were least in number (Table 1).

**Species richness in Nehru Park:** In winter season total 324 individuals were observed which belonged to thirty species out of which Blue rock pigeon number were highest and Jungle crow was in least number. In summer season this number increased to 417 individuals who belonged to thirty three bird species; in which Red wattled lapwing were in maximum number and Siberian stonechat was least in number. In rainy season, 277 individuals of thirty one bird species were recorded out of which Rose ringed parakeets were highest in count and Shikra was least in number (Table 1).

**Species richness in Lalbagh:** In winter season total 352 individuals were observed which belonged to thirty five species out of which Blue rock pigeon number were highest and Jungle crow was in least number. In summer season this number increased to 452 individuals who belonged to thirty nine bird species; in which Blue rock pigeon and Red wattled lapwing were in maximum number and Small minivet was one in number. In rainy season, 301 individuals of forty four bird species were recorded out of which Rose ringed parakeet were maximum in count and Coppersmith barbet were least in number (Table 1).

**Species richness in Pipliyapala Regional Park:** In winter season total 370 individuals were observed which belonged to forty three species out of which Blue rock pigeons were highest in number and Alexandrine parakeet was in least number. In summer season this number increased to 496 individuals who belonged to fifty two bird species; in which Red wattled lapwing were in maximum number and Pied cuckoo was least in number. In rainy season, 327 individuals of forty six bird species were recorded out of which Blue rock pigeon were maximum in count and Shikra was least in number (Table 1).

In the present investigation the minimum numbers of species were observed in Nehru Park (30) in winter season and maximum

species were recorded in Pipliyapala Regional Park (52). Total 58 species of birds were reported from all the sites collectively.

The Temporal Variation of avian fauna of different study sites (Meghdoot Garden, Nehru Park, Lalbagh and Pipliyapala Regional Park) during January 2018 to December 2018(winter, summer and rainy season) were represented in Table 2.

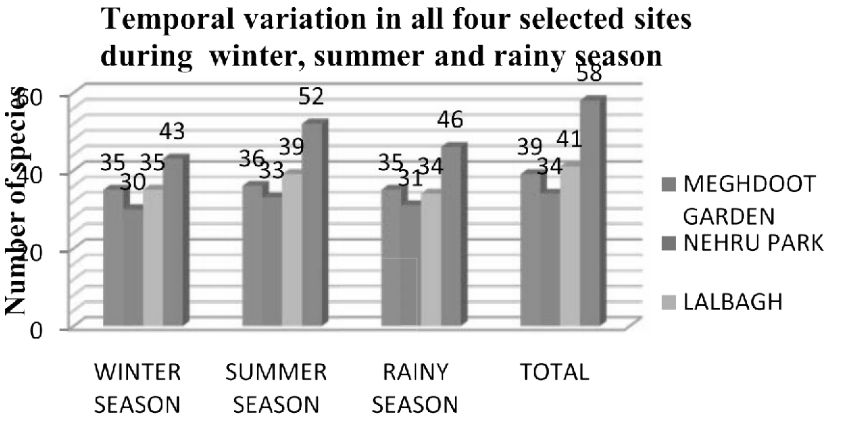
Temporal variation of birds in Meghdoot Garden: A total thirty five species were recorded in the winter season; thirty six species were found in the summer season and thirty five species were found in the Rainy season. Family Columbidae was found dominating in winter season with 3 species; similarly in summer and winter season Columbidae was dominant with 3 species each. Temporal variation of birds in Nehru Park: Thirty species of avian fauna was observed in the winter season; in summer season thirty three species were recorded and thirty one species were observed in rainy season. Family Columbidae, Corvidae and Muscicapidae were dominant with 3 species each in winter season; family Muscicapidae was dominant in summer season with 4 species and lastly, Columbidae, Corvidae and Muscicapidae were dominant with 3 species in the rainy season.

Temporal variation of birds in Lal Bagh: A total thirty five species were recorded in winter season; thirty nine species were observed in summer season and thirty four species were found in rainy season. Only Family Muscicapidae was dominant in winter, summer and rainy season with 5, 5 and 4 species respectively. Temporal variation of birds in Pipliyapala Regional Park: Forty three species were recorded in winter season; fifty two species were found in summer season and forty six species were observed in rainy season. In winter season family Muscicapidae was dominant with 5 species; then in summer season it was again dominant with 6 species and lastly, Accipitridae and Muscicapidae were dominant with 4 species each in the rainy season.

**Table – 1: Season wise Species Richness value (D)**

| | WINTER SEASON | SUMMER SEASON | RAINY SEASON |
|---|---|---|---|
| MEGHDOOT GARDEN | 1.8953 | 1.734 | 2.0275 |
| NEHRU PARK | 1.6666 | 1.616 | 1.8626 |
| LALBAGH | 1.8655 | 1.8344 | 1.9597 |
| REGIONAL PARK | 2.2354 | 2.3348 | 2.5438 |

**Graph – 1: Graphical representation of temporal variation in species count in all three seasons (Species wise) in Meghdoot garden, Nehru Park, Lalbagh and Regional Park during January 2018-December 2018.**




**All three Seasons**

**Discussion**

Species richness is a vital tool in evaluating the importance of green spaces quantitatively (Aouissi *et al.,* 2017). In the present study, the species richness among all four study sites was observed and highest value recorded was 52 (Pipliyapala Regional park) and the lowest was 34 (Nehru park). Interestingly, population of

Blue rock pigeon was highest with frequency of 6 in the overall season wise study. This result is also mentioned in the study of Menon and Mohanraj (2016). On the contrary, they highlighted the successful invasion of House crow in their study but it was least in number in our present study. Tripathi *et al.* (2015) also reported species count of 122 species of birds from Chuhiya forest, district Rewa (M.P.). These results are in agreement with the study of Dapke *et al.* (2015) who observed a species count of 62 terrestrial bird species.

Similarly, we have found fifty eight species collectively in our study sites over a period of one year. Since several other workers have worked on calculating the number of individuals and they also highlighted several conservation efforts in their area. Kanaujia and Kushwaha (2015) worked on the conservation of Long billed vultures in a remote village called Orchha (M.P.). Factors like seasonal and temporal variation also affects species count (Gaur *et al.,* 2019a, b). Our study also pinnacles the urgent need for protection of green spaces in cities so that they can conserve several individuals of bird species. The maximum number of individuals was 496 in Regional Park and minimum were 277 in Nehru Park. So, it can be concluded that these study sites are of great importance in terms of sustentation of avian diversity in the city. Thus, the present study clearly brought out the need for conserving these green spaces in urban cities. Thus, the results of present study are supported by above mentioned authors.

The maximum richness was observed in summer season in Pipliyapala Regional Park (52 species) and lowest count was observed in Nehru park in winter season (30 species). In our study Family Muscicapidae was dominant in Lalbagh and Pipliyapala Regional Park in all the three seasons. Similarly, Muscicapidae was dominant with 4 species in Nehru Park (summer season).Workers like Gaur *et al.* (2019) studied the spatial variation in Indore city and highlighted the importance of such green spaces in this city. Bagde (2015) studied avian diversity in Chhindwara District of Madhya Pradesh and observed around 124 species and concluded that family

Muscicapidae was dominant with 13 species in that area. Moreover, Pejaver *et al.* (2013) published a list of 50 avian species from the Hoshangabad region. Total 262 species and their seasonal sightings were studied by Pasha *et al.* (2004).

In our study Family Accipitridae was dominant with 4 species in rainy season at Regional Park and family Corvidae was dominant with 3 species each at Nehru Park in winter and rainy season. Interestingly, Kushwaha *et al.* (2015) assessed the avian diversity at Tikamgarh district and reported 170 species of 46 families out of which family Accipitridae and Corvidae were dominant with 16 and 13 species respectively. Furthermore, Tiple *et al.* (2010) reported few seasonal species which can be sighted only in winters and summers respectively. These species were 14 in number in their study out of 140 species observed. Therefore in the present study showed that with slight change in temperature (seasonal) the bird's richness vary. Thus, the results of present study corroborate with above mentioned authors.

**Conclusion**

The present study showed that the highest value of species richness was recorded as D= 2.3348 at Pipliyapala Regional Park in Summer Season. This high value of species richness can also be due to a permanent water body adjacent to the Park and this park is also well maintained by the Indore Municipal Corporation. Well maintenance also includes watering all the plant whole year. The lowest value of Species Richness was 1.6160 in Nehru Park in summer season. This may be due to free entry to everyone and very poor maintenance of the Park. Visitors also litter in the park and there is no entry fee in the garden which generates zero revenue for the growth of this public Park. These findings pinnacles the activity of bird watching, conservation, awareness and sustentation of avian diversity especially promoting tourism in these spaces as it generates revenue, which is further used in the maintenance and development.

**Table: 2 – List of all species recorded at all four study sites with seasonal disparity.**

| Scientific Names | Meghdoot Park | Nehru park | Lal bagh | Regional Park | winter | summer | rainy |
|---|---|---|---|---|---|---|---|
| *Pavo cristatus* | Absent | Absent | Absent | Present | Absent | Absent | Present |
| *Columba livia* | Present | Present | Present | Present | Present | Present | Present |
| *Streptopelia chinensis* | Present | Present | Present | Present | Present | Present | Present |
| *Streptopelia senegalensis* | Present | Present | Present | Present | Present | Present | Present |
| *Apus affinis* | Absent | Present | Present | Present | Present | Present | Present |
| *Centropus sinensis* | Present | Absent | Present | Present | Present | Present | Present |
| *Clamator jacobinus* | Absent | Absent | Absent | Present | Present | Present | Absent |
| *Eudynamys scolopaceus* | Present | Present | Present | Present | Present | Present | Present |
| *Ardeola grayii* | Absent | Absent | Absent | Present | Present | Present | Present |
| *Bubulcus ibis* | Present | Present | Absent | Present | Present | Present | Present |
| *Vanellus indicus* | Present | Present | Present | Present | Present | Present | Present |
| *Elanus caeruleus* | Absent | Absent | Present | Present | Absent | Absent | Present |
| *Pernis ptilorhynchus* | Absent | Absent | Absent | Present | Absent | Absent | Present |
| *Accipiter badius* | Present | Present | Absent | Present | Present | Present | Present |
| *Milvus migrans* | Present | Present | Present | Present | Present | Present | Present |
| *Athene brama* | Present | Present | Present | Present | Present | Present | Present |
| *Ocyceros birostris* | Present | Present | Present | Present | Present | Present | Present |
| *Psilopogon haemacephalus* | Present | Present | Present | Present | Present | Present | Present |
| *Merops orientalis* | Present | Present | Present | Present | Present | Absent | Absent |
| *Halcyon smyrnensis* | Present | Present | Present | Present | Present | Present | Present |
| *Psittacula cyanocephala* | Absent | Absent | Absent | Present | Absent | Present | Present |
| *Psittacula eupatria* | Present | Absent | Absent | Present | Present | Absent | Present |
| *Psittacula krameri* | Present | Present | Present | Present | Present | Present | Present |
| *Pericrocotus cinnamomeus* | Present | Absent | Present | Present | Present | Present | Present |
| *Coracina javensis* | Absent | Absent | Present | Present | Absent | Present | Absent |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Oriolus kundoo* | Absent | Present | Present | Present | Absent | Present | Absent |
| *Aegithina tiphia* | Present | Present | Present | Present | Present | Present | Present |
| *Dicrurus macrocercus* | Present | Present | Present | Present | Present | Present | Present |
| *Rhipidura albicollis* | Present | Present | Absent | Present | Present | Present | Present |
| *Dendrocitta vagabunda* | Present | Present | Present | Present | Present | Present | Present |
| *Corvus splendens* | Present | Present | Present | Present | Present | Present | Present |
| *Corvus macrorhynchos* | Absent | Present | Present | Present | Present | Present | Present |
| *Terpsiphone paradisi* | Present | Absent | Absent | Present | Absent | Present | Absent |
| *Dicaeum agile* | Present | Present | Absent | Present | Absent | Present | Present |
| *Leptocoma zeylonica* | Absent | Present | Absent | Present | Absent | Present | Present |
| *Cinnyris asiaticus* | Present | Absent | Present | Present | Present | Present | Present |
| *Euodice malabarica* | Present | Absent | Present | Present | Present | Present | Present |
| *Passer domesticus* | Present | Present | Present | Present | Present | Present | Present |
| *Motacilla maderaspatensis* | Absent | Absent | Present | Present | Absent | Present | Absent |
| *Motacilla alba* | Absent | Absent | Absent | Present | Absent | Present | Absent |
| *Machlolophus xanthogenys* | Present | Absent | Absent | Present | Absent | Absent | Present |
| *Prinia socialis* | Absent | Absent | Present | Present | Present | Present | Present |
| *Orthotomus sutorius* | Present | Present | Present | Present | Present | Present | Present |
| *Hirundo smithii* | Absent | Absent | Present | Present | Absent | Present | Absent |
| *Hirundo rustica* | Present | Absent | Present | Present | Absent | Present | Absent |
| *Ptyonoprogne concolor* | Present | Present | Absent | Present | Present | Present | Present |
| *Pycnonotus cafer* | Present | Present | Present | Present | Present | Present | Present |
| *Phylloscopus trochiloides* | Present | Absent | Absent | Present | Present | Present | Absent |
| *Zosterops palpebrosus* | Present | Absent | Present | Present | Present | Present | Present |
| *Turdoides striata* | Present | Present | Present | Present | Present | Present | Present |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Gracupica contra* | Present | Absent | Present | Present | Present | Present | Present |
| *Acridotheres tristis* | Present | Present | Present | Present | Present | Present | Present |
| *Saxicoloides fulicatus* | Present | Present | Present | Present | Present | Present | Present |
| *Copsychus saularis* | Present | Present | Present | Present | Present | Present | Present |
| *Cyornis tickelliae* | Absent | Absent | Present | Present | Present | Present | Present |
| *Ficedula parva* | Absent | Present | Present | Present | Present | Present | Present |
| *Saxicola maurus* | Absent | Present | Absent | Present | Absent | Present | Absent |
| *Oenanthe fusca* | Absent | Absent | Present | Present | Present | Present | Absent |

(Keys = 'Present' means presence of species & 'Absent' means absence of species)

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Chapter-14

# STUDY OF ICHTHYOFAUNA IN FISH FAUNA IN JETGARH RESERVOIR, BHIKANGAON TEHSIL, KHARGONE DISTRICT (M.P.)

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***Abstract***

*Freshwater fish diversity is poorlystudied. There is no proper documentation on freshwater fish resources of Jetgarh reservoir Bhikangaon tehsil, Khargone district. This study was aims to prepare database of fishes found in Bhikangaon town. Fishes are the unique creature of animal world. It is one of the good source of protein and is able to combat problem of malnutrition. All fishes are useful as food fishes except Ambassis, Puntius and Gambusia, which are useful as ornamental and larvicidal fishes. The species diversity is peak in post monsoon, coinciding with favorable climatic conditions such as sufficient water and food resources. The diversity was low in pre-monsoon probably due to the shrinkage of the water spread of the reservoir. The high value of dissolved oxygen coupled with low biochemical oxygen demand and other nutrient parameters indicate that the water body is moderately oligotrophic in nature. Khargone district is basically a tribal district. This is the first study to catalogue species of fishes found in Jetgarh reservoir Bhikangaon tehsil, Khargone district is situated in M.P. The fish species of the Jetgarh reservoir was studied from June-2015 to May-2016. Total 26 species recorded from sampling station.*

**Key words-** Fish diversity, Commercial Importance, Reservoir.

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## Introduction

The reservoir water is mostly used by local farmers during crop seasons. Although, the reservoir gets replenished from the local nala in monsoon season, the water level fluctuates remarkably from dry to wet seasons. The water level becomes very low during pre-

monsoon and only covers its bottom which is mainly composed of soft substrates like mud, organic debris. In contract, the water level is relatively higher during post-monsoon and reaches up to its dike which is composed of non-soft substrates like boulders, cobbles and stones. Additionally, it is subjected to various humanuse e.g. fishing, grazing, irrigation and foddercollection, domestic use, harvesting of wetland products, recreation and supply of water for irrigation.

Fishes are the important vertebrate group of animal's world contributing to the biodiversity of animals. Primarily fishes are used as a food source. Many vital vitamins and fatty acids are found in fishes so sometimes it is referred by doctors as a good food source .The study of fish and their stability is important because fish population of a water body may varysignificantly from year to year. The fish fauna is an important aspect of fishery potential of a reservoir.

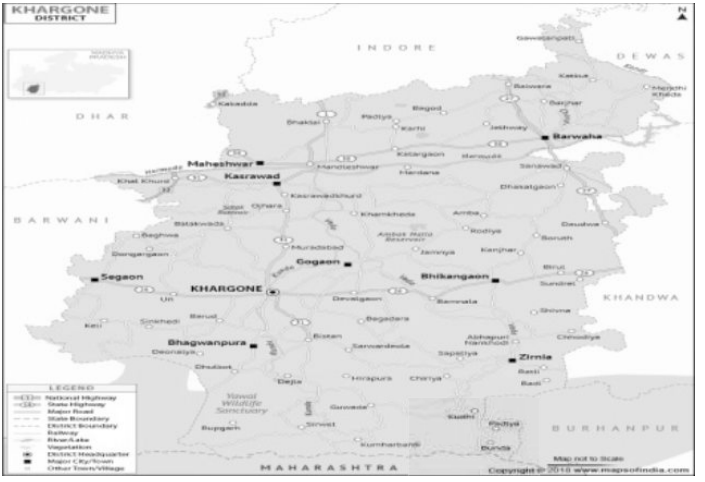



Fig. 1 Map showing Bhikangaon tehsil, Khargone district.



Fig. 2: Satellite Map of Jetgarh Reservoir Bhikangoan District Khargone.

Fishes play an important role, as they are not only useful for food and recreation, but also act as a tool for biological control by feeding upon the planktonic population and aquatic vegetation in the reservoir. They are useful indicators of environmental quality and ecological integrity. More work has beencarried out on fish fauna in different freshwater reservoir during the last few years Freshwater fishes are a poorly studied group since information regarding distribution, population dynamics and threats is incomplete, and most of the information available is from a few well-studied locations only (Zooreach organization 2010; Sabuj Kumar Chaudhuri 2010).

**Material and Methods**

The fishes were collected from Jetgarh reservoir, Bhikangaon tehsil, Khargone district and from local fisherman .Fisherman generally use many types of nets like gill nets, cast net, drag net etc. Fishes were preserved in 10 % formalin solution and identified with the help of standard keys and book. Study period: This study was conducted between June. 2015 - May. 2016. The fishes were identified with the help of Jhingran1982, Day1989, Gopalji, Shrivastava 1992 and Jayaram 1999, the checklist of identified fish species was prepared and presented in table -1and table-2

**Results and Discussion**

The diversity of the fishes mainly depends upon the biotic and abiotic condition, type of the ecosystem, age of the water body, mean depth, water level fluctuations, morph-metric condition and bottom have great implications. The hydro-biological features of the water body also play an effective role in fisheries output to a greater extent.

In present study 26 species were recorded and similar work also done by many workers Arya *et al*., (2001). They have reported the presence of breeding grounds of some species viz., *Ompokbimaculatus* ,*Labeo fimbriatus* , *Labeo calbasu* and major carps in the Indira sagar reservoir stretch, Which are likely to be disappeared due to dam construction. The loss of breeding grounds of these fishes would have a negative impact on the population of these fishes in reservoir area.Venkateshwarlu et al., (2009) Obsereved fish diversity of Sogane and Santhkadur Shimong Karnataka, and found 17 fish species which belongs to 4 orders, 11 families, 14 generas, the family Cyprinidae was dominant the other group in the fish fauna in the both tank. Gosawami and Mankodi (2010) had observed 15 fish species belongs to 12 genera, 6 families and 3 orders. Among the 6 families the Cyprinidae family was most dominated.

Mandal (2010) observed similar observation Shrivastava *et al.,* (2011) studied the fish fauna of Shajapur district. Solanki et al., (2011) worked at Sanjay Sagar reservoir and obsereved 16 species of fishes, belongs to different orders of class teleost viz. Cypriniforms, Siluriforms, Metacembeliformes and Ophiocephaliforms Narsimha and Benarjee (2013) observed 30 species of fishes at Nagaram Tank Warangal which were belongs to 6 orders. The fish fauna of 30 species belong to 13 families among which 13 species of Cypriniformes.

**Conclusion**

It was concluded that the reservoir is rich in high fish diversity with good economic potential. To conserve and maintain the fish diversity, we further need to assess water quality and anthropogenic activities involved in this tank.

**Acknowledgement**

We are thankful to local fisherman community of Bhikangaon town who provided us there tradition knowledge of fish identification and especially local names of fishes.

## Table - 1 Showing Ichthyofauna collection, Vernacular nameand seasonal abundance.

| SN | Scientific Name | Vernacular Name | Abundance | | |
|---|---|---|---|---|---|
| | | | Pre-mansoon | Mansoon | Post-mansoon |
| 1 | *Catla catla* | Catla | ++ | +++ | ++++ |
| 2 | *Cirrhinus mrigala* | Nain | ++ | ++++ | ++++ |
| 3 | *Labeo rohita* | Rohu | + | ++++ | ++++ |
| 4 | *Labeo calbasu* | Kalot | + | +++ | +++ |
| 5 | *Labeo gonius* | Kurs | ++ | ++ | +++ |
| 6 | *Labeo bata* | Bata | ++ | +++ | ++++ |
| 7 | *Rasbora daniconius* | Dandua | - | ++ | ++++ |
| 8 | *Puntius ticto* | Sindhari | - | ++ | +++ |
| 9 | *Cyprinus carpio* | Common carp | ++++ | ++++ | ++++ |
| 10 | *Chela bacaila* | Chela | + | ++++ | +++ |
| 11 | *Hypophthalmichthys molitrix* | Silver carp | ++++ | ++++ | ++++ |
| 12 | *Mystus seenghala* | Tengar | +++ | ++++ | ++++ |
| 13 | *Mystus cavasius* | Tengara | +++ | ++++ | ++++ |
| 14 | *Wallago attu* | Padhani | + | ++++ | ++++ |
| 15 | *Heteropneustes fossilis* | Singhi | ++ | +++ | ++++ |
| 16 | *Clarias batrachus* | Mangur | ++ | +++ | ++++ |
| 17 | *Rita rita* | Rita | +++ | ++++ | ++++ |
| 18 | *Glossogobius giuris* | Doke | - | ++ | +++ |
| 19 | *Tilapia mossambica* | Tilapia | ++++ | ++++ | ++++ |
| 20 | *Chanda nama* | Chanari | ++ | +++ | ++++ |
| 21 | *Channa punctatus* | Girai | ++ | +++ | ++++ |
| 22 | *Channa gachua* | Chanaga | ++ | +++ | ++++ |
| 23 | *Channa striatus* | *Sabal* | ++ | ++++ | ++++ |
| 24 | *Puntius sophore* | Fodri | - | ++ | +++ |
| 25 | *Gambusia sp.* | Gambusia | +++ | +++ | +++ |

**Table - 2 Showing Biodiversity status, abundance and habitat of fishes.**

| SN | Scientific Name | IUCN-Status | Habitat |
|---|---|---|---|
| 1 | *Catla catla* | VU | Lotic |
| 2 | *Cirrhinus mrigala* | LR-nt | Lentic & Lotic |
| 3 | *Labeo rohita* | LR-nt | Lotic & Lentic |
| 4 | *Labeo calbasu* | LR-nt | Lotic & Lentic |
| 5 | *Labeo gonius* | LR-nt | Lotic & Lentic |
| 6 | *Labeo bata* | LR-nt | Lentic & Lotic |
| 7 | *Rasbora daniconius* | LR-nt | lotic |
| 8 | *Puntius ticto* | LR-nt | Lentic |
| 9 | *Cyprinus carpio* | LR-IC | Lentic |
| 10 | *Chela bacaila* | LR-nt | Lotic & Lentic |
| 11 | *Hypophthalmichthys molitrix* | NA | Lentic |
| 12 | *Mystus seenghala* | LR-nt | Lotic & Lentic |
| 13 | *Mystus cavasius* | LR-nt | Lotic & Lentic |
| 14 | *Wallago attu* | LR-nt | Lotic & Lentic |
| 15 | *Heteropneustes fossilis* | VU | Lotic & Lentic |
| 16 | *Clarias batrachus* | VU | Lotic |
| 17 | *Rita rita* | VU | Lentic & Lotic |
| 18 | *Glossogobius giuris* | NA | Lentic & lotic |
| 19 | *Tilapia mossambica* | VU | Lotic & Lentic |
| 20 | *Chanda nama* | LR-nt | Lentic&Lotic |
| 21 | *Channa punctatus* | LR-nt | Lentic&Lotic |
| 22 | *Channa gachua* | LR-nt | Lotic & Lentic |
| 23 | *Channa striatus* | LR-nt | Lotic & Lentic |
| 24 | *Puntius sophore* | NA | Lentic & Lotic |
| 25 | *Gambusia sp.* | NA | Lentic |
| 26 | *Ambasias kopsii* | NA | Lentic |

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Chapter-5

# UTILITY OF POLYNOMIAL REGRESSION IN THE ANALYSIS OF WATER PARAMETERS

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***Abstract***

*This paper briefly presents the aims, requirements and results of polynomial regression and multiple regressions and its potential utility in ecological studies. These statistical techniques are particularly suited for analyzing predictor variables (i.e. not truly independent), with independent variables, Polynomial regression analysis of this physico-chemical parameter suggests that free carbon dioxide of studied water body is an important parameter and is significantly correlated with thirteen parameters out of nineteen water quality parameters studied. Multiple regressions are somewhat the extension of curve fitting.*

**Key words:** Polynomial regression, Statistical technique, and Multiple regression.

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## Introduction

Water is a priceless gift of nature. From the beginning of human history, fresh water has been vital for human survival. The world is heading towards a freshwater crisis mainly due to mismanagement of natural resources. This crisis is already evident in many parts of the world including India, varying in scale and intensity. The overall condition or health of aquatic ecosystems is determined by the interaction of its physical, chemical and biological

components. In order to protect the ecosystem understanding of environmental changes is necessary. Ecological –limnological assessment helps us to conserve and manage natural resources. Many methods and criteria are available to assess aquatic ecosystems. One of them is physico-chemical approach to monitor water pollution is most common.

There are several statistical methods such as co-relation, smoothing of data, regression and cluster analysis which maybe helpful in predicting and planning the ecosystem. Correlation among the water quality parameters has been reported by Tiwari *et al*. (1988), Somasekhara Rao *et al*. (1994), Prakash (1994), Mariappan (2000),Jeyaraj*et al*. (2002), Lingeswara Rao *et al*. (2002), Tyagi *et al*. (2003) and Mohanty *et al*. (2003) Prakash and Dagaonkar(2011).

A systematic study of regression coefficients of the water parameters not only helps to assess the overall water quality but also to quantify relative concentration of various pollutants in water and provide necessary cluefor implementation of rapid water quality management programs( Mulla,*et al.,* 2007, and Kumar and Sinha , 2010.)

**Material and Methods**

Dhar is located in the Malwa region of western Madhya Pradesh.Munj Sagar is located in the district Dhar. It covers an area of about 49.596 h .The altitude of Munj Sagar Talab is 554m.In Year 2005 it was deepen by removing the bottom soil. This water body was basically constructed for drinking water purpose but Now-a days its water is mainly utilized for irrigation and fish culture purpose .

MunjSagar talab has mainly three Pakka Ghats . These ghats were chosen as sampling station. First one is Ganesh Ghat(S1) geographically located at $22^0$36’13.55” North latitude and $75^0$17’54.25” East latitude. Second is Shankar ghat (S2) geographically located at $22^0$36’05.28” North latitude and $75^0$17’59.66” East latitude and third is Chatrighat (S3) geographically

located at $22^0$35'58.34" North latitude and $75^0$17'45.82" East latitude .These sampling stations were named as S1, S2 and S3 during the course of study .

Polynomial curve fitting and Multiple regression method were used to predict some physico and chemical parameters of Munj Sagar.

**Polynomial curve fitting**

The general polynomial equation for the curve fitting is

$$Y = A + B1*X + B2*X^2 + B3*X^3 + B4*X^4 + B5*X^5$$

The numerical coefficient of above equation were calculated by the method of least square method with the help of Origin6.0 software.

**a) Multiple regression**

The general form of linear multiple regression model equation for 4 independent variables is of the form,

$$Y= pr1 + pr2*X1 + pr3*X2 + pr4*X3 + pr5*X4 + pr6*X1^2 + pr7*X2^2 + pr8*X3^2 + pr9*X4^2$$

where y is independentvariable . x1, x2 … are dependent variables and pr1, pr2 are constant . The value of these constant were obtained by deploying XLfitsoftware\

**Result and Discussion**

In the present study several orders of polynomial fitting were tried among different parameters using the Origin 6.0 software. The fifth order polynomial was found to be the a best fit for Free $CO_2$, and DO. The value of different constant for fifth order polynomial having value of "r" equal to 1 for these parameters were reported in the table 1

The fifth order polynomial equations for DO with those physico chemical parameters for which r= 1are as follows

*DO = 1.27E6 - 6.41E5 Ca +1.28E5 -1.28E4 +6.39E2 -1.27E1*

*DO= -4.36E5 +2.19E5 NO -4.9E4 +4.38E3 -2.18E2 +4.32E0*

The fifth order polynomial equations for Free $CO_2$ with those physico chemical parameters for which r= 1 are as follows

*FREE $CO_2$= 6.30E10$^{04}$ - 2.91E10$^{05}$TEMP + 5.31*10$^{05}$ TEMP$^2$ + 4.78E05TEMP$^3$ + 2.13E5TEMP$^4$ -3.77E4TEMP$^5$*

*FREE $CO_2$= -3.99E2 +1.52E3DO -2.06E3DO$^2$ +1.21E3DO$^3$ - 2.62E2DO$^4$ -5.72E-1DO$^5$*

*FREE $CO_2$ = 2.63E3 -1.22E4pH +2.26E4pH$^2$ -2.06E4pH$^3$ +9.27E3pH$^4$ -1.66E3pH$^5$*

*FREE$CO_2$ = 5.57E3 -2.57E4Mg +4.68E4Mg$^2$ -4.22E4Mg$^3$ 1.88E4Mg$^4$ -3.31E3Mg$^5$*

*FREE$CO_2$ = 2.50E4 -1.15E5HD +2.10E5HD$^2$ -1.89E5HD$^3$ +8.43E4HD$^4$ -1.49E4HD$^5$*

*FREE$CO_2$= -7.60E2 +3.53E3Nit -6.48E3Nit$^2$ +5.87E3Nit$^3$ - 2.63E3Nit$^4$ +4.67E2Nit$^5$*

*FREE$CO_2$= 3.47E3 -1.60E4Cl +2.95E4Cl$^2$ -2.69E4Cl$^3$ +1.21E4Cl$^4$ - 2.16E3Cl$^5$*

*FREE$CO_2$ = 2.68E4 -1.23E5$CO_3$ +2.24E5$CO_3^2$ -2.01E5$CO_3^3$ +8.94E4$CO_3^4$ -*

*1.57E4$CO_3^5$*

*FREE$CO_2$ = -1.13E5 +5.23E5HCO -9.55E5HCO$^2$ +8.62E5HCO$^3$ - 3.84E5HCO$^4$*

*+6.78E4HCO$^5$*

*FREE$CO_2$ = -186E3 +8.61E3PO -1.58E4PO$^2$ +1.42E4PO$^3$ - 6.36E3PO$^4$ +1.12E3PO$^5$*

$FREECO_2 = -1.03E5 + 4.81E5Si - 8.86E5Si^2 + 8.06E5Si^3 - 3.62E5Si^4 + 6.45E4Si^5$

$FREECO_2 = 4.49E4 - 2.09E5BOD + 3.83E5BOD^2 - 3.48E5BOD^3 + 1.56E5BOD^4 -$

$2.77E4BOD^5$

$FREECO_2 = -4.86E5 + 2.25E6DEPTH - 4.10E6DEP^2 + 3.69E6DEP^3 - 1.64E6DEP^4$

$+2.90E5DEP^5$

$FREECO_2 = -1.39E5 + 6.46E5TRANS - 1.18E6TRANS^2 + 1.07E6TRANS^3 -$

$4.77E5TRANS^4 + 8.43E4TRANS^5$

Fifth order polynomial equation between the pair of Free carbon dioxide and 13 physico -chemical parameters namely Temperature, DO. pH, Mg, Hardness, Nitrate, Chlorides , Carbonate alkalinity, Bicarbonate alkalinity,Phosphate, Silicates, BOD, Depth, Transparency was obtained.This indicates that free carbon dioxide is the most important parameter in present study by knowing the value of free carbon dioxide,these 13 parameters can be predicated by using fifth order polynomial equation . Utilization of this methodology will thus greatly facilitate the task of rapid monitoring of the status of pollution of water economically and this is the most important part of any pollution study to suggest some effective and economic way for water quality management . Kumar and Sinha (2010) reported the association of conductivity with eight physico chemical parameters namely pH, Alkalinity ,Total hardness , Total solids , Total dissolved solids , Chemical oxygen demand , Calcium, and Chloride concentration of water with value of regression coefficient , r more than 0.90.

**Multiple regressions between physico- chemical parameters:**

Multiple regression is somewhat the extension of curve fitting in this method value of one parameter (dependent) is obtained with several independent parameters. The multiple regression analysis was carried out between several parameters using XLfit software and the only combination of those parameters which have value of "r' as 1 were reported in the present study. These parameters are DO and free $CO_2$. The independent variables and the value of the constant are reported in the table no.(2 to 4) and figs(1and 2 ) shows the observed and obtained value of these parameters.

DO was estimated by keeping BOD, Temperature, Turbidity, pH and BOD as independent variables. The regression equation was as follows

DO = 8.731 -1.955*BOD - 0.179*Temperature

-0.047*Turbidity +1.193*pH +0.059* BOD ^2

Free CO2 was estimated by keeping Temperature, Transparency,Turbidity, as independent variables. The regression equation was as follows

Free CO2 = -22.560 +0.409* Temperature + 0.849*Transparency

+0.123*Turbidity - 0.009* Temperature^2 -0.010* Transparency^2

Multiple regression analysis is statistical tool which predict a parameter with the combination two or more than two parameter. Mathur *et al*. (1990) predicted the cadmium content in Ganga at Varansi keeping Temp., pH, Chloride, Alkalinity, DO, COD, Cr, Mn, and Ni. as independent variables , while lead was estimated with alkalinity DO, COD, Cu, Cr, Co, Mn, and Ni content of water. Balachandran *et al*. (2008) estimated the Chlorophyll a production using Multiple Regression Model. Hayat (2008) predicted plankton productivity using multiple regression keeping Total alkalinity, DO ,Temperature and Hardness as independent variables. Bala and

Mukharjee (2010) predicted pH of six water land of Nadia district keeping Tran, TDS, EC ,DO and BOD as independent variables.

Hence it can be concluded that the statistical studies of the water parameters have a great significance in the study of water resources.

## TABLE-1:

**VALUE OF CONSTANTS FOR FIFTH ORDER POLYNOMIAL FIT(r=1) FOR**

**SOMEPHYSICO-CHEMICAL PARAMETERS OF MUNJ SAGAR TALAB, DHAR.**

| X | Y | R | A | B1 | B2 | B3 | B4 | B5 |
|---|---|---|---|---|---|---|---|---|
| FREE CO2 | TEMPRATURE | 1 | 6.30E+04 | -2.91E+05 | 5.31E+05 | -4.78E+05 | 2.13E+05 | -3.77E+04 |
| | DISSOLVED OXYGEN | 1 | -3.99E+02 | 1.52E+03 | -2.06E+03 | 1.21E+03 | -2.62E+02 | -5.72E-01 |
| | .pH | 1 | 2.63E+03 | -1.22E+04 | 2.26E+04 | -2.06E+04 | 9.27E+03 | -1.66E+03 |
| | MAGNACIUM | 1 | 5.57E+03 | -2.57E+04 | 4.68E+04 | -4.22E+04 | 1.88E+04 | -3.31E+03 |
| | HARDNESS | 1 | 2.50E+04 | -1.15E+05 | 2.10E+05 | -1.89E+05 | 8.43E+04 | -1.49E+04 |
| | NITRATES | 1 | -7.60E+02 | 3.53E+03 | -6.48E+03 | 5.87E+03 | -2.63E+03 | 4.67E+02 |
| | CHLORIDE | 1 | 3.47E+03 | -1.60E+04 | 2.95E+04 | -2.69E+04 | 1.21E+04 | -2.16E+03 |
| | ALKINITY | 1 | 2.68E+04 | -1.23E+05 | 2.24E+05 | -2.01E+05 | 8.94E+04 | -1.57E+04 |
| | BICARBONATE | 1 | -1.13E+05 | 5.23E+05 | -9.55E+05 | 8.62E+05 | -3.84E+05 | 6.78E+04 |
| | PHOSPHATE | 1 | -1.86E+03 | 8.61E+03 | -1.58E+04 | 1.42E+04 | -6.36E+03 | 1.12E+03 |
| | SILICATE | 1 | -1.03E+05 | 4.81E+05 | -8.86E+05 | 8.06E+05 | -3.62E+05 | 6.45E+04 |
| | BOD | 1 | 4.49E+04 | -2.09E+05 | 3.83E+05 | -3.48E+05 | 1.56E+05 | -2.77E+04 |
| | DEPTH | 1 | -4.86E+05 | 2.25E+06 | -4.10E+06 | 3.69E+06 | -1.64E+06 | 2.90E+05 |
| | TRANSPERENCY | 1 | -1.39E+05 | 6.46E+05 | -1.18E+06 | 1.07E+06 | -4.77E+05 | 8.43E+04 |
| DO | CALCIUM | 1 | 1.27E+06 | -6.41E+05 | 1.28E+05 | -1.28E+04 | 6.39E+02 | -1.27E+01 |
| | NITRATE | 1 | -4.36E+05 | 2.19E+05 | -4.39E+04 | 4.38E+03 | -2.18E+02 | 4.32E+00 |

| TABLE-2 VALUES OF MODEL PRAMETERS FOR BOD,DO FREECO2 AND pH | | |
|---|---|---|
| **CONSTANTS** | **PARAMETERS** | |
| | **DO** | **CO2** |
| **pr1** | 8.731 | -22.560 |
| **pr2** | -1.955 | 0.409 |
| **pr3** | 0.179 | 0.849 |
| **pr4** | -0.047 | 0.123 |
| **pr5** | 1.193 | -0.009 |
| **pr6** | 0.059 | -0.010 |

**TABLE-3: PREDICATED ANDOBSERVED VALUE OF DO USING MULTIPLE REGRESSION**

| **Seasons** | **Variables** | | | | | **DO** | |
|---|---|---|---|---|---|---|---|
| | BOD | Temperature | Turbidity | pH | Observed | Pred | Residuals |
| **Winter 6-7** | 8.85 | 20.125 | 14.692 | 7.797 | 8.28 | 8.28 | 0 |
| **Summer 6-7** | 11.125 | 28.617 | 34.717 | 8.118 | 7.486 | 7.486 | 0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Rainy 6-7** | 12.917 | 30.283 | 27.217 | 7.835 | 6.852 | 6.852 | 0 |
| **Winter 7-8** | 9.042 | 19.625 | 14.2 | 7.999 | 8.284 | 8.284 | 0 |
| **Summer7-8** | 11.317 | 27.975 | 35.933 | 8.104 | 7.178 | 7.177 | 0 |
| **Rainy7-8** | 13.7 | 31.042 | 27.717 | 7.693 | 6.499 | 6.499 | 0 |

TABLE4-: PREDICATED AND OBSERVED VALUE OF FREE $CO_2$ USING MULTIPLE REGRESSION

| Observations | Variables | | | Free $CO_2$ | | |
|---|---|---|---|---|---|---|
| | Temperature | Transparency | Turbidity | Free co2 | Pred (Free co2) | Residuals |
| Winter 6-7 | 20.125 | 45.858 | 14.692 | 0.741 | 0.741 | 0.00 |
| Summer 6-7 | 28.617 | 28.175 | 34.717 | 1.468 | 1.468 | 0.00 |
| Rainy 6-7 | 30.283 | 32.400 | 27.217 | 1.241 | 1.241 | 0.00 |
| Winter 7-8 | 19.625 | 44.383 | 14.200 | 0.794 | 0.794 | 0.00 |
| Summer7-8 | 27.975 | 27.850 | 35.933 | 1.604 | 1.604 | 0.00 |
| Rainy7-8 | 31.042 | 33.583 | 27.717 | 1.373 | 1.373 | 0.000 |

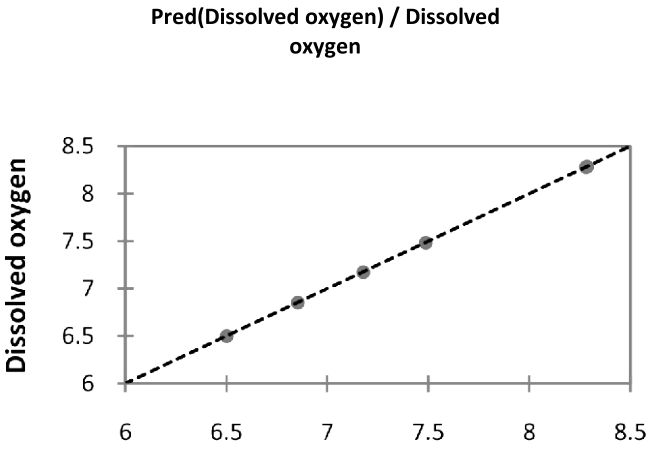



FIG 1- SHOWING PREDICATED AND OBSERVED VALUE OF DO

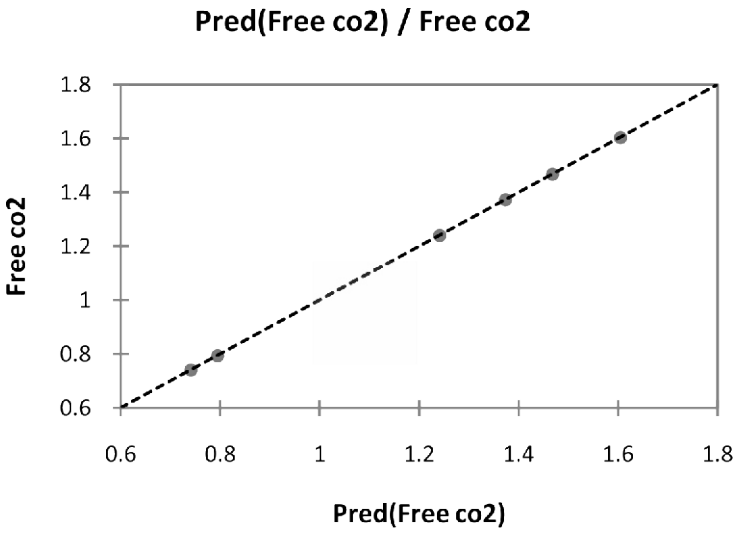



FIG 2- SHOWING PREDICATED AND OBSERVED VALUE OFFree $CO_2$

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Chapter-10

# FACILITATION OF SUSTAINABLE ECOSYSTEM FOR SPIDER TO INNOVATIVE TECHNOLOGIES

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***Abstract***

*Sustainable ecosystem is huge topic for discussion in this era. To achieve and maintain sustainability, we must integrate the ecology of biology and sociology with a new biological techniques ways to work. Loss of biodiversity is long-term damage to ecosystems is the biggest subject for research. It's a continuous process which comes from some biotic and abiotic factors such as; pollution of the atmosphere, waste production, toxic substance disposal, damaged aquatic ecosystems, deforestation etc. To control loss of biodiversity we must apply some innovative technologies of genome analysis and database management system.Spiders (order Araneae) are the species which is broadly distributed in our diversity. Latrodactus is geneus of amazing spider commonly known as black widow have numerous attractive features and huge research topic, Because of its biological product and the behavior. The literature review has been carried out by following reasoning methodology and is presented. The results of this study indicate that different researchers have taken different approach to analyzed the genomic data with some broadly use methods like whole genome sequencing, genotyping and different proteome analysis and management of data Overall, it is evident from the literature offers a meaningful option, especially for managing genomic data and provided new framework towards the sustainable ecosystem.*

**Keywords:** Sustainable ecosystem, *L. hesperus,* Whole genome sequencing, Genomic data.

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**Introduction**

Ecology is the study of relationship between living organisms and their environments. The ecology depends on some biotic and abiotic factor. A sustainable ecosystem is a biological environment and series of habitats that is able to increase and support itself without outside influence or assistance. In ideal sustainable ecosystems, everything is already provided within the ecosystem for life to survive. Nowadays there are different branch of sociology that deals with the relations between human beings and their environment, and the balanced or harmonious relationship of living things to their environment. Which are concentrate on issues of sustainable ecosystems include climate change; an emerging global crisis in water availability and water pollution; record loss of biodiversity and long-term damage to ecosystems, pollution of the atmosphere, waste production and disposal, impacts of chemicals use and toxic substance disposal, damaged aquatic ecosystems, deforestation etc.

In the order of above discussion previously researchers drawn new methodology of species diversity, identification, sequencing and also provide broad way analysis of bio products of the organism. In this study we talk about broadly distributed species *Latrodactus*this geneus of amazing spider commonly known as black widow member of the Theridiidae family. This genus contains 32 species, which include several North American "Black Widows" (Southern Black Widow *Latrodectus mactans*, Western Black Widow *Latrodectus hesperus,* and Northern Black Widow *Latrodectusvariolus*) has a much wider geographic distribution. Elsewhere, others include the European black widow (*Latrodectustredecimguttatus*), the Australian Redback Black Widow (*Latrodectushasseltii*) or several different species in Southern Africa that can be called Button spiders also identified.

In most cases, the females are dark-coloured, but some may have lighter bodies or even reddish. Many can have red, white or brown markings on the upper-side (dorsal) of the abdomen. Some can be readily identifiable by reddish markings on the central underside (ventral) abdomen, which are often hourglass-shaped.

These small spiders have rare potent venom containing the neurotoxin latrotoxin, which causes the condition latrodectism, Female widow spiders have unusually large venom glands and their bite can be particularly harmful to large vertebrates, including humans. Despite their notoriety, *Latrodectus* bites rarely cause death or produce serious complications. It's also produce silk fibers which is used in many form like textile armor etc. The bio product of spider, the behavior, evolution and the diversity is broad topic of the research.

**Methodology**

In the backdrop of the aims and objectives of this study, the literature published in standard journals and form reputed sources was collected. The process of review was based on the standard method. For the purpose of the review aspects like the research question being posed, theoretical background, methodology used, findings, conclusions, etc. were considered. The discussion is presented in a chronological order, so that it also indicates the underlying pattern of evolution of the innovative methods to find the new diversity and plan to propose the new technologies a step towards the sustainable ecosystem. Bioinformatics is branches which help to find the better and less time consuming technologies to conserved the essential biological information in the form to databases and provide the numerous conclusions for human welfare.

**Result and Discussion**

It has been reported that many methodologies for ecosystem conservation and the reformation is already applied. The need of this investigation is to discuss about the sustainability of the ecosystem

and the betterment of the species diversity. For this we reported some of the literature to draw a new framework with the help of bioinformatics. Whole genome sequencing and the identification of the species provides huge data of the organism. Which means the information can be compared in many different ways. For example, a researcher might compare their results/finding of genomic data of one organism with that of other characteristics, which might be stored in a different database. Hence, in order to process genomic data researchers can analyze different sets of essential information and the methods. This branch of biology has huge capacity of data analysis and storage capabilities of which aims to discover new relationships between different organism and data. Thus, in view of importance of *L. hesperus,* the literature has been specifically reviewed and the discussion is presented hereunder.

Kenneth and Robert (1979) reported the interesting courtship and mating behavior of the black widow spider, they work on *Lactrodectushesperus*chamberlin and lvie, were studied to determine stimuli responsible for mate location and courtship initiation in this species. The researchers observed new courtship patterns which included a vigorous display performed by females. Male *L hesperus* also initiated courtship behavior on unoccupied female webs of another species. They conclude that male and female L. Hesperus produce sexually specific, complementary contact pheromones which are incorporated into their silk. The substance apparently functions in mate location, sex identification and courtship for this species. In addition to this Fleischmann (1995) discussed about the new approach for genome analysis based on sequencing and assembly of unselected pieces of DNA from the whole chromosome has been applied to obtain the complete nucleotide sequence (1,830,137 base pairs) of the genome from the bacterium *Haemophilusinfluenzae* Rd. His effort gave a new framework for microbial genomics. *H. influenzae* Rd genome sequence was the first complete genome (Genome Sequence Database, accession number L42023) from a free-living organism.

Lately in the order to identification of the other different properties of *Latrodectus*Daly (2001)tested the effectiveness of *L. hasseltii* (redback spider) antivenom in neutralizing the lethal effects of *L. hesperus* and *L. mactans* (North American black widow) venoms. They use LD50 values for the *L. hesperus* and *L. mactans* venom preparations were determined. Investigation determined that to derive mouse LD50 values for *L. hesperus* and *L. mactans* venom obtained by electrical stimulation of live adult spiders. Redback spider antivenom is effective in neutralizing the lethal effects of *L. hesperus* and *L. mactans* venoms in a mouse envenomation model. Jessica *et al* (2004) also reported the spider genus *Latrodectus* includes the widely known black widows, notorious because of the extreme potency of their neurotoxic venom. The genus has a worldwide distribution and comprised 30 species that time, the phylogenetic relationships of which were previously unknown. Although the taxonomy of the genus has been examined repeatedly, the recognition of taxa within *Latrodectus* has long been considered problematic due to the difficulty associated with identifying morphological features exhibiting discrete geographic boundaries. They are presented, first phylogenetic hypothesis for the *Latrodectus* genus and is generated from DNA sequences of the mitochondrial gene cytochrome *c* oxidase subunit I. they suggested the monophyletic group with minimal amounts of genetic divergence, corroborating the hypothesis that human transport has recently expanded the range of this species.

In order to the new technologies the whole genome sequencing L hesperus was done by Ayoub*et al.(*2010) the group of researchers 1262MBp genome size, Length of sequence in 1,137,104,656, Number of scaffolds151,814 and for this they use sequencing technology Illumina with 48.0x coverage also identified three related widow species evolutionary branching, gene annotation regulatory sequence identification and ortho/paralogy detection. Its provide the numerous data like number of contigs and gaped scaffolds. Multiple bioinformatics analysis tools used to find actual

systemic position of the *L. hespures* and other valuable information like mutagens.

On the other hand Yonghui*et al.(*2010) monitored incredible strength and toughness, spider dragline silk is widely lauded for its impressive material properties. Dragline silk is composed of two structural proteins, MaSp1 and MaSp2, which are encoded by members of the spidroin gene family. These genes included three loci for the MaSp1 protein and the single locus for the MaSp2 protein. In addition, we mapped a *MaSp1* pseudogene. All the *MaSp1* gene copies and pseudogene localized to a single chromosomal region while *MaSp2* was located on a different chromosome of *L. hesperus*. Using probes derived from *L. hesperus*, we comparatively mapped all three *MaSp1* loci to a single region of a *L. geometricus* chromosome. Further comparative mapping with taxa of increasing divergence from *Latrodectus* will pinpoint when the *MaSp1* duplication events occurred and the phylogenetic distribution of silk gene linkage patterns.

In addition of the study Heidebrecht*et al*. (2013) found natural spider silk fibers combine extraordinary properties such as stability and flexibility which results in a toughness superseding that of all other fiber materials. As the spider's aggressive territorial behavior renders their farming not feasible, the biotechnological production of spider silk proteins (spidroins) is essential in order to investigate and employ them for applications. In order to accomplish this task, two approaches have been tested: firstly, the expression of partial cDNAs, and secondly, the expression of synthetic genes in several host organisms, including bacteria, yeast, plants, insect cells, mammalian cells, and transgenic animals.

Later on Amanda *et al.*(2013) state that Orb-web and cob-web weaving spiders spin dragline silk fibers that are among the strongest materials known. Draglines are primarily composed of MaSp1 and MaSp2, two spidroins (spider fibrous proteins) expressed in the major ampullate (MA) silk glands. Prior genetic studies of dragline silk have

focused mostly on determining the sequence of these spidroins, leaving other genetic aspects of silk synthesis largely uncharacterized. They also identified transcription of *TuSp1* in MA glands. Modulating expression rates of MaSp1 variants as well as MaSp2 and TuSp1 could lead to differences in mechanical properties of dragline fibers. Many of the newly identified candidate genes likely encode secreted proteins, suggesting they could be incorporated into dragline fibers or assist in protein processing and fiber assembly. Their results demonstrated previously unrecognized transcript complexity in spider silk glands.

Thomas *et al*.(2014) stated that Spiders (Order Araneae) are essential predators in every terrestrial ecosystem largely because they have evolved potent arsenals of silk and venom. They proposed a transcriptional program for the silk glands that involves regulating gland specific synthesis of silk fiber and glue components followed by protecting and processing these components into functional fibers and glues. Black widow silk gland gene repertoire provides extensive expansion of resources for biomimetic applications of silk in industry and medicine. Furthermore, our multi-tissue transcriptome facilitates evolutionary analysis of arachnid genomes and adaptive protein systems were proposed.

Wendy (2016) investigated on reproductive physiology of the black widow spider, including oogenesis, pedicel maturation, and oviposition. She identified oogenesis in the black widow spider occurred in three distinct phases of development: pre-vitellogenic, vitellogenic, and post-vitellogenic. The pedicel stalk showed signs of apoptosis during late vitellogenesis, and was detached from Phase 3 oocytes. It was hypothesized that ova migrate into the ovarian lumen through an opening in the ovarian wall. Wendy first time reported analysis of ovarian development in the western black widow spider. In addition, on Sandra *et al.* (2017) compared silk gene expression profiles of mature males to those of females from three cob-web weaving species (Theridiidae). They used de novo assembled species-specific male transcriptomes from *Latrodectushesperus*,

*Latrodectusgeo metricus,* and *Steato dagrossa* followed by differential gene expression analyses. The relative expression levels of particular spidroin genes varied between sexes and species. Finally, his expression profiling results suggested species-specific adaptive divergence of silk use by male theridiidae.

**Conclusion**

Conservation of species diversity, a continual process that requires well-designed strategies and approaches that fulfill the desired goal,in view the above; literature published in the reputed journals has been reviewed in this study. Now we come to conclusion, that innovation in the techniques and methodology is the necessity of upcoming issues. And as we know form the above discussion it providesus bulk information and we can use in different researches to enhance the economical trades like textile, armor and medicine. In this investigation the genomic analysis provides a less time consuming and valuable information about the species identification and taxonomical information and also draws frame work to maintain the sustainable ecosystem through control the loss of biodiversity and endangered species records. These methodologies also carry us towards recombination technologies to improve the traditional quality and quantities of the species byproduct. But the challenges are large enough that require retrieving and reorganizing these techniques to enhance the sustainable ecosystem in the planate.

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Chapter-12

# STUDIES ON ZOOPLANKTON POPULATION AS BIO-INDICATORS OF WATER POLLUTIONFROM VIKRAM TEARTH SAROVAR, UJJAIN CITY (M.P).

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***Abstract***

*Bio-indicators have proved very useful as they provide valuable information for aquatic management and have gained increasing popularity. Planktons especially zooplanktons serve as early warning signals that tell us about the health of an aquatic ecosystem. Zooplanktons are affected by various environmental factors such as temperature, D.O, hardness, B.O.D etc. Due to their presence, absence or dominance they are being used as indicator organisms of physical, chemical and biological processes. The present observation was made in summer season 2019, from Vikram tearth sarovar of Ujjain city (M.P). During our study 35 species belonging to 4 classes were identified. Rotifera were most dominant followed by Copepoda, Cladocera and Ostracoda. The zooplanktons, Brachionous spp. Keretella spp. and some Cyclops spp. showed dominance. These dominant zooplanktons from selected pond are indicators of organic pollution. It can be concluded that the Vikram tearth sarovar is polluted and rapidly turning towards eutrophication. So our findings highlighted the contamination and deterioration of water quality at Vikram tearth sarovar due to domestic sewage and human activities. In the present study emphasis was given on zooplanktons as bio-indicators which can act promising tool for monitoring water quality.*

**Keywords:** Zooplanktons, Bio-indicators, *Brachionus calyciflorus*, eutrophication, Vikram tearth sarovar, Ujjain city.

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## Introduction

Water like other primordial elements was revered and worshiped since Vedic Times. The Rig Veda says: “Agni and Water

are sustainers of life, they are affectionate mothers, givers of all givers of life, and they have healing powers". Water is an essential ingredient of life. It has been rightly described as "elixir of life". The quality of water can be monitored by physical, chemical or biological method. Zooplanktons by their presence, absence or dominance can tell us about the health of an aquatic environment, thus thereby can act as the indicators of water pollution.

Zooplankton are minute aquatic animals that are non-motile or are very weak swimmers and they drift in water column of ocean, seas or fresh water bodies to move any great distance. Usually they move in the sunlit zone where food resources are most abundant and they also found in deep ocean water (Abdus *et al.,* 1995). They are heterotrophic in nature (sometimes detritivorous) and are the favorite food of a great many marine and freshwater animals. Since zooplankton plays important role in food web by linking the primary producers (by consuming phytoplankton, mainly various bacterioplankton and sometimes zooplankton) and higher trophic levels (Byars, 1960). The freshwater zooplankton comprise of Protozoa, Rotifers, Cladocerans, Copepods and Ostracods. Zooplankton is valuable source of crude protein, amino acids, lipids, fatty acids, minerals and enzymes for fry (Needham and Needham, 1962). Yurkowski and Tabachek (1978, 79) reported that zooplankton satisfy all food requirements of fish and supported fry growth. Lysine and methionine, which are known to be the most limiting amino acids in feeds, are present in appreciable quality in zooplankton (Dabrowski and Rusiecki, 1983). High ratio of unsaturated fatty acids to saturated fatty acid of zooplankton shows that zooplankton is good quality food for rearing fish larva (Lokman, 1994). The polyunsaturated fatty acid (PUFA) contents showed high concentrations of eicosapentaenoic acid and docosahexaenoic acid with moderate amounts of linoleic acid in zooplankton therefore, zooplankton is regarded as desirable food. Live zooplankton is also reported to contain enzymes like amylase, protease, exonuclease, esterase that play important roles in larval digestion (Munilla-Moran *et al.*, 1990).

A bioindicator can be defined as ‘‘a species or group of species that readily reflects the abiotic or biotic state of an environment, represents the impact of environmental change on a habitat, community, or ecosystem, or is indicative of the diversity of a subset of taxa, or of the wholesale diversity, within an area’’(McGeoch, 1998). High nutrient inputs, principally nitrogen (N) and phosphorous (P) are draining at an alarming pace in the water bodies causing eutrophication (Vollenweider, 1968; Pandit, 1999 and Shah, 2015). Different zooplankton behaves differently in responses to eutrophication as changes in reproductive rates (Fileto *et al.,* 2004), filtering capacities (Xie *et al.,* 1998) and specializations in acquiring food (Schriver *et al.,* 1995 and Shah, 2014). Therefore, it is imperative to study the zooplankton as bioindicator particularly with reference to Vikram Tearth Sarovar Ujjain (M.P).

In present investigation an attempt was made to study the Zooplanktonic community structure with respect to the physico-chemical characteristics of water, which may be first sign for the deterioration in the water quality. Zooplankton species with high quality environmental requirements quickly deteriorate when the contaminants were introduced in the water bodies. In contrast, the Zooplanktonic species which were able to survive and found in polluted water bodies are considered as bio-indicators of the polluted aquatic environment.

**Materials and Methods**

**Description of study site:** Present study was carried out at one of the fresh water body of Ujjain city. The Vikram Tearth Sarovar a perennial, rain fed pond situated at Latitude 23.1648°N and Longitude 75.8059°E in Ujjain city. The pond receives domestic effluents from the surrounding catchment area.

**Collection of samples:** The pond survey was carried out from Feb 2019 to May 2019. Water samples were collected periodically during the early hours between 7.00 to 10.00 am. The plankton samples were

collected by filtering 50 litres of water through standard plankton net (25 mesh bolting silk) and transferred to plastic containers and 5% formalin was added for sample preservation.

**Physico-chemical analysis:** Temperature was recorded on the spot using Centigrade Thermometer. The pH of the water samples was measured by using the gun pH meter on the spot. Physico-chemical analysis (Electrical conductivity, alkalinity, chemical oxygen demand, dissolved oxygen and biological oxygen demand) of the sample was done according to standard methods (APHA, 1975) in lab.

**Biological analysis:** The systematic identification of Zooplanktons was made by using keys of Adoni (1985), Edmondson (1959), Dhanapati (2000), Altaff (2004).




**Fig 1; Showing satellite map of Vikram Tearth Sorvar)**
**(Source from Google earth)**

***Brachionus*: *Trichocera* ratio (Q B/T):-** *Brachionus*:*Trichocera* ratio called as Sladecek's quotient (Q) was also used in the present study to find out the trophic state of the pond. It is represented as:

$$Q = \frac{\text{Number of species of } \textit{Brachionus (B)}}{\text{Number of species of } \textit{Trichocerca (T)}}$$

Where, B= Number of *Brachionus sps.*

T= Number of *Trichocera sps.*

Q= Sladecek's Quotient

*If the value of this quotient is less than 1.0 it means oligotrophic condition, values between 1.0 and 2.0 reflect mesotrophic and values over 2.0 indicate eutrophic conditions* [Sladecek, 1945].

**Results and Discussion**

The pH ranged from 8.03 during the month of February to 9.00 during May 2019. pH was always alkaline. Highest pH was recorded during May (summer). This may be due to low level of water and high photosynthesis of micro and macro organism resulting in high production of free carbon dioxide during the equilibrium towards alkaline side (Trivedy, 1989; Shiddamallayya and Pratima, 2008).

In the present investigation electrical conductivity ranged from 711 µmhos /cm to 1760 µmhos/ cm. High value was recorded during the month of May 2019 (summer) and low during the month of February. The high value of conductivity might be due to high temperature at less solubility and high degradation of organic substances. Olsen (1950) classified the name of water bodies having conductivity values greater than 500.00 µmhos cm as eutrophic, according to this criterion Vikram Tearth Sarovar falls under the category of eutrophic water body.

Biological oxygen demand (BOD) is the amount of oxygen utilized by microorganisms in stabilizing the organic matter. Estimation of biological oxygen demand (BOD) is an important measure to the oxygen required for the degradation of organic matter. In the present study the BOD value ranged from 35.6 to 63.21 mg/l. Highest BOD was recorded during May 2019.

Dissolved oxygen (DO) is an important aquatic parameter whose measurement is vital in the context of culture of any aquatic animal as oxygen plays a crucial role in its life processes. Dissolved oxygen concentration more than 5.00 mg/l favors good growth of flora and fauna (Das, 2000). In the present investigation the dissolved oxygen was found to vary from 3.6 to 4.4 mg/l, with minimum concentration during the month of May. The dissolved oxygen

decreased due to increased temperature of water (Naz and Turkmen, 2005) and decomposition of organic matter and respiration by micro and macro organisms.

High hardness of aquatic ecosystems points out towards eutrophication (Rai, 1971). Sawyer (1960) classified water on the basis of hardness into three categories that is soft (0.00-75.00 mg/l), moderately hard (76.00-150.00 mg/l) and hard (151.00-300.00 mg/l). According to this classification Vikram tearth sarovar falls in the category of hard water with hardness ranging from 283 to 400 mg/l. Maximum hardness was recorded in the month of May. Higher values of hardness might be due to the evaporation of water at higher temperature during summer months, high loading of organic substances, detergents, chlorides and other pollutants.

**Table:-1 Showing the important Physico- chemical parameters at Vikram Tearth Sarovar**

***PL= Permissible level**

| S.NO. | PARAMATERS | FEB | MAR | APR | MAY | WHO *PL | ICMR *PL |
|---|---|---|---|---|---|---|---|
| 1 | Ph | 8.03 | 8.4 | 8.6 | 9.00 | 6.5-8.5 | 7-8.5 |
| 2 | Conductivity(μΩ/cm) | 711 | 1017 | 1503 | 1760 | - | - |
| 6 | B.O.D. (mg/l) | 35.6 | 37.21 | 44.01 | 63.21 | <5 | <5 |
| 4 | D.O. (mg/l) | 4.4 | 4.2 | 3.8 | 3.6 | >5 | >6 |
| 5 | Hardness(mg/l) | 283 | 300 | 356 | 400 | 500 | 300 |

Zooplankton are considered as bioindicator of eutrophication in aquatic environments because of their prompt response to changing environmental conditions and short life cycle (Gannon and

Stemberger, 1978; and Sladecek, 1983). Majority of the zooplankton show divergent response towards eutrophication in freshwater ecosystems. As a result of eutrophication there is change in reproductive rates or even cycles, filtering rates (Xie 1998 *et al.,*) or some change their nutritive behavior in terms of food acquisition (Schriver *et al.,* 1995). Eutrophication is the major cause for the replacement of large sized zooplankton with small bodied ones (Pandit, 1999 and Shah, 2002). As a consequence of racing eutrophication, some of the observed species of zooplankton showed wide ecological amplitude, while some showed rapid variations to fluctuating environmental conditions thereby follow a definite succession in terms of mosaic and spatial distribution in the pond under investigation.

In the present study the zooplankton community was represented by 35 taxa.The order of dominance in decreasing order can be represented as Rotifera (16) > Cladocera(10) > Copepoda (6) > Ostracoda (3). Among 35 taxa the strongly eutrophic zooplankton which dominated at Vikram Tearth Sarovar were *Brachionus calyciflorus, Bosmina longirostris, Chydorus sphaericus Monostyla closterocera Cyclops vernalis* and *C. vicinus* . Dominance of these Zooplanktons showed that they can tolerate severe pollution caused by anthropogenic pressure.

The findings of the present study also indicate that Vikram Tearth Sarovar exhibited dominant Zooplankton species of *Monostyla sps., Keratella sps., Lapadella sps., Mesocyclopes sps., Cypris sps., , B. quadridentatus, B. forficula, Keratella tropica, Brachionus diversicornis* and *B. urceolaris* species at the selected site.Nogueira (2001) reported that above recorded species are the index of eutrophic waters and its abundance is considered as a biological indicator for eutrophication. *Brachionus calyciflorus* was frequently observed during all months at Vikram Tearth Sarovar .This species is considered to be the indicators of eutrophication (Sampaio *et al.,*

2002). Looking to the presence of these indicators in studied water body, we can say that it is in the state of eutrophication.

**Brachionus: Trichocerca Ratio**

Brachionus: Trichocerca ratio was introduced by Sladecek in 1983. It is also called as Sladecek's quotient. As per Sladecek, the genus Brachionus are generally found in eutrophic waters (except two species i.e. *B. sericus* a typical acidophilic and *B. plicatilis* inhabitant of brackish waters) and the genus *Trichocerca* is purely oligotrophic in behavior. This ratio can be used for individual water body or even for the individual sample. Sladecek also opined that this ratio is analog of the 5 phytoplankton quotients proposed by Thunmark and Nygaard.

During the present study, 06 taxa of Brachionus and only 1 taxa of Trichocerca were recorded at Vikram Tearth Sarovar therefore the calculated quotient is 6 that reflects the eutrophic nature of Vikram Tearth Sarovar as per Sladecek.

**Conclusion**

On the basis of studied physico-chemical and biological parameters (Zooplanktons) we can conclude that Vikram Tearth Sarovar is highly polluted due to anthropogenic pressure and thus need management and planning to preserve its intrest. To review its pollution condition and eutrophication status like *Brachionus calyciflorus, Bosmina longirostris, Chydorus sphaericus, Cyclops vernalis* , *C. vicinus, Monostyla closterocera* can be considered as pollution indicators.

**Table:- 2. Zooplanklton status at Vikram Tearth Sarovar.**
**(*)= pollution indicators.**

| S.NO | ZOOPLANKTONIC FORMS | FEB | MAR | APR | MAY |
|---|---|---|---|---|---|
| | **ROTIFERS** | | | | |
| 1 | *Brachionus angularis* | ++ | ++ | ++ | ++ |
| 2 | **Brachionus calyciflorous* | +++ | +++ | +++ | +++ |

| | | | | | |
|---|---|---|---|---|---|
| 3 | **B. quadridentatus* | ++ | ++ | ++ | ++ |
| 4 | **Brachionus forficula* | ++ | ++ | ++ | ++ |
| 5 | **Brachionus diversicornis* | ++ | ++ | ++ | ++ |
| 6 | *F. longiseta* | + | + | - | + |
| 7 | **Lapadella patella* | ++ | ++ | ++ | ++ |
| 8 | **Brachionus urceolaris* | ++ | ++ | ++ | ++ |
| 9 | **Keratella tropica* | ++ | ++ | ++ | ++ |
| 10 | *Lecane bulla* | - | + | - | - |
| 11 | *Trichocera insigns* | + | - | - | - |
| 12 | *Anuraeopsis sp.* | + | + | + | - |
| 13 | *Asplanchana brightwelli* | + | + | + | + |
| 14 | *Rotaria rotatoria* | - | - | + | + |
| 15 | **Monostyla closterocera* | +++ | +++ | +++ | +++ |
| 16 | *Monostyla bulla* | + | + | + | + |
| | **CLADOCERA** | | | | |
| 1 | **Bosmania longirastrosis* | +++ | +++ | +++ | +++ |
| 2 | **Moina brachiata* | ++ | ++ | ++ | ++ |
| 3 | *Moina dubia* | - | + | - | - |
| 4 | *Daphnia pulex* | ++ | ++ | + | ++ |
| 5 | **Chydorus sphaericus* | +++ | +++ | +++ | +++ |
| 6 | *Macrothrix rosea* | - | + | - | - |
| 7 | *Daphnia Carinata* | + | - | - | - |
| 8 | *Alona intermedia* | + | - | - | - |

| | | | | | |
|---|---|---|---|---|---|
| 9 | *Alona sps.* | + | - | - | - |
| 10 | *Ceriodaphnia spp.* | - | + | + | + |
| | **COPEPODA** | | | | |
| 1 | **Cyclops sps* | ++ | + | ++ | ++ |
| 2 | *Macrocyclops sps* | + | ++ | + | + |
| 3 | **Cyclops vernalis* | +++ | +++ | +++ | +++ |
| 4 | **C.vicinus* | +++ | +++ | +++ | +++ |
| 5 | *Haliodiaptomous sps.* | + | - | + | - |
| 6 | **Mesocyclops* | ++ | +++ | ++ | ++ |
| | **OSTRACODA** | | | | |
| 1 | **Cypris sps.* | ++ | ++ | ++ | ++ |
| 2 | *Stenocypris sps.* | + | + | - | + |
| 3 | *Centrocypris sps* | + | - | | - |

***Where, (+) = Rare, (++) = Abundant, (+++) = Dominant, (-) Absent**

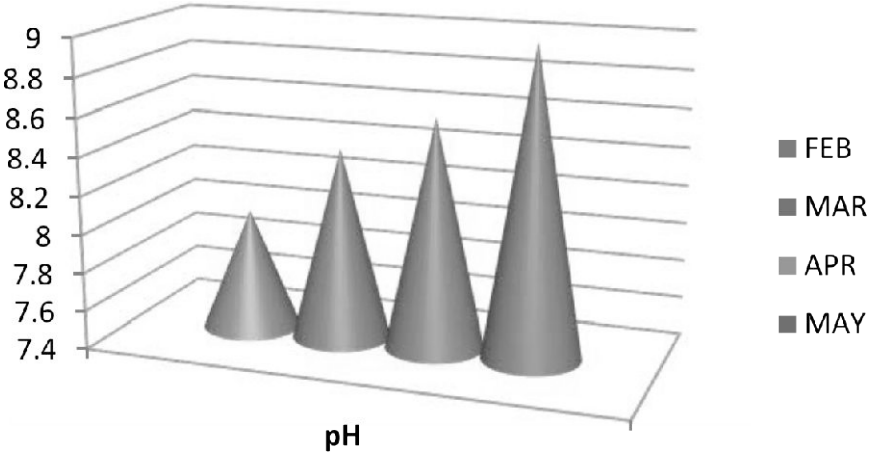



**Fig 2; Showing pH Variation during Summer**

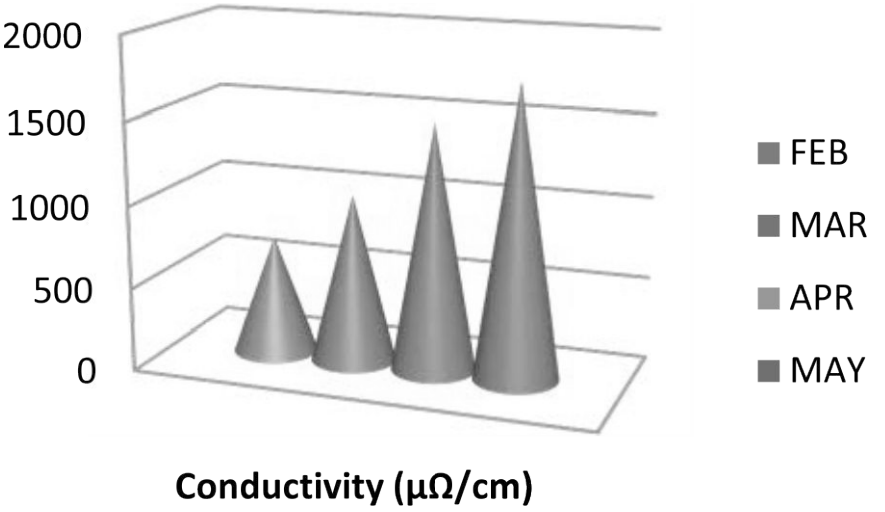



**Fig 3; Showing Conductivity Variation during Summer**

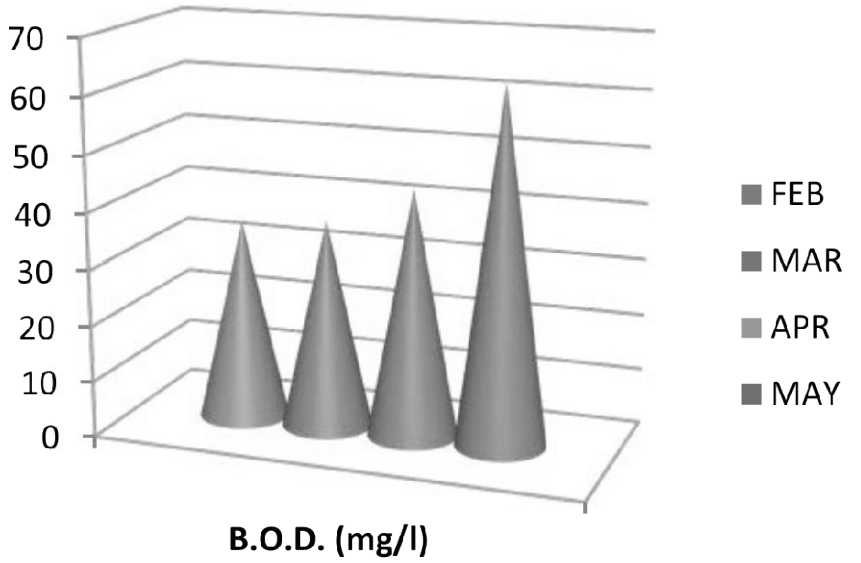



**Fig 4; Showing BOD Variation during Summer**

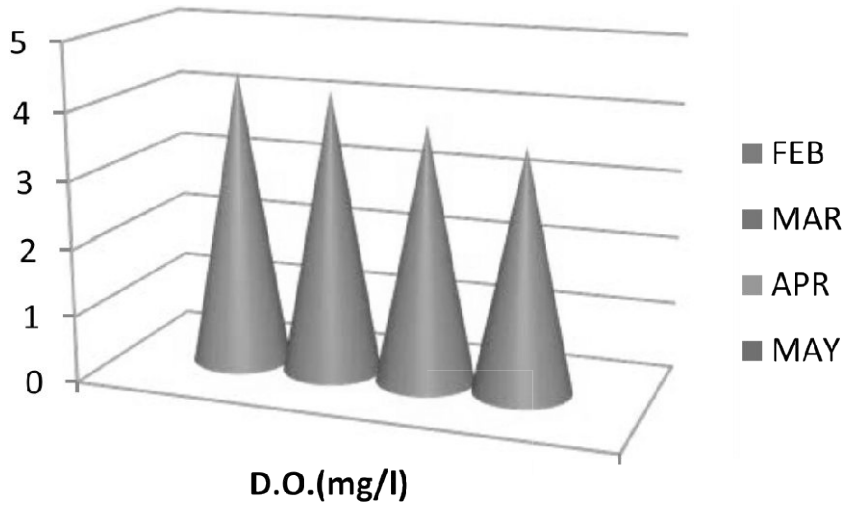



**Fig 5; Showing D.O Variation during Summer**

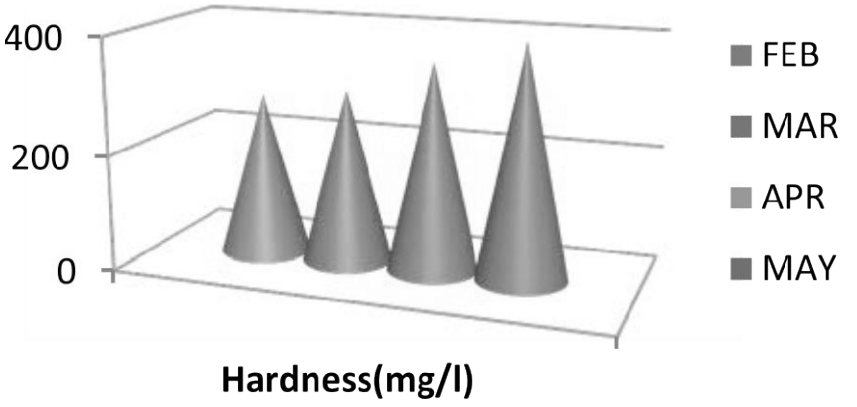



**Fig 6; Showing hardness variation during Summer season**

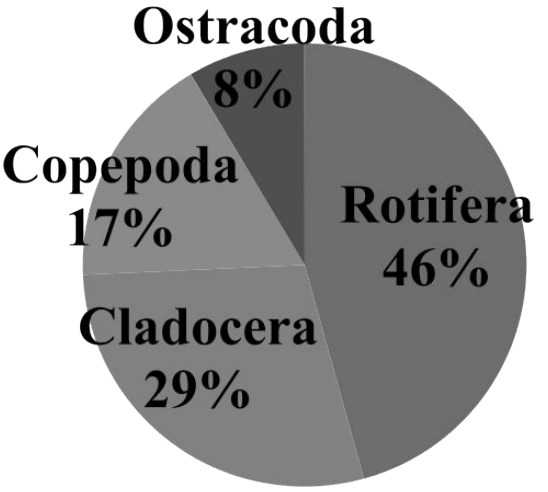



**Fig 7; Pia diagram showing percentage of Zooplankton composition at Vikram Tearth Sarovar**

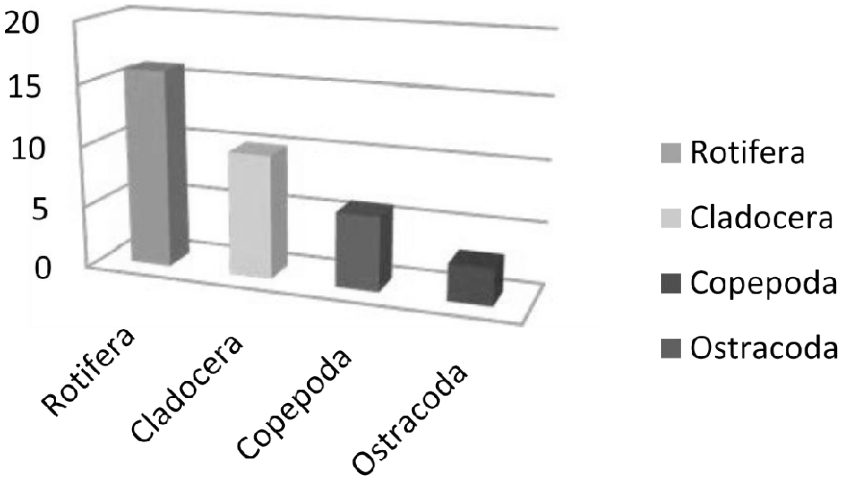



**Fig 8; Showing contribution of Zooplanktonic forms**

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Chapter-17

# STUDY OF NAVLAKHA FISH MARKET AT INDORE (M.P.)

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***Abstract***

*The fisheries sector has very important place in India. It is consider as important area for income and employment point of view. It also helps in providing the cheap and nutritious food and foreign exchange. In the present study a survey was conducted in summer season (Feb - May 2019) to assess the fish marketing system of Navlakha fish market, Indore (M.P). In the survey result authors observed that this fish market includes preserved, fresh and live fresh water fishes. There were 25-30 shops available for fish marketing. The market chain from producer to consumer passes through a number of chain like local traders, agents/ suppliers, wholesalers and retailers. Weekly supply of fishes in this fish market was 400-600 kg. Most of the fishes were brought from local water resources like Bilawali talab, Yashwant Sagar dam, Kshipra river and some parts of Narmada River (from Punasa Dam to Barwani ). It was estimated that out of total input of fishes 35% were Cyprinus carpio, Labeo sps. andCatla catla(25%), Cat fishes (10%),Channa sps. (10%) and miscellaneous fishes (20%). This survey revealed that in general the price of fish depends upon its species, size, quality, availability and demands etc.*

**Key words:** Navlakha fish market, Fishermen, intermediaries

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## Introduction

Fish market is a place where fish and fishery products are available to purchase. Fish market system play a very important role

in economic development of community engaged in this sector. It also provides number of employments opportunities to persons engaged directly or indirectly in fisheries sector.

A well organised marketing system is important to attract good number of buyer. There is practically no definite structure of fish markets in the country (Pandey, *et al*., 1984). Fish passes through several intermediaries from the fish production centre to consumer. The intermediaries are involved in providing various kind of services like- capturing, sorting, processing, preservation, packing and transporting etc..These activities result in cost addition at every stage of marketing (Bishnoi, 2005). Fish market provides number of employments to those persons who engaged directly or indirectly in fisheries sector.

The domestic fish marketing system in India is still no good. It is lacking in many modern Physical facilities and infrastructure (FAO, 2001). Gupta (1984) and Srivastava (1985) had studied the marketing of fish and fishery products in India and had identified infrastructural bottlenecks in efficient marketing system, while Flowra et al. (2012) studied fish market system in neighbouring country like Bangladesh.

**Materials and Methods**

**Study area and periods:**

The study was carried out in Navlakha fish market at Indore city. Its latitude and Longitude coordinates are 22.719568, 75.857727. Indore city in India is located in west central part of Madhya Pradesh. The fish market survey was conducted from February to May 2019.

**Methodology-**

The survey was conducted among various stack holders like - fish farmers, commission agents, retailers and consumers. To collect data, frequently market visit, interviews of various stakeholders etc were carried out.

**Survey points-**

The stakeholder selected for gathering information were fish producers, commission agent, retailer and consumer

**(A).Fishermen/ fish producer:** After harvesting fish, fishermen sell fishes in market or those to the local traders at production site or to retailers through commission agents.

**(B).Commission agents:** The commission agent is an important functionary in the fish marketing channel in Navlakha fish market. They receive fish from fishermen / producer in the wholesale market and dispose the fish through auction for this act, commission agents are entitled to certain commission which normally varies from 6 to 8 percent of the sale value in the present study.

**(C). Retailers:** Retailers are the most important segment of marketing system. They procure fish from fishermen / producer and local traders directly or through auction by commission agents.

**(D). Consumer:** A person who purchases fish and fishery products for nutritional purpose.

**Results and Observations**

Following are the results of survey:

**Time of fish market-** 3:00 to 9:00 pm

**Location of fish market-** between Agrasen square to Navlakha square.

**Types of market-**Retail fish market

**Shops-** There were 25-30 shops available for fish marketing. They were of following three types:-

**a). Large shops** =03.

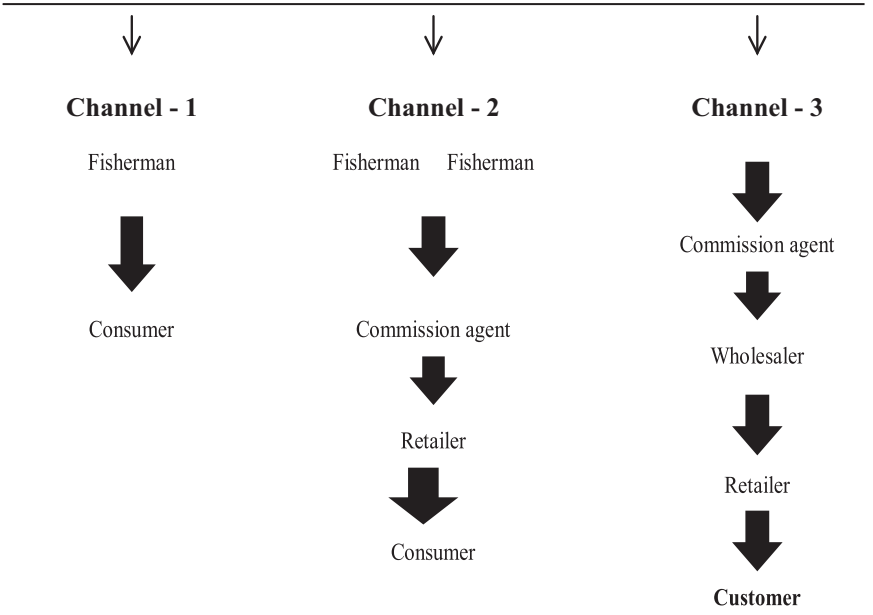
**b). Medium shops** =15-17.

**c). Small shops** =10.

**Gender of fish saler-**10 males and 15-20 females.

**Marketing channels-**

Three type of marketing channels were observed in Navlakha fish market such as-




**Quantity -**Weekly supply of fishes in Navlakha fish market was 400-600 kg.

**Sources-**Most of the fishes were brought from local water resources like Bilawali talab, Yashwant sagar dam, Kshipra river and some part of Narmada river belt etc.

**Percent contribution of fishes group-**It was estimated that out of total input of fishes 35% fishes were belongs to *Cyprinus carpio*, *labeo rohita*, 25% to *Catla catla*, and 10% to *Channa sps*. 10% to Cat fishes and 20% to miscellaneous fishes .

**Fish Fauna –** 21 species of freshwater fishes were generally observed in the studied fish market during the study period (table 2). They

belong to 05 orders, 08 family and 14 genera. Out of these Order- Cypriniformes and family -Cyprinidae was dominated, while Order- Perciformes, family- Cichlidae and Order- Mastacembeliformes, family Mastacembelidae was recessive

**Price of Fishes-**The result of the survey also revealed that in general the price of fishes varies, which mainly depends upon market structure, species, quality, quantity, weight of fish and demand.

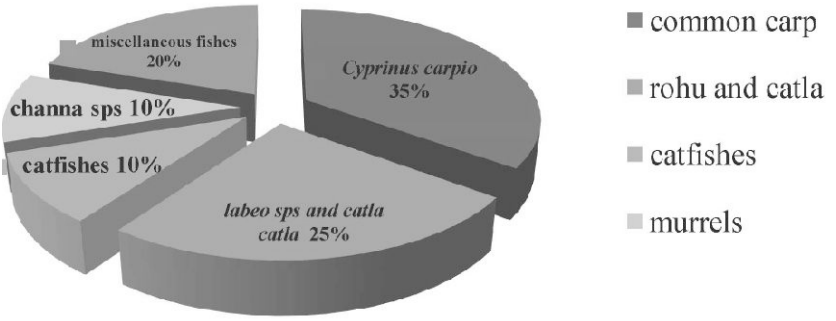



**Fig. 1.Contribution of different fish species in Navlakha fish market**



**Fig.2.Overview of Navlakha fish market**

**Table 1. General Characteristics of Navlakha fish market**

| Market Characteristics | Parameters |
|---|---|
| Market nick name | Guruvariya Macchali Bazaar |
| Shops status | Temporary |
| Availability of platform | Nil |
| Communication system | Poor |
| Shades status | Temporary of polythin etc. |
| Drainage system | Ansent |
| Ice facility | Present |
| Water supply | Absent |
| Sanitation | Poor |
| Parking facility | Absent |

**Table 2. List of fish species which were found in Navlakha fish market**

| S.No. | Local name of fishes | Scientific name of fishes | Prices (in rupee/ kg) of different fishes in different months (2019) Feb March April May | | | |
|---|---|---|---|---|---|---|
| 1 | Rohu | ***Labeo rohita*** | 140 | 140 | 150 | 160 |
| 2 | Catla | ***Calta catla*** | 150 | 150 | 160 | 180 |
| 3 | Naren | ***Cirrhinus mrigala*** | 150 | 150 | 160 | 180 |
| 4 | Silver | ***Hypophthalmichthys molitrix*** | 100 | 80 | 100 | 100 |
| 5 | Common carp | ***Cyprinus carpio*** | 160 | 180 | 180 | 200 |
| 6 | Magur | ***Clarius batracus*** | 100 | 100 | 120 | 120 |
| 7 | Sawal | ***Channa marulius*** | 350 | 400 | 350 | 400 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | Kabra | ***Channa striatus*** | 350 | 400 | 350 | 400 |
| 9 | Girai | ***Channa punctatus*** | 80 | 100 | 100 | 100 |
| 10 | Padhin | ***Wallago attu*** | 240 | 260 | 260 | 300 |
| 11 | Seeghal | ***Mystus seenghala*** | 320 | 350 | 320 | 320 |
| 12 | silan | ***Pangasus pangasius*** | 120 | 120 | 140 | 140 |
| 13 | Tilapia | ***Oreochromis niloticus*** | 140 | 140 | 120 | 120 |
| 14 | katiya | ***Mystus vitatus*** | 260 | 280 | 280 | 280 |
| 15 | Darai | ***Puntius sarana*** | 80 | 80 | 100 | 80 |
| 16 | Bherka | ***Puntius sophore*** | 60 | 60 | 60 | 60 |
| 17 | Katiya | ***Mystus cavasius*** | 120 | 130 | 120 | 130 |
| 18 | Chaliya | ***Chela bacaila*** | 100 | 110 | 100 | 100 |
| 19 | Dummar | ***Labeo fibriatus*** | 160 | 180 | 160 | 160 |
| 20 | Goli | ***Labeo gonius*** | 120 | 110 | 100 | 120 |
| 21 | Baam | ***Mastacembelus armatus*** | 180 | 200 | 200 | 220 |



*Catla catla*



*Hypophthalmichthysmolitrix*



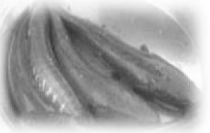
*Mystus seeghala*



*Cyprinus carpio*



*Pangasiuspangasius*



*Channasps.*

Fig.3. Some common fishes available in Navlakha fis market

Table 3.Sytematics position observed in Navlakha fish market.

| S.No. | Order | Family | Genus | Species |
|---|---|---|---|---|
| 1 | Cypriniformes | Cyprinidae | *Labeo* | *Rohita* |
| 2 | | | *Labeo* | *Fibriatus* |
| 3 | | | *Labeo* | *Gonius* |
| 4 | | | *Calta* | *Catla* |
| 5 | | | *Cirrhinus* | *Mrigala* |
| 6 | | | *Hypophthalmich thys* | *Molitrix* |
| 7 | | | *Cyprinus* | *Cardio* |
| 8 | | | *Puntius* | *Sarana* |
| 9 | | | *Puntius* | *Sophore* |
| 10 | | | *Chela* | *Bacaila* |
| 11 | Ophiocephaliformes | Ophiocephalidae | *Channa* | *Marulius* |
| 12 | | | *Channa* | *Striatus* |
| 13 | | | *Channa* | *Punctatus* |
| 14 | Siluriformes | Clariidae | *Clarius* | *Batracus* |
| 15 | | Siluridae | *Wallago* | *Attu* |
| 16 | | Pangasiidae | *Pangasius* | *Pangasius* |
| 17 | | Bagridae | *Mystus* | *Seenghala* |
| 18 | | | *Mystus* | *Vitatus* |
| 19 | | | *Mystus* | *Cavasius* |
| 20 | Perciformes | Cichlidae | *Oreochromis* | *Niloticus* |
| 21 | Mastacembeliformes | Mastascembelidae | *Mastacembelus* | *Armatus* |

Table 1 described the general characterstics of studied fish market which suggest the its condition is not very good as far as facilities and hygenic conditions are concerned ,thus need

imrovement.Kumar et al. (2008) also reported that in India infrastructure facilities, drainage system and sanitation conditions of fish markets are inadequate and poorly maintained.

Table 2 shows selling price of different fish species.It shows that fishes like Channa marulius,Mystus seenghala are sold on higher price and fish like Mystus sophore and Puntius sarana sold on lower price .Generally price of different fish species vary month to month and found depend on size, quality, Quantity.freshness and gills redness and flesh stiffness.

In the present study three channel were obseved. Channel one has no intermediary, Channel two and three have two intermediary between fishermen and consumer.Our study suggest that shorter channel provides more benifits to fishermaen than loger channel ,but as suggested by Rokeya et al. (1997) that fishermen hardly get chance to communicate directly with the consumers.

A similer study was reported by Sathiadhas and Narayana Kumar (1994). He suggested that Post-harvest operations of fishes provide more employment than the production sector. This seems to be true in our study too.

**Conclusion**

Condition of Navlakha fish market was not very good. Modern facilities are lacking. Three market channels were observed. Accordingly, we come to conclusion that shorter channel provides more monitoring benefits to fishermen. Fish market seems to provide employment opportunities to fishermen, fish transporter, wholesaler, retailer etc.

**Acknowledgement**

We are thankful to Dr. Suresh T Silawat,Principal of Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.) for providing nacessary facilities. We would also like to extend thanks to

peoples who engaged in fish marketing system in Navlakha fish market and provided me required information .

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# Chapter-7

# EFFECT OF JUVENILE HORMONE ANALOGUE (METHOPRENE AND FENOXYCARB) ON DEVELOPMENT OF SILKWORM LARVAE AND SILK PRODUCTION

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***Abstract***

*Juvenile hormone analogues have been tested as insect growth regulators in silkworm (Bombyx mori), seeking an increment of silk production. These chemical products, when applied in small or moderate rates, promote the extension of the last larval instar. To understand the physiologic consequences on silk production by the silkworm strain CSR2 × CSR4. The application of methoprene and fenoxycarb, a juvenile hormone analogue, was performed to evaluate its effects on larval development and silk production. JHA was topically applied 48h after the fourth larval ecdysis, on the dorsal integument of the 2nd thoracic segment of the insects, between 1 and 1.5 µg JHA influenced positively the duration of the fifth instar and the weight gain of the insects. The application of 1µg JHA resulted in the heaviest silk glands, cocoons, Shell cocoons and pupae weights. Comparatively to the control, the increment on silk production by the use of 1µg JHA was more accentuated than the corresponding negative effects on the cocooning rate.*

**Key Words**:*Silkworm, Bombyx mori, Juvenile hormone analogues, Temperature, R.H%, Pupa, Larvae.*

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**Introduction**

Sericulture is one of the agro based industries in India. India occupies second place of Mulberry raw silk production in the world. Mulberry silk comes from the cocoons of *Bombyx mori (L).* The fact that the Silkworm, *Bombyx mori* is domesticated for nearly four thousand years ago is well established. It is well documented that all insects require proper environmental conditions for normal life (Ahsan, 2006). The environment influences the activities of the organism directly or indirectly. This is true for domesticated insects like *Bombyx mori.* Due to continuous domestication for many years, the silkworm has lost many of its natural activities as sense of smell, flight etc. and it is completely under the protection of the silkworm growers (Itushi, 2012). Though the number of generations in a year is controlled genetically in the silkworm, environmental conditions like photoperiod, temperature, humidity etc., are known to influence during the entire life cycle of the silkworm(Biram and Gowda, 2009).Juvenile hormone analogues have been tested in *Bombyx mori* as insect growth regulators in order to increase silk production (Akai *et al.,* 1971). These chemical products, when applied in diminute and appropriate rates, promote the extension of the larval period, when the insect feeds. The first studies with juvenile hormone analogues in *B. mori* were accomplished through topical applications on the insect (Akai *et al.,* 1973). Later, researchers looked for the practical application of these hormones in the sericulture, through spraying or immersion of the leaves into the products (Akai and Kiguchi, 1981). The physiological effects on insects caused by the application of juvenile hormone analogues vary according to the product rate (Akai *et al.,* 1981), insect strain (Akai *et al.,* 1984), application method and time (Cappellozza *et al.,* 1997). Therefore, the present study was taken to determine the effects of the topical application of rates of JHA on the larval development and silk production of CSR2 × CSR4 silkworm larvae at different temperature range (20, 25, 30 and 35°C) and constant humidity (75-80%).

## Material and Methods

### Study Area

Present work was carried out at Government Resham Kendra, Indore region (Sanwer and Sonkatch, M.P.)

### Experimental Species

Productive bivoltine silkworm hybrid (CSR2 × CSR4) was obtained from Central Sericulture Research and Training Institute (Mysore, India) was used as a study material. This hybrid is suitable to rear during favourable season (August–February).

### Rearing method

*Bombyx mori* larvae (CSR2 × CSR4 strain) were reared in laboratory conditions under different temperature (20, 25, 30 and 35°C) and constant relative humidity (75-80%). For larvae feeding, mulberry leaves were supplied, five times a day (Cappellozza *et al.,* 1997).

### Temperature conditions:

Four different types of temperature, viz. 20, 25, 30, 35°C were maintained in the laboratory throughout the experimentation, using an Environmental chamber.

### Humidity conditions:

Constant relative humidity (R.H. %) 75-80 % were induced for the study on the experimental silkworm breeds/hybrids, all through the experimentation.

### Drug concentration and traetment:

Four different drug concentrations of methoprene and fenoxycarb, viz. 0.5, 1, 1.5 and 2µg were applied to the larvae throughout experimentation. *Bombyx mori* larvae were reared in laboratory conditions under controlled range of temperature (20, 25, 30 and 35°C) and constant relative humidity (75-80%). 48 hours after beginning of the fifth instar, the silkworm larvae were topically

treated with JHA at the rates of 0.5, 1, 1.5 and 2µg diluted in 5 mL ethanol solvent. Larvae of the control were only treated with the solvent. The applications were on the larval thoracic tergum (dorsal portion of larvae segment other than the head), ideally on the second thoracical by using 100 mL micro-syringe.

**Results**

**Cocoon production:**

Cocoon production is summarized in table-1 and figure-1, 2. 50 larvae were taken for the experiment and treated with juvenile hormone analogue (methoprene).

At 20ºC temperature 31, 36, 34 and 35 larvae were converted into cocoons at 0.5, 1, 1.5 and 2µg methoprene drug concentration and 31, 33, 32 and 29 larvae were converted into cocoons at 0.5, 1, 1.5 and 2µg fenoxycarb drug concentration respectively.

At 25ºC temperature 32, 40, 35 and 38 larvae were converted into cocoons at 0.5, 1, 1.5 and 2µg methoprene drug concentration and 38, 41, 35 and 32 larvae were converted into cocoonsat 0.5, 1, 1.5 and 2µg fenoxycarb drug concentration respectively.

At 30ºC temperature 30, 38, 35 and 31 larvae were converted into cocoons at 0.5, 1, 1.5 and 2µg methoprene drug concentration and 30, 33, 28 and 24 larvae were converted into cocoons at 0.5, 1, 1.5 and 2µg fenoxycarb drug concentration respectively.

At 35ºC temperature 27, 33, 29 and 25 larvae were converted into cocoons at 0.5, 1, 1.5 and 2µg methoprene drug concentration and 25, 30, 28 and 21 larvae were converted into cocoons at 0.5, 1, 1.5 and 2µg fenoxycarb drug concentration respectively.

The maximum no. of cocoon obtained at methoprene was **40 at 1 µg on 25ºC** andat fenoxycarb was **41 at 1µg on 25ºC** whereas minimum cocoon obtained at methoprene was **25 at 2 µg on 35ºC** and at fenoxycarbwas **21 at 2µg on 35ºC.**

**Table: 1 Effect of Juvenile hormone analogue Methoprene and fenoxycarb on cocoon production:**

| Temperature (°C) | Larvae | Humidity | Drug Concentration | No. of Cocoon produced | |
|---|---|---|---|---|---|
| | | | | Methoprene | Fenoxycarb |
| 20°C | 50 | 75-80% | 0.5µg | 31 | 31 |
| | | | 1µg | 36 | 33 |
| | | | 1.5µg | 34 | 32 |
| | | | 2µg | 35 | 29 |
| 25°C | 50 | 75-80% | 0.5µg | 32 | 38 |
| | | | 1µg | 40 | 41 |
| | | | 1.5µg | 35 | 35 |
| | | | 2µg | 38 | 32 |
| 30°C | 50 | 75-80% | 0.5µg | 30 | 30 |
| | | | 1µg | 38 | 33 |
| | | | 1.5µg | 35 | 28 |
| | | | 2µg | 31 | 24 |
| 35°C | 50 | 75-80% | 0.5µg | 27 | 25 |
| | | | 1µg | 33 | 30 |
| | | | 1.5µg | 29 | 28 |
| | | | 2µg | 25 | 21 |

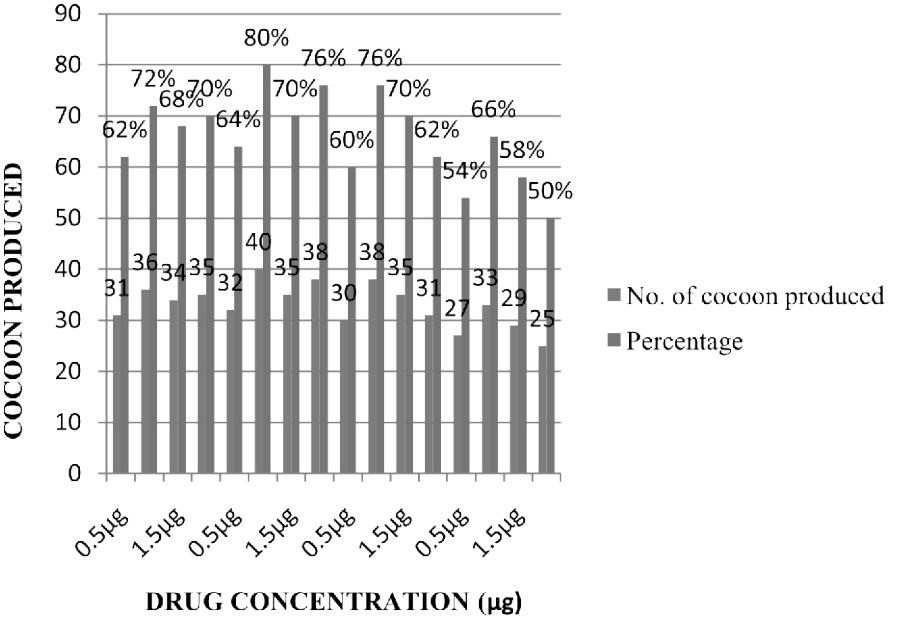



**Figure:1** shows the effect of Juvenile hormone analogue Methoprene on cocoon production.

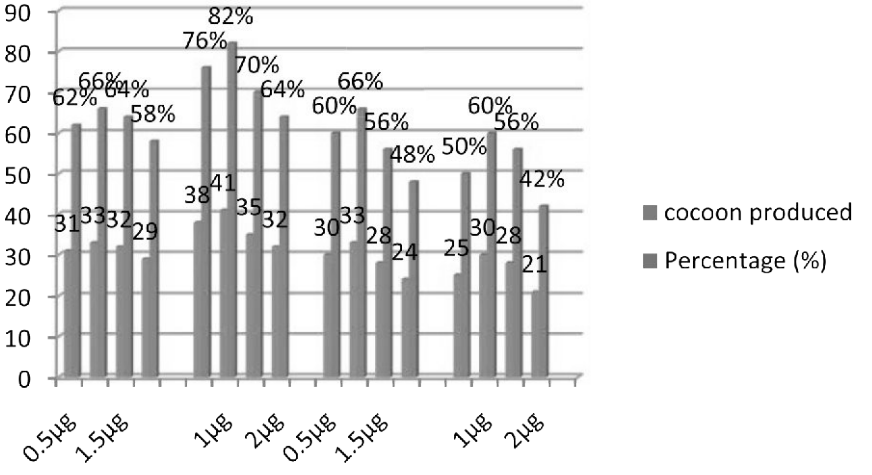


**Figure: 2** shows the effect of juvenile hormone analogue fenoxycarb on pupation.

**WEIGHT OF SILKWORM AND PRODUCTIVITY OF SILK:**

Larvae weight, Cocoon weight and length of silk produced by the topical application of JHA of CSR2 × CSR4 bi-voltine breed is summarized in table 2 and figure 3, 4, 5 and 6.

Larval weight was 2.4, 3.1, 2.89 and 2.6 gms at 0.5, 1, 1.5 and 2 µg methoprene respectively. Cocoon weight was 3.0, 3.47, 3.15 and 3.12 gms at 0.5, 1, 1.5 and 2 µg methoprene respectively. Length of silk obtained 1010.4, 1504.3, 1311.7 and 1123 meters at 0.5, 1, 1.5 and 2 µg methoprene, respectively.

Larval weight was 2.1, 2.89, 2.01 and 1.90gms at 0.5,1, 1.5 and 2 µg fenoxycarb respectively. Cocoon weight was 3.10, 3.29, 3.00 and 2.69gms at 0.5, 1, 1.5 and 2 µg fenoxycarb respectively. Length of silk obtained 1100.0, 1200.0, 1100 and 1000.0 meters at 0.5, 1, 1.5 and 2 µg fenoxycarb, respectively.

The maximum larvae weight, cocoon weight and length of silk obtained was **3.1 gms, 3.47 gms and 1504.3 meters at 1 µg** drug concentration respectively whereas minimum larvae weight, cocoon weight and length of silk obtained was **2.4 gms, 3.0 gms and 1010 meters at 0.5 µg** drug concentration respectively. In the control group the larvae weight, cocoon weight and length of silk obtained were **2.5 gms, 2.97 gms and 701.6 meters**. In the present investigation maximum larvae weight, cocoon weight and length of silk obtained is in experimental group as compared to the control group.

The maximum larvae weight, Cocoon weight and length of silk obtained was 2.89 gms, 3.29gms and 1200 meters at 1 µg drug concentration respectively whereas minimum larvae weight,

Cocoon weight and length of silk obtained was 1.90 gms, 2.69 gms and 1000 meters at 2µg drug concentration respectively.

**Table-2 Effect of Juvenile hormone analogue Methoprene and Fenoxycarb on weight of cocoon and productivity of silk (at temperature 25°C and humidity 75-80%):**

| Concentration | Weight of larvae | | Weight of cocoon | | Length of silk produced | |
|---|---|---|---|---|---|---|
| | Methoprene | Fenoxycarb | Methoprene | Fenoxycarb | Methoprene | Fenoxycarb |
| 0.50µg | 2.4gm | 2.1gm | 3.0gm | 3.10gm | 1010.4m | 1100m |
| 1µg | 3.1gm | 2.89gm | 3.47gm | 3.29gm | 1504.3m | 1200m |
| 1.5µg | 2.89gm | 2.01gm | 3.15gm | 3.00gm | 1311.7m | 1100m |
| 2µg | 2.6gm | 1.90gm | 3.12gm | 2.69gm | 1123m | 1000m |
| Control (untreated) | 2.5gm | 2.5gm | 2.97gm | 2.97gm | 701.6m | 900m |

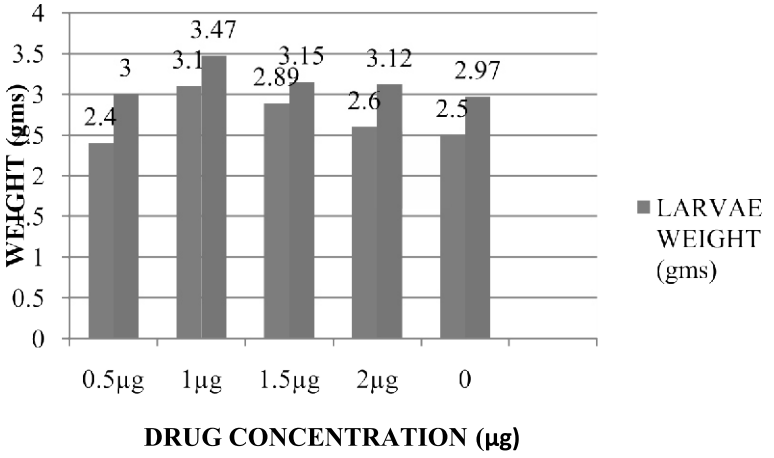



**Figure:3** shows the effect of Juvenile hormone analogue Methoprene on weight of larvae and cocoon.

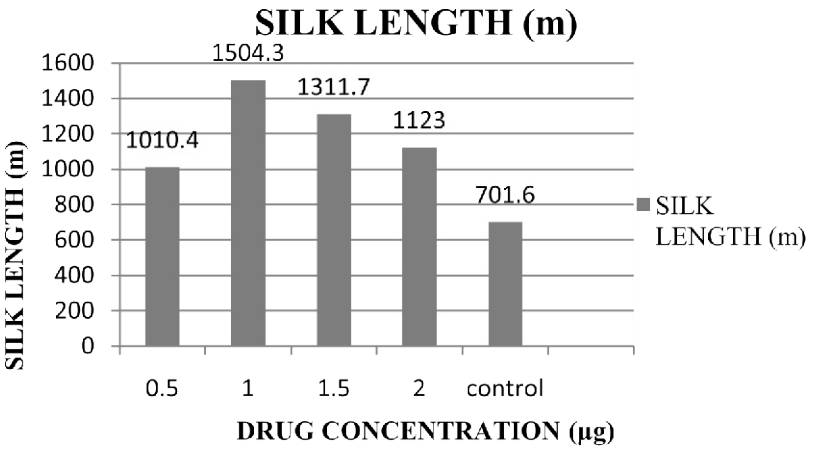



**Figure:4** shows the productivity of silk at different concentration of Methoprene.

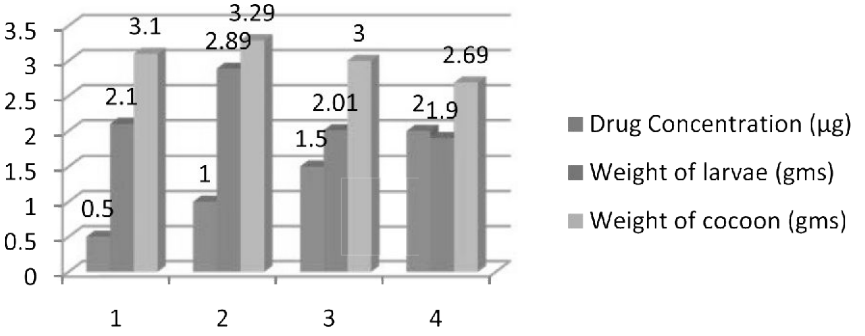



**Figure: 5** shows the effect of Juvenile hormone analogue Fenoxycarb on weight of larvae and cocoon.

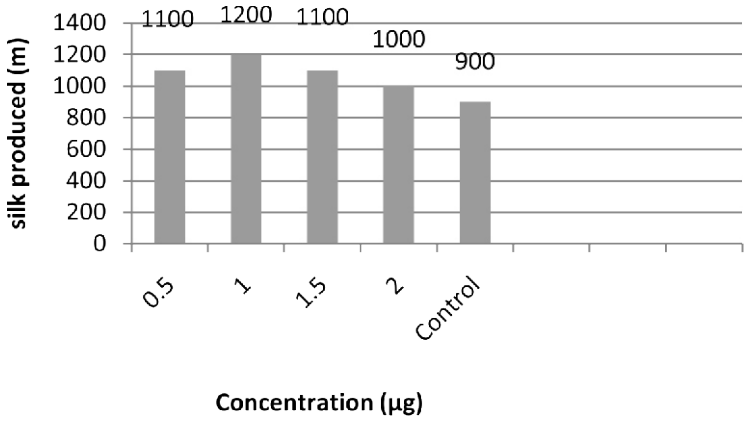



**Figure: 6** shows the productivity of silk at different concentration of Fenoxycarb.

**Discussion**

It is a well known fact that many factors such as weather conditions, feeding habit, diet, chemicals may affect the enzymatic and non-enzymatic compound of insect body (Chang *et al.,* 1972). Methoprene and fenoxycarb is a Juvenile Hormone analogue, which has been used extensively in insect endocrinology to investigate Juvenile Hormone regulation of morphology, reproduction, development, and metabolism (Chowdhary*et al.,* 1986). This study demonstrates that juvenile hormone analogue, methoprene and fenoxycarb (JHA) is proved to be very active at low concentrations and induces physiological changes when applied to fifth instar larvae of silkworm, *Bombyx mori L.* The physiological effects on insects caused by the application of juvenile hormone analogues vary according to the product rate (Chowdhari*et al.,* 1990), insect strain (Kotikal and Devaiah, 1986), application method and time (Murakoshi *et al.,* 1999). This proves that Juvenile Hormone alters the biochemical pathway in insects. The present study results showed that the application of methoprene causes increase in cocoon weight, shell weight, and extension of the fifth instar larval period. The extension is highly

related to the quantity, i.e., increase in the quantity resulted in linear increase of the larval period of the treated larvae (Subba Rao *et al.,* 2000). Moreover, the effect of the juvenile hormone analogue on insects is through the influence on their morphogenesis, i.e., causing an increment in weight gain, and a portion of this biomass weight gain is directed to the growth of silk gland and its metabolism (Zera and Zhao, 2000) resulting in increased cocoon weight and shell weight. The results of present study indicate that stimulating capacity of the Juvenile Hormone Analogue on various characteristic of the silkworm contributing to the quality silk yield. Results of present study prove that the appropriate application of Juvenile Hormone methoprene and fenoxycarb brings about significant improvement in silk production.

## Conclusion

The application of 1 µg methoprene and fenoxycarb on fifth instar larvae of *B.mori,* increases their development and silk production, compensating the corresponding reduction of cocooning rate. However, field studies using practical methods of application of the product on the insects, are needed to confirm the benefit of such technique in sericulture.

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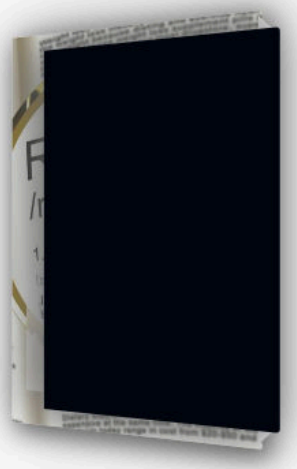
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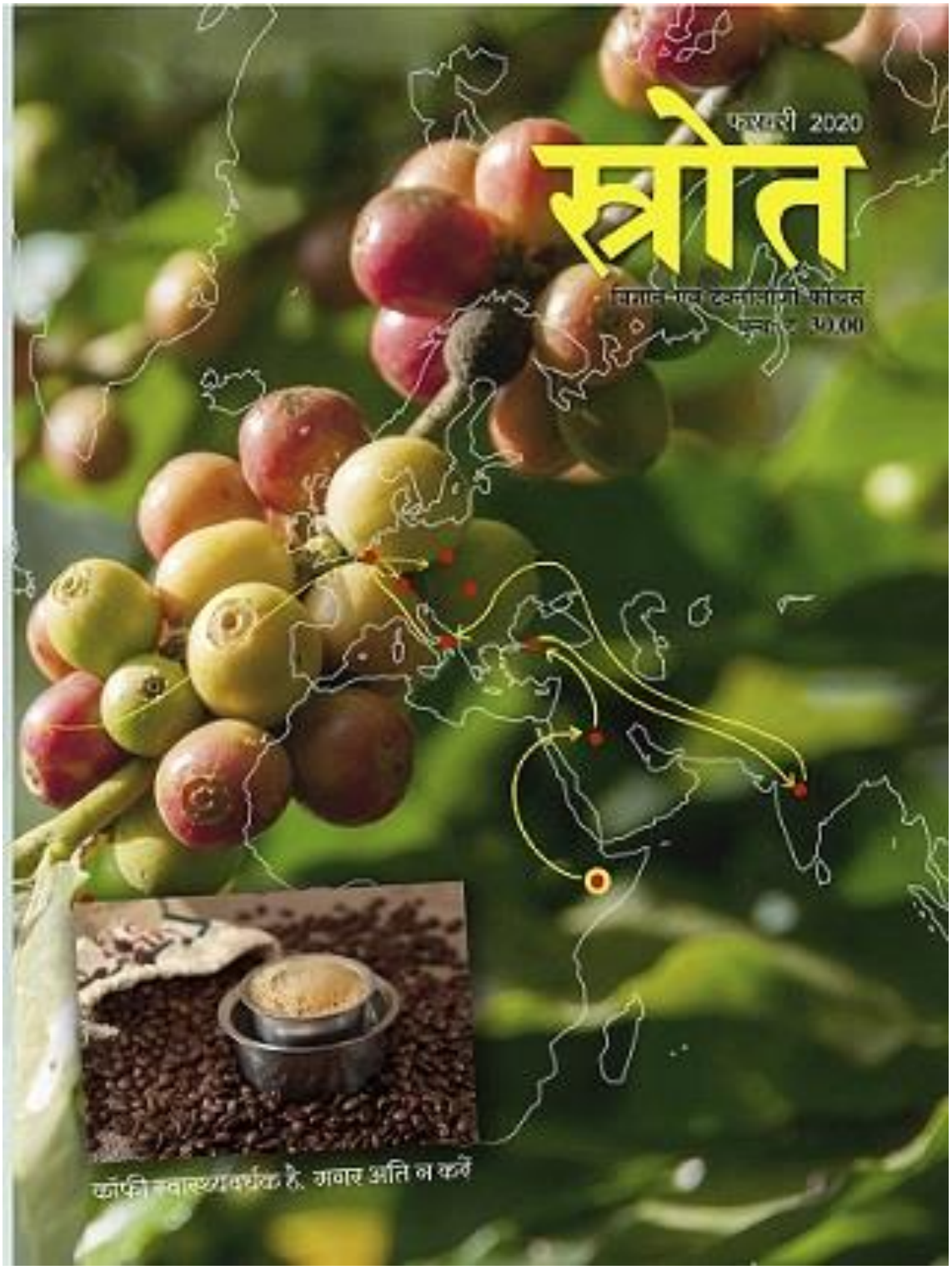
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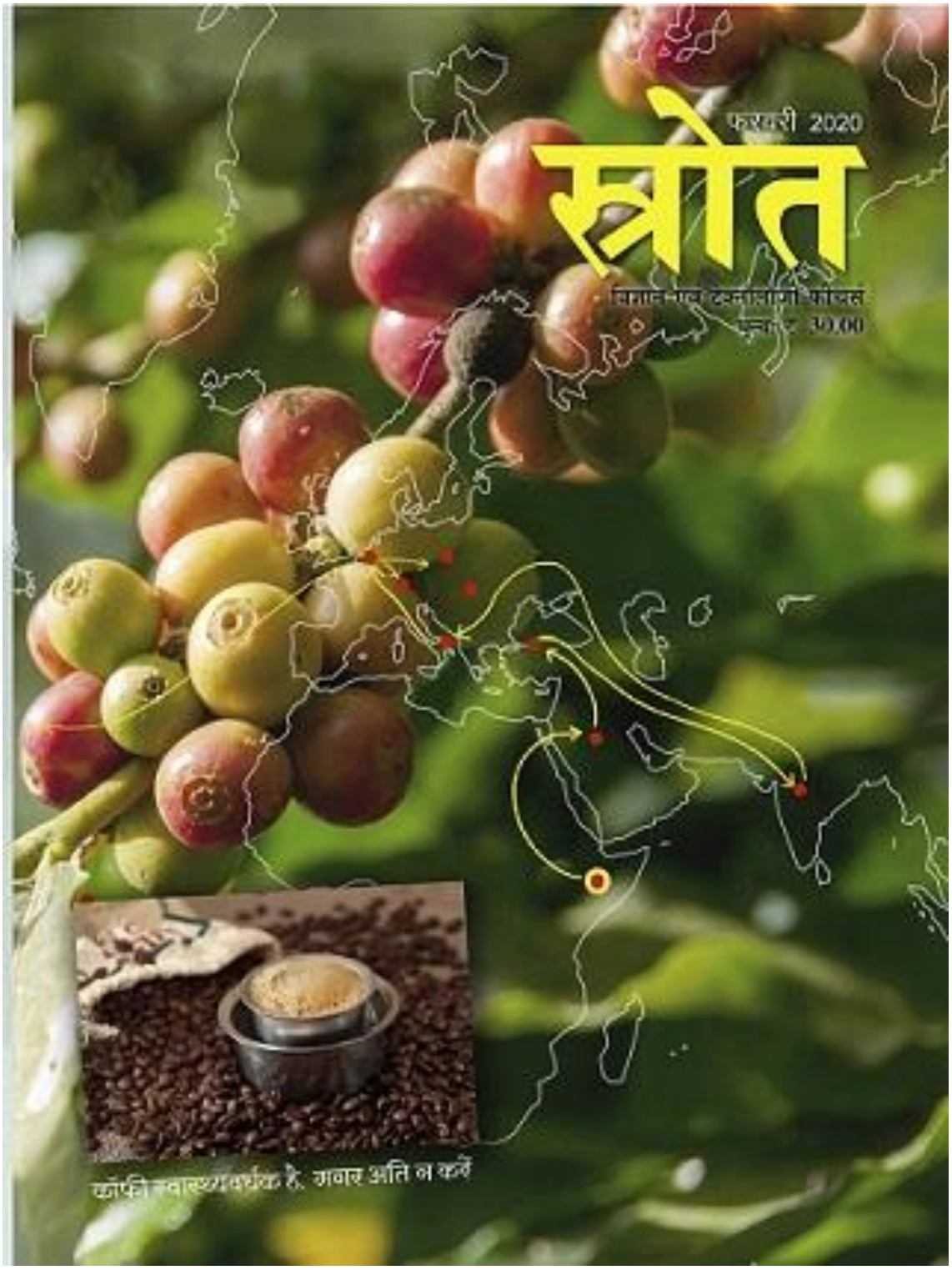


मेक्सिको और कैलिफोर्निया के आसपास मिल्कवीड पौधों की दो दर्जन प्रजातियां मिलती हैं जिन्हें पशु खाना पसंद नहीं करेंगे, चाहे भूखे मर जाएं। इन पौधों से निकलने वाले दूध में कार्डिनोलाइड्स नामक बेहद कड़वे एवं विषाक्त स्टेरॉइड पाए जाते हैं जिन्हें खाने से हृदय गति अनियंत्रित हो जाती है तथा उल्टियां होने लगती हैं।

हर वर्ष बेहद लंबे प्रवास के दौरान मोनार्क तितलियां इन्हीं मिल्कवीड पौधों पर अंडे देती हैं। अंडों से निकली पेटू इल्लियां (कैटरपिलर्स) पत्तियों के साथ विषाक्त दूध का भी सेवन करते हैं परंतु उनका कुछ नहीं बिगड़ता। ये कैटरपिलर्स विष को शरीर में एकत्रित करते रहते हैं। जब वे तितली में परिवर्तित हो जाते हैं तो यही विष तितली के शरीर में आ जाता है। तो सवाल उठता है कि आखिर कैटरपिलर्स और मोनार्क तितली इस अत्यंत प्रभावी विष को क्यों एकत्रित करके शरीर में रखती है और वे खुद इस विष के दुष्प्रभाव से कैसे बची रहती हैं?

प्रकृति में तितलियों और कैटरपिलर्स के कई शिकारी पाए जाते हैं जो मौका मिलते ही उन्हें खा सकते हैं। विष को शरीर में एकत्रित करके रखने से शिकारी इन तितलियों और उनकी इल्लियों को खाने से बचते हैं। शिकारियों से बचने का यह महत्वपूर्ण तरीका है।

## कार्डिनोलाइड्स का कमाल


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6. मलेरिया उन्मूलन की नई राह नवनीत कुमार गुप्ता
7. खसरा का आक्रमण प्रतिरक्षा तंत्र को बिगाड़ता है
8. बाल के एक टुकड़े से व्यक्ति की शिनाख्त
9. क्या आपका डीएनए सुरक्षित है?
10. कॉफी स्वास्थ्यवर्धक है, मगर अति न करें डॉ. डी. बालसुब्रामण्यन
11. वॉम्बेट की विष्ठा घनाकार क्यों होती है? डॉ. विपुल कीर्ति शर्मा
12. मच्छर की आंखों से बनी कृत्रिम दृष्टि एस. अनंतनारायणन
13. ज़हर खाकर मोनार्क तितली कैसे ज़िंदा रहती है? डॉ. विपुल कीर्ति शर्मा
14. करीबी प्रजातियों पर जलवायु परिवर्तन का उल्टा असर
15. एक मस्तिष्कहीन जीव के जटिल निर्णय
16. बिना भोजन के जीवित एक सूक्ष्मजीव
17. नाभिकीय उर्जा को ज़िन्दा रखने के प्रयास एस. अनंतनारायणन
18. अंतरिक्ष में भारत के बढ़ते कदम ज़ाहिद खान
19. 5जी सेवाओं से मौसम पूर्वानुमान पर प्रभाव
20. क्या पढ़ने की गति बढ़ाना संभव है?
21. हम भाषा कैसे सीखते हैं डॉ. डी. बालसुब्रामण्यन

# वॉम्बेट की विष्ठा घनाकार क्यों होती है? -डॉ. विपुल कीर्ति शर्मा



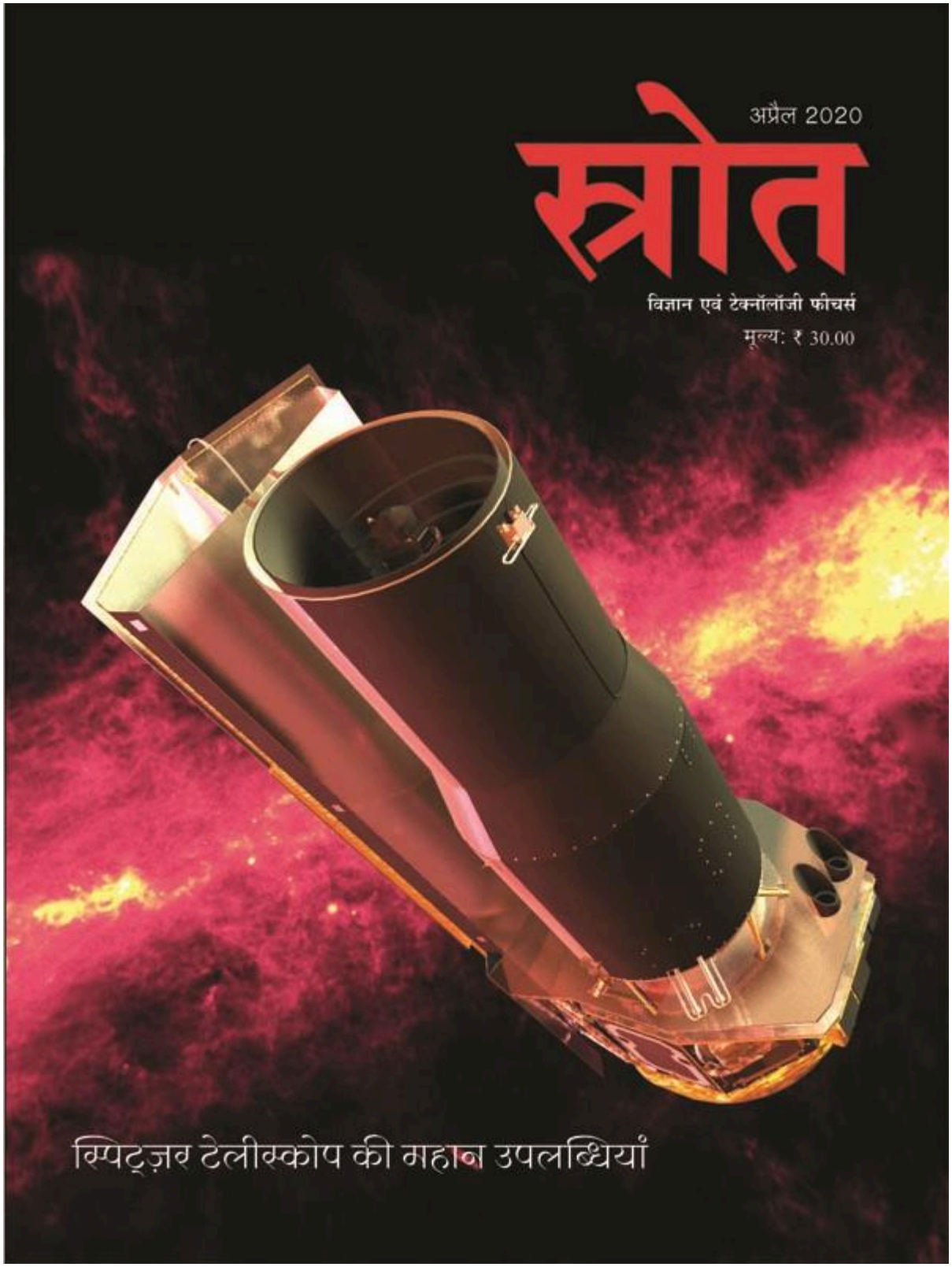


नोबेल पुरस्कारों की घोषणा के बाद हर बार की तरह इस बार के इगनोबेल पुरस्कार की भी घोषणा की गई। 1991 से हर वर्ष इगनोबेल पुरस्कार भी उन वैज्ञानिकों को दिए जाते हैं जिनकी खोज पहले तो सबको हंसाती है और फिर गंभीर चिंतन करने पर विवश करती है। इस वर्ष तस्मानिया में कार्यरत ऑस्ट्रेलिया के शोधार्थी को इस खोज के लिए पुरस्कृत किया गया कि वॉम्बेट नामक जंतु की विष्ठा घनाकार (क्यूब) क्यों होती है। पुरस्कार प्राप्त करने वाली पैट्रेशिया यंग और 5 साथियों को यह पुरस्कार भौतिकी में प्राप्त हुआ।

विश्व के अनेक वैज्ञानिक जंतुओं की विष्ठा पर शोध करके आंकड़े बटोरते हैं। उदाहरण के लिए कई बार वैज्ञानिकों को डायनासौर्स की विष्ठा (कोप्रेलाइट) के 6 करोड़ वर्ष पुराने जीवाश्म प्राप्त होते हैं। विष्ठा का बारीकी से अध्ययन करके यह बताया जा सकता है कि वे मांसाहारी थे या शाकाहारी या सर्वाहारी थे और भोजन में क्या खाते थे – फल-फूल खाते थे, घास खाते थे या छाल खाते थे।

हाल ही में विष्ठा पर शोध के लिए 'इन विट्रो' एवं 'इन विवो' की तर्ज़ पर एक नया शब्द गढ़ा गया है: 'इन-फिमो'। जब शोध टेस्ट ट्यूब, बीकर या पेट्री डिश जैसे कांच के बर्तन में होता है तो उसे 'इन विट्रो' कहते हैं और जब प्रयोग जीवित प्राणी में होता है तो 'इन विवो'। 'फिमो' शब्द लेटिन भाषा के शब्द 'फिमस' से लिया गया है जिसका मतलब 'गोबर' है।

विष्ठा की बातें करना अधिकांश लोगों को बेकार लग सकता है। कुछ एक बीमारी के प्रकरणों में तो डॉक्टर ने भी आपसे मल के नमूने एकत्रित कर प्रयोगशाला में टेस्ट करने भेजे ही होंगे। इसलिए कुछ वैज्ञानिकों के लिए विष्ठा या मल से प्राप्त आंकड़े सोने की खदान हो सकते हैं।


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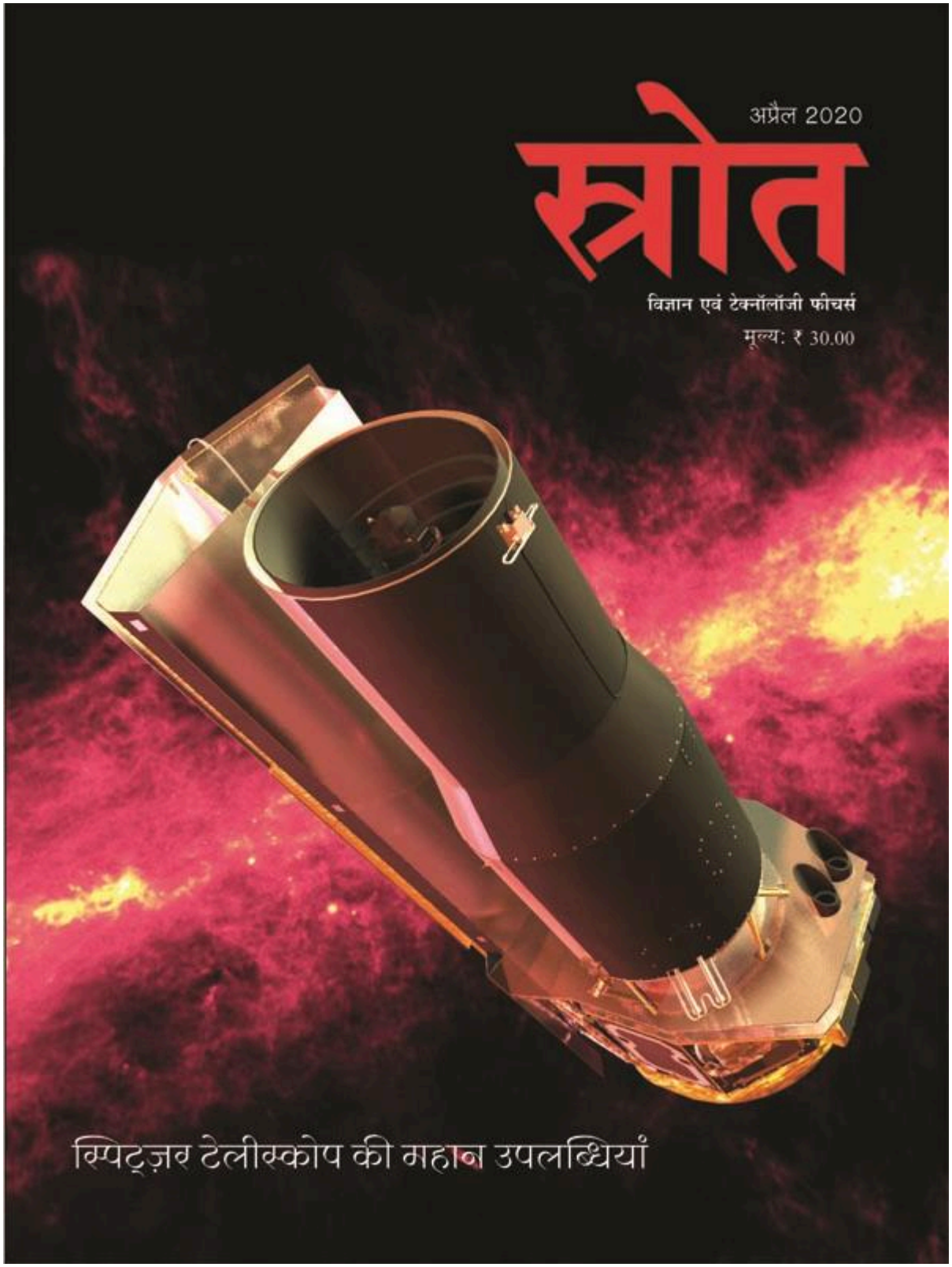

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# साढ़े पांच हज़ार वर्ष पुरानी चुंइंगम – डॉ. विपुल कीर्ति शर्मा




चुंइंगम को चबाते हुए हमने कई अठखेलियां की हैं। हाल ही में दक्षिणी डेनमार्क से 5700 वर्ष पूर्व इंसानों द्वारा चबाए गए टार के टुकड़े प्राप्त हुए हैं। बर्च नामक पेड़ की छाल को चबाने से बनी चिपचिपी एवं काली टार की इस चुंइंगम को चबाते-चबाते उन लोगों ने अपने कई रहस्य उसमें कैद कर दिए। इनकी मदद से आज के वैज्ञानिक उनके रहन-सहन और खान-पान की आदतों का पता लगा सकते हैं।

5700 वर्ष पूर्व के प्राचीन डेनमार्क निवासी शिकार करके अपना जीवन यापन करते थे। वे तीर के सिरे पर नुकीले पत्थर चिपकाने के लिए या पत्थरों के सूक्ष्म औजारों को लकड़ी पर चिपकाने के लिए चिपचिपे टार का उपयोग करते थे। टार प्राप्त होता था बर्च नामक पेड़ की छाल को चबाने से। लगातार चबाने से टार चुंइंगम के समान नरम हो जाता था और औज़ारों को चिपकाने-सुधारने के काम आता था। शायद, टार में पाए जाने वाले एन्टिसेप्टिक तेल और रसायन का उपयोग दांत दर्द से राहत पहुंचाने के लिए भी किया जाता हो। यह भी हो सकता है कि आज के बच्चों के समान उस समय के बच्चे भी टार की चुंइंगम से खिलवाड़ करते रहे हों। टार की चुंइंगम को चबाते-चबाते मुंह के अंदर की टूटी कोशिकाएं, भोजन के कण एवं सूक्ष्मजीव भी उसमें संरक्षित हो गए थे। यह प्राचीन चुंइंगम वैज्ञानिकों को प्राचीन मानव के डीएनए का अध्ययन करने का बेहतरीन अवसर दे रही है।

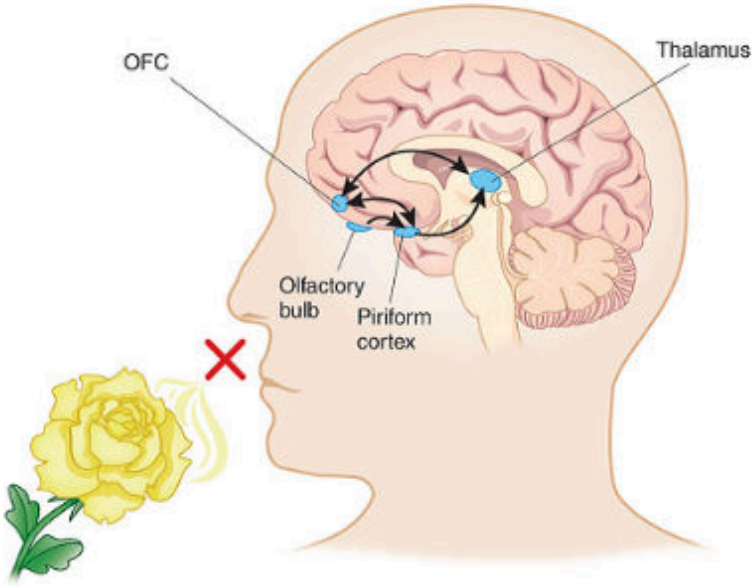

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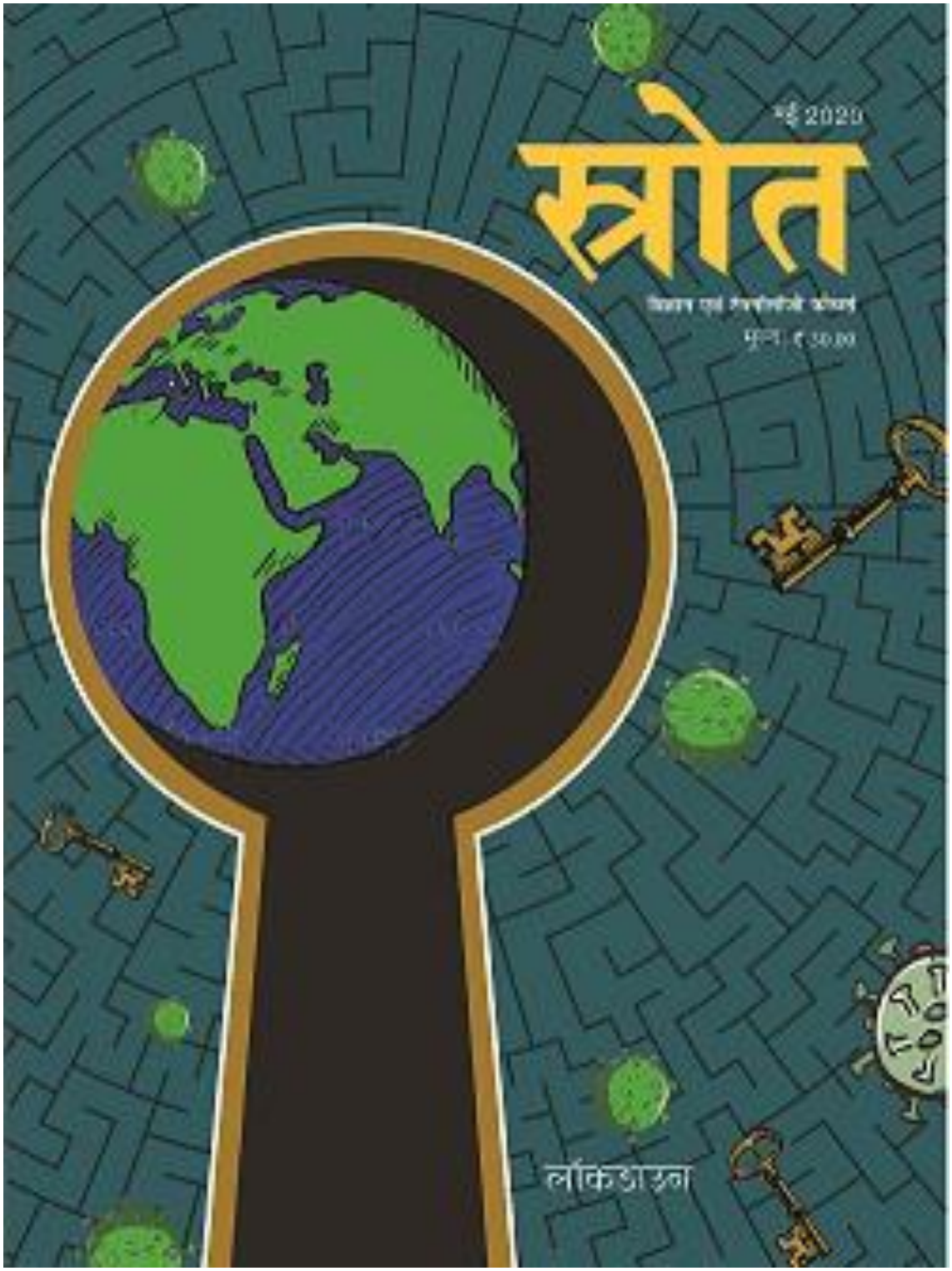

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16. साढ़े पांच हज़ार वर्ष पुरानी चुईंगम डॉ. विपुल कीर्ति शर्मा
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20. आसान नहीं है चीतों का पुनर्वास प्रमोद भार्गव

# गंध और मस्तिष्क का रिश्ता – डॉ. विपुल कीर्ति शर्मा




**गं**ध से हमारा बेहद करीबी रिश्ता रहा है। पकवानों की खुशबू से ही हम यह बता देते हैं कि पड़ोसी के घर में क्या बना है। गरमा-गरम कचोरी, कढ़ाई से उतरती सेव व पकोड़े, पके आम व खरबूज़े की मीठी खुशबू हो या चंदन, गुलाब, मोगरा, चंपा आदि के इत्र की मदहोश कर देने वाली गंध हमें दीवाना बनाने के लिए काफी है। अलबत्ता, हममें से कुछ ऐसे भी हैं जो तपेली में जलते हुए दूध, बासी दाल और हींग जैसी तेज़ गंध को भी नहीं सूंघ पाते।

स्वाद की तरह गंध भी एक रासायनिक संवेदना है। हमारे आसपास का वातावरण गंध के वाष्पशील अणुओं से भरा हुआ है। जब हम नाक से सांस खींचते हैं तो गंध के अणु नाक के भीतर रासायनिक ग्राहियों से क्रिया करके संदेश को मस्तिष्क में पहुंचा देते हैं। अभी तक यही समझा जाता था कि मस्तिष्क के कुछ विशेष हिस्से (जैसे घ्राण बल्ब) गंध संदेशों की विवेचना कर हमें गंध का बोध कराते हैं। लेकिन कुछ ही समय पहले एक शोध टीम ने कुछ ऐसी महिलाओं की खोज की है जिनकी सूंघने की क्षमता तो सामान्य है परन्तु उनके मस्तिष्क में घ्राण बल्ब नहीं है।


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1. व्योम मित्र: एक मानव-रोबोट डॉ आनंद कुमार शर्मा
2. तोतों में मनुष्यों के समान अंदाज़ लगाने की क्षमता
3. सत्रहवीं शताब्दी की पहेली भंवरे की मदद से सुलझी
4. कोविड-19 के खिलाफ लड़ाई की प्रगति डॉ. डी. बालसुब्रामण्यन
5. कोविड-19 मरीज़ की देखभाल
6. कोरोना वायरस किसी सतह पर कितनी देर रहता है?
7. कोरोनावायरस पर जीत की तैयारी डॉ. डी. बालसुब्रामण्यन
8. कोरोना के खिलाफ लड़ाई में टेक्नॉलॉजी बना हथियार प्रदीप
9. कोरोना संक्रमितों की सेवा में अब रोबोट जाहिद खान
10. चेहरा छुए बिना रहना इतना कठिन क्यों है?
11. कोरोना वायरस के खिलाफ दवाइयों के जारी परीक्षण
12. गर्भ में कोरोनावायरस से संक्रमण की आशंका
13. कोरोना वायरस किसी प्रयोगशाला से नहीं निकला है
14. कोरोना वायरस के रुोत पर गहराता रहस्य
15. चिड़िया घर में बाघिन कोरोना संक्रमित
16. लंबे जीवन का रहस्य
17. बुढ़ापे की जड़ में एक एंज़ाइम एस. अनंतनारायणन
18. क्या तनाव से बाल सफेद हो जाते हैं?
19. कृत्रिम बुद्धि से एंटीबायोटिक की खोज प्रदीप
20. अस्पतालों में कला और स्वास्थ्य डॉ. डी. बालसुब्रामण्यन
21. कोशिकाओं की खुदकुशी - एपोप्टोसिस डॉ. विपुल कीर्ति शर्मा
22. मिर्गी के दौरे में जूता सुंघाना कहां तक सही? कालू राम शर्मा

# कोशिकाओं की खुदकुशी – एपोप्टोसिस

वर्षा ऋतु में प्रकृति सजीव हो उठती है। कीट-पतंगे, मकड़ियां और नाना प्रकार के जीव जंतु दिखाई पड़ने लगते हैं। मेंढकों का भी यह प्रजनन काल होता है। नर मेंढक ज़ोर-ज़ोर से टर्रा कर मादा को आमंत्रित करते हैं। और मादा भी उनके प्रणय निवेदन को स्वीकार कर खिंची चली आती है।प्रजनन के दौरान मादा मेंढक पानी में अंडे देती है और नर अपने शुक्राणु उनपर छिड़क देता है। अंडों से टैडपोल बनता है और उसके बाद मेंढक। संरचना और स्वभाव में टैडपोल मेंढक से काफी भिन्न होते हैं। टैडपोल पानी में रहते हैं, गलफड़ों से श्वसन करते हैं, शाकाहारी होते हैं और काई कुतर कर खाते हैं। इनकी आंत बहुत लंबी होती है और तैरने के लिए इनमें पूंछ भी होती है। दूसरी ओर, मेंढक पानी और ज़मीन दोनों जगह रहते हैं। त्वचा और फेफड़ों से श्वसन करते हैं। मांसाहारी होते हैं, छोटे-मोटे जीव जंतुओं का शिकार करते हैं। इनकी आंत भी छोटी होती है, पूंछ नहीं होती लेकिन चलने और तैरने के लिए इनके पास बढ़िया अनुकूलित टांगें होती हैं।

जब टैडपोल से वयस्क मेंढक बनता है तो उसकी पूंछ और गलफड़े कहां चले जाते हैं? ये टूट कर गिरते नहीं बल्कि अवशोषित कर लिए जाते हैं।

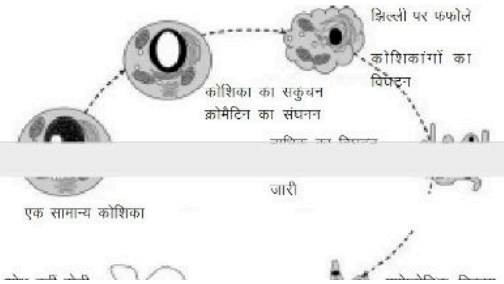
टैडपोल से मेंढक बनने जैसा ही कुछ-कुछ तितली के जीवन में भी घटता है। इनके अंडों से कैटरपिलर (इल्ली) निकलते हैं। कैटरपिलर खूब फूल-पत्तियां खाते हैं। उसके बाद वे एक प्यूपा (शंखी) में बदल जाते हैं। और फिर एक दिन प्यूपा में से तितली निकलती है। तितली कैटरपिलर से बिल्कुल अलग होती है। जहां लंबे कैटरपिलर में चलने के लिए अनेक टांगों जैसी रचनाएं होती हैं, पत्तियों को कुतर-कुतर कर खाने के लिए मज़बूत जबड़े होते हैं वहीं तितलियों में फूल का रस पीने के लिए लंबी स्ट्रॉ के समान सूंड (प्रोबोसिस) नाम की नली होती है, चलने के लिए 3 जोड़ी टांगें और उड़ने के लिए पंख होते हैं।

टैडपोल और कैटरपिलर दोनों में ही अनेक अंग वयस्क होने पर बदल जाते हैं। पुराने अंग नष्ट होकर अवशोषित हो जाते हैं और नए अंगों का निर्माण होता है। अर्थात प्रत्येक प्राणी में विकास के दौरान अनेक पुरानी और टूटी-फूटी कोशिकाएं बेकार हो जाने पर निर्धारित कार्यक्रम के अनुसार नष्ट हो जाती हैं। कोशिका के नष्ट होने की इस प्रक्रिया को एपोप्टोसिस या तयशुदा कोशिका मृत्यु (प्रोग्राम्ड सेल डेथ) कहते हैं।

हमारे शरीर की प्रत्येक कोशिका की निश्चित आयु होती है। जैसे रक्त में पाई जाने वाली लाल रक्त कोशिकाएं मात्र 120 दिन जीवित रहती हैं। इनकी भरपाई के लिए कोशिका विभाजन द्वारा निरंतर नई कोशिकाएं बनती रहती हैं।

प्राय: कोशिकाओं की मृत्यु चोट, संक्रमण, विकिरण या रसायनों आदि के कारण होती हैं। यह आत्मघात नहीं है। इसे नेक्रोसिस कहते हैं। इसमें कोशिकाएं स्वेच्छा से नहीं मरतीं, उनकी हत्या होती है। किन्तु एपोप्टोसिस आंतरिक या बाह्य कारणों से, शरीर के हित में स्वैच्छिक आत्म बलिदान है, मृत्यु का वरण है। शरीर के रोगों से और दर्द से बचाने का तरीका है।

नेक्रोसिस और एपोप्टोसिस में कोशिकाएं भिन्न प्रकार से नष्ट होती हैं। कोशिका मृत्यु के दोनों प्रकार नेक्रोसिस और एपोप्टोसिस की विधियों में भिन्नता आसानी से पहचानी जा सकती है।




Log

सभी लक्षण परिलक्षित होते हैं। दर्द महसूस होता है। कोशिकाएं फूल जाती है और उनका ढांचा और उनकी अखंडता नष्ट हो जाती है। कोशिकांग फूल कर फूटने लगते हैं। यह सब अव्यवस्थित ढंग से होता है।

# Srote - June 2020

[Download entire magazine]





1. कोविड-19: कंटेनमेंट बनाम मेनेजमेंट मिलिंद सोहोनी
2. कोविड-19 महामारी बनाम डिजिटल महामारी अनुराग मेहरा
3. कोविड-19 उपचार: भगदड़ में विज्ञान दरकिनार
4. कोरोनावायरस से उबरने का मतलब क्या है?
5. आइंस्टाइन एक बार फिर सही साबित हुए
6. कोविड-19 वायरस और इसके पॉलीप्रोटीन डॉ. डी. बालसुब्रामण्यन
7. कोविड-19 से निपटने में इबोला अनुभव से सीख भारत डोगरा
8. शरीर में कोरोनावायरस की जटिल यात्रा पर एक नज़र
9. क्या कोरोनावायरस के विरुद्ध झुंड प्रतिरक्षा संभव है? डॉ. विपुल कीर्ति शर्मा
10. क्या कोविड-19 में मददगार होगा प्लाज़्मा उपचार? डॉ. विपुल कीर्ति शर्मा
11. कोविड-19 टीके के लिए मानव चुनौती अध्ययन
12. वायरस उत्पत्ति के बेबुनियाद दावे प्रदीप
13. आपदा के बीच नए शोध और नवाचार मनीष श्रीवास्तव
14. शरीर में कोरोनावायरस का उपद्रव
15. प्रजातियों के बीच फैलने वाली जानलेवा बीमारियां
16. ऐसा क्यों लगता है कि यह पहले हो चुका है?
17. एंज़ाइम की मदद से प्लास्टिक पुनर्चक्रण
18. युनिस फुट - जलवायु परिवर्तन पर समझ की जननी
19. वायरस का तोहफा है स्तनधारियों में गर्भधारण कालू राम शर्मा
20. वायरस रोगों का इलाज भी कर सकते हैं कालू राम शर्मा
21. सरगम एक प्रागैतिहासिक तोहफा है डॉ. डी. बालसुब्रामण्यन
22. पसीना - नैदानिक उपकरण और विद्युत स्रोत डॉ. डी. बालसुब्रामण्यन
23. नर लीमर अपनी पूंछ से 'प्रेम रस' फैलाते हैं
24. क्या सफेद अफ्रीकी गैंडों का अस्तित्व बचेगा? डॉ. विपुल कीर्ति शर्मा

# क्या कोविड-19 के विरुद्ध झुंड प्रतिरक्षा संभव है?

दुनिया भर में तेज़ी से फैलते कोविड-19 के कारण हम सब घरों में कैद होकर रह गए हैं। कोरोना वायरस के संक्रमण के प्रारंभ में यूनाइटेड किंगडम ने लोगों के एकत्रित होने पर रोक तथा कठोर सोशल डिस्टेंसिंग लागू नहीं किया था। यद्यपि चिकित्सा समुदाय के अनेक लोग रोक न लगाने से आश्चर्यचकित थे, फिर भी अधिकारियों की योजना पूरी तरह बंद की बजाय क्रमिक प्रतिबंधों के माध्यम से वायरस को दबाने की थी। प्रयास था कि प्राकृतिक तरीके से झुंड प्रतिरक्षा विकसित की जाए। झुंड प्रतिरक्षा को सामुदायिक प्रतिरक्षा भी कहते हैं क्योंकि इस में पूरे समुदाय में प्रतिरक्षा क्षमता विकसित होती है।

**क्या है झुंड प्रतिरक्षा?**

झुंड प्रतिरक्षा तब होती है जब एक समुदाय के अनेक लोग एक संक्रमणकारी बीमारी के प्रतिरोधी हो जाते हैं जिसके कारण रोग फैलने से रुक जाता है। झुंड प्रतिरक्षा दो प्रकार से प्राप्त हो सकती है - प्रथम, जब समुदाय के अनेक व्यक्ति बीमारी से संक्रमित हो जाते हैं और कुछ समय में प्रतिरक्षा तंत्र बगैर किसी दवाई या वैक्सीन के बीमारी को हराकर व्यक्ति को ठीक कर देता है।

झुंड प्रतिरक्षा प्राप्त करने का दूसरा तरीका है टीकाकरण यानी वैक्सिनेशन। इस तरीके में रोगजनक परजीवी को प्रयोगशाला में रसायनों या अन्य तरीकों से इतना कमज़ोर कर दिया जाता है कि वह प्रजनन और रोग उत्पन्न करने में असमर्थ हो जाता है। फिर उसे पोषक के शरीर में डाला जाता है। परजीवी के रसायन (प्रोटीन) पोषक के शरीर में प्रतिरक्षा तंत्र को एंटीबॉडी बनाने के लिए उत्तेजित तो करते हैं पर बीमार नहीं कर पाते। इस प्रकार शरीर परजीवी से लड़ने के तरीके विकसित कर लेता है और बीमार भी नहीं होता है। कुछ प्रकार के वैक्सीन में बीमारी के बेहद हल्के लक्षण (जैसे बुखार वगैरह) दिख सकते हैं। जब जनसंख्या के बड़े भाग में वैक्सिनेशन हो जाता है तो बीमारी पूर्ण रूप से खत्म हो जाती है क्योंकि परजीवी को कोई संवेदी पोषक नहीं मिलता और हमें झुंड प्रतिरक्षा मिल चुकी होती है।

कुछ बीमारियों के खिलाफ झुंड प्रतिरक्षा बेहतर कार्य करती है तो कुछ के लिए यह तरीका फेल हो जाता है। चेचक को मानव इतिहास की सबसे भयानक बीमारियों में से एक माना जाता है। वैक्सिनेशन से चेचक के सफाए के बारे में एडवर्ड जेनर के शोध प्रकाशन के लगभग 200 वर्षों बाद 1980 में विश्व स्वास्थ संगठन ने विश्व को चेचक मुक्त घोषित किया क्योंकि विश्व की जनसंख्या का बहुत बड़ा भाग वैक्सिनेट हो गया था।

अनेक प्रकार के वायरल एवं बैक्टीरियल इन्फेक्शन एक व्यक्ति से दूसरे व्यक्ति में फैलते हैं। यह शृंखला तब टूटती है जब अधिकांश लोग संक्रमित नहीं होते या संक्रमण नहीं फैलाते। यह उन लोगों की रक्षा करने में मदद करता है जो वैक्सिनेशन नहीं करवाते हैं या जिनका प्रतिरक्षा तंत्र कमज़ोर है या वे आसानी से संक्रमित हो जाते हैं। आसानी से संक्रमित होने वाले व्यक्तियों में - बूढ़े, बच्चे, नवजात शिशु, गर्भवती महिलाएं, कमज़ोर प्रतिरक्षा या कुछ गंभीर स्वास्थ्य स्थितियों वाले लोग हो सकते हैं।

**झुंड प्रतिरक्षा के आंकड़े**

कुछ बीमारियों के लिए झुंड प्रतिरक्षा तब प्रभावी हो सकती है जब किसी आबादी में 40 प्रतिशत लोग रोग के लिए प्रतिरोधी हो जाएं। लेकिन ज़्यादातर मामलों में आबादी के 80-95 प्रतिशत लोग प्रतिरोधी होने पर ही बीमारी को फैलने को रोका जा सकता है।

उदाहरण के लिए खसरा (मीज़ल्स) की प्रभावी झुंड प्रतिरक्षा विकसित करने के लिए 20 में से 19 व्यक्तियों को खसरे का टीका लगना चाहिए। इसका मतलब यह हुआ कि अगर एक बच्चे को खसरा होता है तो उसके आसपास की आबादी में सभी को वैक्सिनेट करना होगा ताकि बीमारी को फैलने से रोका जा सके। यदि खसरे से पीड़ित बच्चे के आसपास अधिक लोग बगैर वैक्सिनेशन के होंगे तो बीमारी अधिक आसानी से फैल सकती है क्योंकि कोई झुंड प्रतिरक्षा नहीं है। यानी एक निश्चित प्रतिशत ऐसे लोगों का होना चाहिए जो बीमारी को आगे फैलने से रोकेंगे। इस प्रतिशत को झुंड प्रतिरक्षा का न्यूनतम स्तर या थ्रेशोल्ड कहते हैं।

# Srote - June 2020

[Download entire magazine]





1. कोविड-19: कंटेनमेंट बनाम मेनेजमेंट मिलिंद सोहोनी
2. कोविड-19 महामारी बनाम डिजिटल महामारी अनुराग मेहरा
3. कोविड-19 उपचार: भगदड़ में विज्ञान दरकिनार
4. कोरोनावायरस से उबरने का मतलब क्या है?
5. आइंस्टाइन एक बार फिर सही साबित हुए
6. कोविड-19 वायरस और इसके पॉलीप्रोटीन डॉ. डी. बालसुब्रामण्यन
7. कोविड-19 से निपटने में इबोला अनुभव से सीख भारत डोगरा
8. शरीर में कोरोनावायरस की जटिल यात्रा पर एक नज़र
9. क्या कोरोनावायरस के विरुद्ध झुंड प्रतिरक्षा संभव है? डॉ. विपुल कीर्ति शर्मा
10. क्या कोविड-19 में मददगार होगा प्लाज़्मा उपचार? डॉ. विपुल कीर्ति शर्मा
11. कोविड-19 टीके के लिए मानव चुनौती अध्ययन
12. वायरस उत्पत्ति के बेबुनियाद दावे प्रदीप
13. आपदा के बीच नए शोध और नवाचार मनीष श्रीवास्तव
14. शरीर में कोरोनावायरस का उपद्रव
15. प्रजातियों के बीच फैलने वाली जानलेवा बीमारियां
16. ऐसा क्यों लगता है कि यह पहले हो चुका है?
17. एंज़ाइम की मदद से प्लास्टिक पुनर्चक्रण
18. युनिस फुट - जलवायु परिवर्तन पर समझ की जननी
19. वायरस का तोहफा है स्तनधारियों में गर्भधारण कालू राम शर्मा
20. वायरस रोगों का इलाज भी कर सकते हैं कालू राम शर्मा
21. सरगम एक प्रागैतिहासिक तोहफा है डॉ. डी. बालसुब्रामण्यन
22. पसीना - नैदानिक उपकरण और विद्युत स्रोत डॉ. डी. बालसुब्रामण्यन
23. नर लीमर अपनी पूंछ से 'प्रेम रस' फैलाते हैं
24. क्या सफेद अफ्रीकी गैंडों का अस्तित्व बचेगा? डॉ. विपुल कीर्ति शर्मा

# क्या सफेद अफ्रीकी गैंडों का अस्तित्व बचेगा?

20वीं शताब्दी की शुरुआत तक लगभग 5 लाख गैंडे एशिया और अफ्रीका में घूमते थे। कई दशकों से लगातार हो रहे शिकार और प्राकृतिक आवास के नष्ट होने से सभी राष्ट्रीय उद्यानों में भी गैंडों की संख्या बेहद कम हो चुकी है।

अफ्रीका के पश्चिमी काले गैंडे और उत्तरी सफेद गैंडे हाल के वर्षों में जंगल से विलुप्त हो गए हैं। गैंडों के संरक्षण में जुटे वैज्ञानिकों और अन्य कार्यकर्ताओं को तब झटका लगा जब केन्या के एक संरक्षण स्थल पर 24 घंटे गार्ड की निगरानी में रखे गए अंतिम तीन उत्तरी सफेद गैंडों में से एक 44 वर्ष की आयु में मर गया। शोधकर्ताओं की अंतर्राष्ट्रीय टीम अनेक वर्षों से इन गैंडों को प्रजनन कराने का भरसक प्रयास कर रही थी। कुछ समय पहले ही इन विट्रो-निषेचन की तकनीक से गैंडे के दो अंडाणुओं को प्रयोगशाला में सफलता पूर्वक निषेचित करने से वैज्ञानिकों ने गैंडों को बचाने के लिए एक बार फिर उम्मीद जगा दी है।



ऐसा माना जाता है कि अफ्रीका के उत्तरी सफेद गैंडे 2007-08 में जंगलों से विलुप्त हो चुके थे। इन गैंडों की एक छोटी-सी आबादी चिड़ियाघरों में ही शेष बची थी। परंतु समस्या यह थी कि चिड़ियाघर में बचे गैंडे किसी कारण से प्रजनन करने में सक्षम नहीं थे। 2014 में बचे शेष तीन उम्मदराज़ गैंडों में से अकेला नर भी मर गया। नर के मर जाने के पूर्व भी दोनों मादाओं को प्राकृतिक तथा कृत्रिम तरीके से गर्भधारण करने के लिए प्रोत्साहित किया गया पर नतीजा शून्य रहा। इसी वर्ष अगस्त माह में वैज्ञानिकों ने दोनों बची हुई मादाओं से 10 अंडाणु शरीर के बाहर निकालने में सफलता प्राप्त की। मरने के पूर्व नरों से एकत्रित किए गए शुक्राणुओं के द्वारा अंडों को निषेचित किया जा सकता है। योजना के अनुसार दोनों मादा गैंडों से कुल 10 अंडाणु प्राप्त किए गए।

क्रेमोना, इटली में स्थित एवांटिया प्रयोगशाला के इस कार्य से जुड़े एक वैज्ञानिक ने बताया कि 10 में से केवल 7 अंडाणु ही शुक्राणु द्वारा निषेचन के लिए उपयुक्त पाए गए। अंत में केवल दो अंडाणु भ्रूण में बदले। दोनों भ्रूणों को भविष्य में उपयुक्त मादा गैंडों में प्रत्यारोपित करने के पूर्व बर्फ में जमा कर संरक्षित कर लिया गया है।

यद्यपि भ्रूण को सरोगेट मां में स्थापित कर जन्म तक देखभाल करने की तकनीक मनुष्यों में बेहद सामान्य हो गई है परंतु गैंडे में इस प्रकार के प्रयोग पहली बार किए जा रहे हैं। वैज्ञानिक सरोगेट मां के रूप में स्वस्थ दक्षिणी सफेद मादा को भी खोज रहे हैं। वैज्ञानिकों के पास दो भ्रूण संरक्षित हैं।

गैंडों में भ्रूण प्रत्यारोपण एक बेहद कठिन कार्य है। आशा करते हैं कि वैज्ञानिकों के प्रयास से गैंडे की प्रजाति को बचाया जा सकेगा। यद्यपि उत्तरी सफेद गैंडों की पूरी तरह वापसी के लिए उपरोक्त प्रयोगों को कई बार दोहराने की ज़रूरत होगी। वैज्ञानिकों के पास केवल दो बूढ़ी गैंडा मादाएं शेष हैं जिनसे अभी और अंडाणु प्राप्त किए जा सकते हैं। केवल चार नरों से प्राप्त शुक्राणुओं की उपलब्धि के कारण आनुवंशिक विविधता बहुत कम रह गई है। यदि मृत गैंडों की जमी हुई (फ्रोज़न) कायिक कोशिकाओं के जीन्स को भी मिला लिया जाए तो जीन समूह 12 गैंडों का हो जाता है। अगर इन मृत गैंडों की संग्रहित जीवित स्टेम कोशिकाओं को प्रेरित कर अंडाणुओं और शुक्राणुओं में बदल दिया जाए तो काम और आसान हो जाएगा। वैज्ञानिक जुटे हुए हैं और आशा करें कि एक दिन उत्तरी सफेद गैंडे का शिशु पुन: दौड़ता दिखेगा।**(स्रोत फीचर्स)**

# Srote - June 2020

[Download entire magazine]





1. कोविड-19: कंटेनमेंट बनाम मेनेजमेंट मिलिंद सोहोनी
2. कोविड-19 महामारी बनाम डिजिटल महामारी अनुराग मेहरा
3. कोविड-19 उपचार: भगदड़ में विज्ञान दरकिनार
4. कोरोनावायरस से उबरने का मतलब क्या है?
5. आइंस्टाइन एक बार फिर सही साबित हुए
6. कोविड-19 वायरस और इसके पॉलीप्रोटीन डॉ. डी. बालसुब्रामण्यन
7. कोविड-19 से निपटने में इबोला अनुभव से सीख भारत डोगरा
8. शरीर में कोरोनावायरस की जटिल यात्रा पर एक नज़र
9. क्या कोरोनावायरस के विरुद्ध झुंड प्रतिरक्षा संभव है? डॉ. विपुल कीर्ति शर्मा
10. क्या कोविड-19 में मददगार होगा प्लाज़्मा उपचार? डॉ. विपुल कीर्ति शर्मा
11. कोविड-19 टीके के लिए मानव चुनौती अध्ययन
12. वायरस उत्पत्ति के बेबुनियाद दावे प्रदीप
13. आपदा के बीच नए शोध और नवाचार मनीष श्रीवास्तव
14. शरीर में कोरोनावायरस का उपद्रव
15. प्रजातियों के बीच फैलने वाली जानलेवा बीमारियां
16. ऐसा क्यों लगता है कि यह पहले हो चुका है?
17. एंज़ाइम की मदद से प्लास्टिक पुनर्चक्रण
18. युनिस फुट - जलवायु परिवर्तन पर समझ की जननी
19. वायरस का तोहफा है स्तनधारियों में गर्भधारण कालू राम शर्मा
20. वायरस रोगों का इलाज भी कर सकते हैं कालू राम शर्मा
21. सरगम एक प्रागैतिहासिक तोहफा है डॉ. डी. बालसुब्रामण्यन
22. पसीना - नैदानिक उपकरण और विद्युत स्रोत डॉ. डी. बालसुब्रामण्यन
23. नर लीमर अपनी पूंछ से 'प्रेम रस'फैलाते हैं
24. क्या सफेद अफ्रीकी गैंडों का अस्तित्व बचेगा? डॉ. विपुल कीर्ति शर्मा

# क्या कोविड-19 में मददगार होगा प्लाज़्मा उपचार?

तेज़ी से फैल रहे कोविड-19 संक्रमण को रोकने के लिए वैज्ञानिक उपाय खोजने में लगे हैं। हाल ही में भारत की शीर्ष संस्था आईसीएमआर ने कोविड-19 मरीज़ों के इलाज के लिए प्लाज़्मा उपचार के ट्रायल की अनुमति दी है। चीन में कोविड-19 संक्रमण से ठीक हुए रोगियों के रक्त में कोविड-19 के विरुद्ध एंटीबॉडीज़ से रोगियों का इलाज करने की संभावना देखी जा रही है। भारत में आईसीएमआर द्वारा विभिन्न संस्थाओं को क्लीनिकल ट्रायल्स प्रारंभ करने का आमंत्रण देने का कारण यह जानना है कि कोविड-19 संक्रमण के विरुद्ध बनी एंटीबॉडी रोगग्रस्त व्यक्तियों के इलाज में कितनी असरदार साबित होती हैं।

बैक्टीरिया, फफूंद, वायरस जैसे रोगाणुओं के लिए हमारा शरीर एक आदर्श आवास है। सर्दी या फ्लू के वायरस पर तो हमारा शरीर ज़्यादा ही मेहरबान प्रतीत होता है। जब रोगाणु हमारे शरीर में प्रवेश करते हैं तो बी तथा टी प्रतिरक्षा कोशिकाएं उन्हें नष्ट करने में लग जाती हैं।

बी-प्रतिरक्षा कोशिकाएं रोगाणुओं पर उपस्थित एंटीजन से जुड़कर प्लाज़्मा कोशिकाओं का निर्माण करती है। प्लाज़्मा कोशिकाएं विभाजित होकर असंख्य प्लाज़्मा कोशिकाएं बनाती हैं जो तेज़ी से एंटीबॉडीज़ का निर्माण करने लगती है। चूंकि ये एंटीबॉडी खास रोगाणुओं के विरुद्ध बनती हैं इसलिए दूसरी बीमारी के रोगाणुओं के विरुद्ध कार्यवाही नहीं कर सकती है। जब शरीर में प्रतिरक्षा कोशिकाओं को एक अपरिचित एंटीजन का पता लगता है तो प्लाज़्मा कोशिकाओं को पर्याप्त रूप में एंटीबॉडी उत्पन्न करने में दो सप्ताह तक का समय लग सकता है। अत्यधिक मात्रा में निर्मित एंटीबॉडीज़ को रक्त रोगाणुओं के आगमन स्थानों पर पहुंचाता है जहां एंटीबॉडीज़ रोगाणुओं को बांधकर उन्हें अक्रिय कर देती हैं जिन्हें भक्षी कोशिकाएं खा जाती हैं।

एंटीबॉडीज़ एकत्रित के लिए पूरी तरह ठीक हो चुके व्यक्ति के शरीर से लगभग 800 मिलीलीटर रक्त निकाला जाता है और रक्त से प्लाज़्मा को अलग किया जाता है। प्लाज़्मा अलग होने के बाद लाल रक्त कोशिकाओं को सलाइन में मिलाकर वापस दानदाता के शरीर में डाल दिया जाता है। प्लाज़्मा में से खून का थक्का जमाने वाले प्रोटीन फाइब्रिनोजन को अलग कर सिरम प्राप्त किया जाता है। सिरम में केवल एंटीबॉडीज़ पाई जाती हैं। सिरम को अल्पकाल के लिए 40 डिग्री सेल्सियस पर तथा ज़्यादा समय तक संग्रहित करने के लिए कुछ रसायन मिलाकर -60 डिग्री सेल्सियस पर रखा जाता है। एक व्यक्ति से प्राप्त प्लाज़्मा में इतनी एंटीबॉडीज़ होती हैं कि 4 मरीज़ों का इलाज हो सकता है।

गंभीर संक्रमण से ग्रस्त रोगियों के प्लाज़्मा में अनेक प्रकार के सूजन पैदा करने वाले रसायन भी पाए जाते हैं जो फेफड़ों को गंभीर क्षति पहुंचा सकते हैं। ऐसी अवस्था में उनके प्लाज़्मा से अवांछित रसायनों को पृथक कर निकाल दिया जाता है। प्लाज़्मा उपचार का उपयोग केवल मध्यम या गंभीर संक्रमण वाले रोगियों पर किया जाता है।

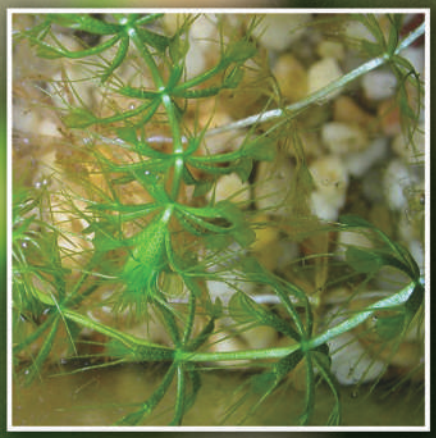
कारगर टीके या इलाज के अभाव में कोविड-19 रोगियों के लिए प्लाज़्मा उपचार तकनीक लड़ाई में आशा की किरण है। चीन, दक्षिण कोरिया, अमेरिका और ब्रिटेन जैसे कई देशों में प्लाज़्मा उपचार पर प्रयोग चल रहे हैं और भारत भी इस दौड़ में पीछे नहीं रहना चाहता।**(स्रोत फीचर्स)**

जुलाई 2020

# स्रोत

विज्ञान एवं टेक्नॉलॉजी फीचर्स

मूल्यः ₹ 30.00







मांसाहारी पौधों में मांस के चस्के का विकास




# स्रोत

**विज्ञान एवं टेक्नॉलॉजी फीचर्स**

**जुलाई 2020**

**वर्ष-14 अंक-07 (पूर्णांक 378)**



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| | | |
|---|---|---|
| कोरोनावायरस: टीकों की प्रगति | | 2 |
| महामारी का अंत कैसे होगा | | 5 |
| कोविड-19: वैकल्पिक समाधान | भारत डोगरा | 7 |
| पारंपरिक विश्वास और आज का विज्ञान | डॉ. डी. बालसुब्रमण्यन | 9 |
| कोविड-19 से उत्पन्न छः संकट | रामचंद्र गुहा | 11 |
| महामारी के अगले दो वर्ष | | 13 |
| कोविड-19: न टीका चाहिए, न सामूहिक प्रतिरोध | मिलिंद वाटवे | 14 |
| आधा मस्तिष्क भी काम करता है! | डॉ. विपुल कीर्ति शर्मा | 16 |
| ऑटिज़्म अध्ययन को एक नई दिशा | | 18 |
| खराब प्रतिरक्षा कोशिकाएं हमें बूढ़ा बना सकती हैं | | 19 |
| नाक के सूक्ष्मजीव संसार में मिला नया बैक्टीरिया | | 20 |
| मंगल पर कभी नदियां बहा करती थीं! | प्रदीप | 21 |
| जीवाश्म पर अधिकार भू-स्वामि का | | 22 |
| टेलीफोन केबल से भूकंप संवेदन | | 23 |
| लॉकडाउन के बावजूद कार्बन उत्सर्जन में कमी नहीं | | 23 |
| वनों की ग्रीनहाउस गैस सोखने की क्षमता घट सकती है | | 25 |
| सांडा: मरुस्थलीय भोजन श्रृंखला का आधार | चेतन मिशर | 26 |
| कॉम्ब जेली का जाड़ों का भोजन उन्हीं के बच्चे | | 28 |
| किशोर कुत्तों का व्यवहार मानव किशोर जैसा | | 29 |
| समय से पहले फूल खिला देते हैं भूखे भंवरे | | 30 |
| सांपों की धींगामुश्ती: प्रणय या युद्ध | कालू राम शर्मा | 31 |
| टिड्डियों को झुंड बनाने से कैसे रोकें | डॉ. डी. बालसुब्रमण्यन | 32 |
| चींटियां स्मृतियां मस्तिष्क के विभिन्न हिस्सों में संजोती हैं | | 33 |
| चोरनी चींटियां अन्य चींटियों के बच्चे खाती हैं | | 34 |
| बकरियों का पालतू गुण | | 35 |
| चमगादड़ हमारे दुश्मन नहीं हैं | | 36 |
| मांसाहारी पौधों में मांस के चस्के का विकास | | 37 |



**स्रोत में छपे लेखों के विचार लेखकों के हैं। एकलव्य का इनसे सहमत होना आवश्यक नहीं है। यह मासिक संस्करण स्वयंसेवी संस्थाओं, सरकारी संस्थाओं व पुस्तकालयों, विज्ञान लेखन से संबद्ध तथा विज्ञान व समाज के रिश्तों में रुचि रखने वाले व्यक्तियों के विशेष अनुरोध पर स्रोत के साप्ताहिक अंकों को संकलित करके तैयार किया जाता है। यहां प्रकाशित सामग्री का उपयोग गैर व्यावसायिक कार्यों के लिए करने हेतु किसी अनुमति की आवश्यकता नहीं है। स्रोत का उल्लेख अवश्य करें।**

# आधा मस्तिष्क भी काम करता है!



**डॉ. विपुल कीर्ति शर्मा**

**'सि**र में भूसा भरा है क्या?' ऐसे ताने अक्सर यह जताने वाले होते हैं कि मस्तिष्क नहीं है। सही भी है अगर मस्तिष्क नहीं है तो शरीर मुर्दे के समान बिस्तर पर पड़ा रहता है जैसा अक्सर ब्रेन डेथ के मामले में होता है। मस्तिष्क हमारी चेतना, विचार, स्मृति, बोलचाल, हाथ-पैरों की गति और हमारे शरीर के भीतर अनेक अंगों के कार्य को नियंत्रित करता है। कुछ लोगों को लगता है कि उनका मस्तिष्क जानकारियों से ठूंस-ठूंस कर भरा है और उसका इंच भर हिस्सा भी निकालकर अलग कर दिया जाए तो मस्तिष्क कार्य नहीं कर सकेगा। तो ऐसे व्यक्ति की कल्पना कीजिए जिसके पास आधा मस्तिष्क हो। तो क्या वह सामान्य क्रियाकलाप कर सकेगा या ज़िंदा भी बचेगा?

हेनरी के जन्म के कुछ ही घंटों के पश्चात मां मोनिका जोन्स यह समझ गई थी कि उनका नवजात बेटा एक दुर्लभ और गंभीर न्यूरोलॉजिकल समस्या से पीड़ित है। हेनरी के मस्तिष्क का एक तरफ का हिस्सा असामान्य रूप से बड़ा था और उसे प्रतिदिन सैकड़ों मिर्गी जैसे दौरे पड़ते थे। दवाएं भी बेअसर लग रही थी। फिर डॉक्टरों के सुझाव से अनेक ऑपरेशन का दौर साढ़े तीन माह की उम्र में प्रारंभ हुआ और 3 साल का होते-होते हेनरी आधा मस्तिष्क विहीन हो गया।

मस्तिष्क के ऑपरेशन की प्रक्रिया कोई नई नहीं है। 1920 में पहली बार मस्तिष्क का ऑपरेशन किया गया था जिसमें मस्तिष्क का कैंसर युक्त हिस्सा निकालकर अलग कर दिया गया था। उसके बाद कई ऑपरेशन किए जा चुके हैं। यह ज्ञात है कि यदि किसी बच्चे का आधा मस्तिष्क बीमारियों के कारण ठीक से कार्य नहीं कर पाता है तो ऑपरेशन करके निकाल देने पर भी वह भला चंगा होकर पढ़ना-लिखना, खेलना-कूदना जैसे सामान्य कार्य कर लेता है। आधे मस्तिष्क को सही तरीके से कार्य करता देखकर वैज्ञानिक भी आश्चर्य चकित हैं।

मोटे तौर पर आधे मस्तिष्क वाले 20 प्रतिशत मरीज़ों तो वयस्क होकर सामान्य रोज़गार भी प्राप्त कर लेते हैं। शोध पत्रिका *सेल रिपोर्ट्स* में प्रकाशित एक हालिया शोध से पता चलता है कि आधे मस्तिष्क में पुनर्गठन के कारण कुछ व्यक्ति पहले की तरह ठीक हो जाते हैं।

कैलिफोर्निया इंस्टीट्यूट ऑफ टेक्नोलॉजी में कार्यरत संज्ञान वैज्ञानिक डॉरिट किलमैन कहते हैं कि मस्तिष्क बहुत ही लचीला यानी अपने कार्य को पुनर्गठित करने में सक्षम होता है। यह मस्तिष्क की संरचना में अचानक उत्पन्न हुए नुकसान की भरपाई भी कर सकता है। कुछ मामलों में नेटवर्क खो चुके हिस्से के कार्य को शेष मस्तिष्क पूरी तरह अपना लेता है।

उपरोक्त अध्ययन को आंशिक रूप से एक गैर-लाभकारी संगठन द्वारा वित्त पोषित किया गया। श्रीमती जोन्स और उनके पति ने यह संगठन ऐसे मरीज़ों की मदद के लिए बनाया था जो मिर्गी जैसे दौरे रोकने के लिए ऑपरेशन कराने के इच्छुक थे। अध्ययन के निष्कर्ष बड़े बच्चों में भी आधा मस्तिष्क निकालने के संदर्भ में उत्साहवर्धक हैं।

सेरेब्रम मस्तिष्क का सबसे बड़ा भाग है। यह वाणि, विचार, भावनाएं, पढ़ने, लिखने और सीखने तथा मांसपेशियों के कार्यों को नियंत्रित करता है। इसका दायां भाग शरीर के बाईं ओर की मांसपेशियों और बायां भाग शरीर के दाईं ओर की मांसपेशियों को नियंत्रित करता है। यद्यपि सेरेब्रम के दोनों भाग (हेमीस्फीयर) दिखने में एक जैसे दिखते हैं किन्तु कार्य में एक-से नहीं होते। इसका बायां भाग उन कार्यों को भी करता है जिनमें तर्क लगते हैं जैसे विज्ञान और गणित की समझ। जबकि दायां भाग अन्य कार्यों के अलावा रचनात्मक और कला से सम्बंधित कार्यों को नियंत्रित करता है। सेरेब्रम के दोनों आधे भाग कार्पस केलोसम से जुड़े हुए होते हैं। मस्तिष्क का यह भाग ऊपर से सपाट न होकर

कई दरारों एवं उभारों से मिलकर बनता है और अखरोट जैसी संरचना वाला होता है। राइट हेंडेड व्यक्तियों में सेरेब्रम का बायां भाग प्रभावी होता है तथा मुख्य रूप से भाषा की समझ, बोलने को नियंत्रण करता है।

ऐसे लोग जिनका हेमिस्फेरोक्टोमी (सेरेब्रम का आधा हिस्सा निकाल देने का ऑपरेशन) हुआ हो, सामान्य व्यक्ति की तरह ही दिखते और व्यवहार करते हैं। पर मेग्नेटिक रेसोनेन्स इमेजिंग (एम.आर.आई.) की रिपोर्ट बताती है कि उनके मस्तिष्क का आधा भाग बचपन में ही निकाल दिया गया था। यह ज्ञात होते ही ऐसा लगता है कि ऐसे व्यक्तियों का सामान्य कार्य करना असंभव है। खास कर जब इसकी तुलना हृदय जैसे किसी अंग से की जाए।

क्या हृदय को दो बराबर हिस्सों में बांटने पर वह कार्य कर पाएगा? बिलकुल नहीं। आप अपने मोबाइल को अगर दो हिस्सों में बांट दे तो यह काम नहीं करेगा। इस प्रकार मस्तिष्क के बहुत से कार्य ऐसे हैं जहां सेरेब्रम के दोनों भाग मिलकर कार्य करते हैं जैसे चेहरे की पहचान। परंतु हाथ हिलाने जैसे कार्य मस्तिष्क के एक भाग से होते हैं। एक मधुर संगीत के लिए गायक और अनेक वाद्य यंत्रों की जुगलबंदी ज़रूरी है। लगभग ऐसा ही मस्तिष्क के भागों का कार्य है। इस सबकी बजाय शोधकर्ताओं ने पाया कि सामान्य कनेक्शन की तुलना में आधे बचे मस्तिष्क ने बचे हुए कनेक्शन को मज़बूत किया और तंत्रिकाओं के बीच बेहतर तालमेल एवं संवाद बैठाया। यह बिल्कुल उस परिस्थिति के जैसा था जहां युगल गीत के कार्यक्रम में जोड़ीदार की अनुपस्थिति में एक ही गायक ने महिला एवं पुरुष दोनों की आवाज निकालकर गाना गाया हो। वैसे ही मस्तिष्क के भाग भी मल्टीटास्किंग यानी बहु-कार्य करने लगे थे।

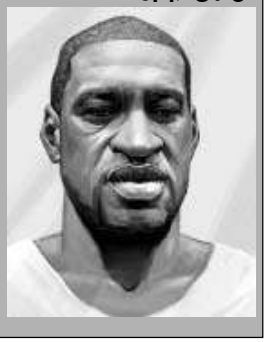
शोधकर्ताओं के लिए ये परिणाम उत्साहजनक हैं और वे अभी भी इस प्रक्रिया को समझने की कोशिश कर रहे हैं। लगभग 200 बच्चों में मस्तिष्क के ऑपरेशन करने वाले बाल न्यूरोलाजिस्ट डॉ. अजय गुप्ता कहते हैं कि मस्तिष्क परिस्थितियों के अनुसार अपने को ढालने में बेहद कामयाब रहता है। अक्सर हेमिस्फेरेक्टोमी के ऑपरेशन्स 4 या 5 वर्ष की आयु के बच्चों में बेहद सफल रहे हैं क्योंकि बड़े होने से पहले उनका मस्तिष्क कमियों की पूर्ति कर लेता है। यद्यपि दौरे पड़ने वाले वयस्क मरीज़ों में मस्तिष्क का ऑपरेशन अंतिम उपाय ही माना जाता है।

बच्चों में भी ये ऑपरेशन बेहद गंभीर होते हैं। मस्तिष्क के निकले हुए हिस्से में तरल भरने से लगातार सिर दुखने जैसी अवस्था बनी रहती है। ऑपरेशन के बाद बच्चे कमज़ोर हो जाते हैं और एक तरफ के हाथ-पैर पर नियंत्रण नहीं रह पाता है। इसके अलावा एक तरफ का दिखना बंद हो सकता है तथा आवाज़ किस दिशा से आ रही है यह बोध भी नहीं हो पाता है। बच्चे की शिक्षा के दौरान पढ़ने, लिखने और गणित पर ज़्यादा ध्यान देना होता है। वयस्क होते-होते ऐसे बच्चे मस्तिष्क के द्वारा मल्टी टास्किंग अपनाने के कारण सामान्य हो जाते हैं। ***(स्रोत फीचर्स)***

## अगले अंक में....

- **महामारी और गणित**
- **कोविड-19 प्लाज़्मा थेरेपी**
- **स्वास्थ्य क्षेत्र की व्यापक चुनौतियां**
- **कोविड-19: नस्लवाद पर वैज्ञानिक चोला**

**स्रोत अगस्त 2020**
**अंक 379**




सितंबर 2020
स्रोत
विज्ञान एवं टेक्नॉलॉजी फीचर्स
मूल्य: ₹ 30.00
चातक के अंडों चूजों की
परवरिश करते हैं बैब्लर

# Srote - September 2020

1. क्या उत्परिवर्तित कोरोनावायरस अधिक खतरनाक है ?
2. कोविड-19 का टीका और टीकों का राष्ट्रवाद
3. कोविड-19 - सामूहिक परीक्षण के तरीके
4. युवाओं से ज़्यादा एंटीबॉडी बुज़ुर्गों में
5. प्राचीन इम्यूनिटी और आज की बीमारियां
6. गरीबों को महामारी के खिलाफ तैयार करना डॉ. डी . बालसुब्रामण्यन
7. गरीबों को महामारी के खिलाफ तैयार करना - भाग 2 डॉ. डी. बालसुब्रामण्यन
8. क्या व्यायाम की गोली बन सकती है?
9. विज्ञान से अपमानजनक शब्दावली हटाने की पहल
10. कोविड-19 वायरस: एक सचित्र परिचय
11. रंग बदलती स्याही बताएगी आपकी थकान
12. कांटों, सूंडों, सुइओं का भौतिक शास्त्र
13. पर्यावरण प्रभाव आकलन को कमज़ोर करने की कोशिश सोमेश केलकर
14. हरे वृक्ष मेंढकों के हरे रंग की पहेली
15. क्या ध्रुवीय भालू विलुप्त हो जाएंगे? डॉ. विपुल कीर्ति शर्मा
16. चातक के अंडों-चूज़ों की परवरिश करते हैं बैब्लर कालू राम शर्मा
17. सर्पदंश से होने वाली मौतों को रोका जा सकता है
18. चमगादड़ 5 करोड़ वर्ष से वायरसों को गच्चा दे रहे हैं
19. कुत्ते पृथ्वी के चुंबकीय क्षेत्र का उपयोग करते हैं
20. एक छोटी-सी चिड़िया जानती है संख्याएं

# क्या ध्रुवीय भालू विलुप्त हो जाएंगे?

अनियंत्रित जलवायु परिवर्तन के प्रकोप हम सभी झेल रहे हैं। हाल ही में एक अध्ययन में वैज्ञानिकों ने अनुमान लगाया है कि आर्कटिक में समुद्री बर्फ सिकुड़ने के कारण ध्रुवीय भालू सदी के अंत तक शायद विलुप्त ही हो जाएंगे।

अलास्का में ब्यूफोर्ट सागर से लेकर साइबेरियाई आर्कटिक तक ध्रुवीय भालू की आबादी वाले 19 क्षेत्रों में लगभग 25 हज़ार ध्रुवीय भालू पाए जाते हैं। यह हिस्सा नवंबर से मार्च तक बर्फ से ढंका रहता है। यहां दिन का तापमान ऋण 15 से ऋण 1 डिग्री सेल्सियस होता है। मांसाहारी ध्रुवीय भालू शिकार के लिए पूरी तरह समुद्री बर्फ पर निर्भर होते हैं और सील का शिकार करते हैं। किंतु प्रति वर्ष वैश्विक तापमान बढ़ने से समुद्री बर्फ में कमी उनकी भोजन आपूर्ति में बाधा डालती है और वे प्रति वर्ष भूखे रह जाते हैं।



टोरोन्टो विश्वविद्यालय के वैज्ञानिक डॉ. पिटर मोलनर ने हाल ही में नेचर क्लाइमेट चेंज में छपे शोध में कहा है कि बर्फ की कमी के कारण शिकार खोजने के लिए भालुओं को लंबी दूरी तक जाना पड़ता है और लगातार भोजन की कमी उनका अंत कर देगी।

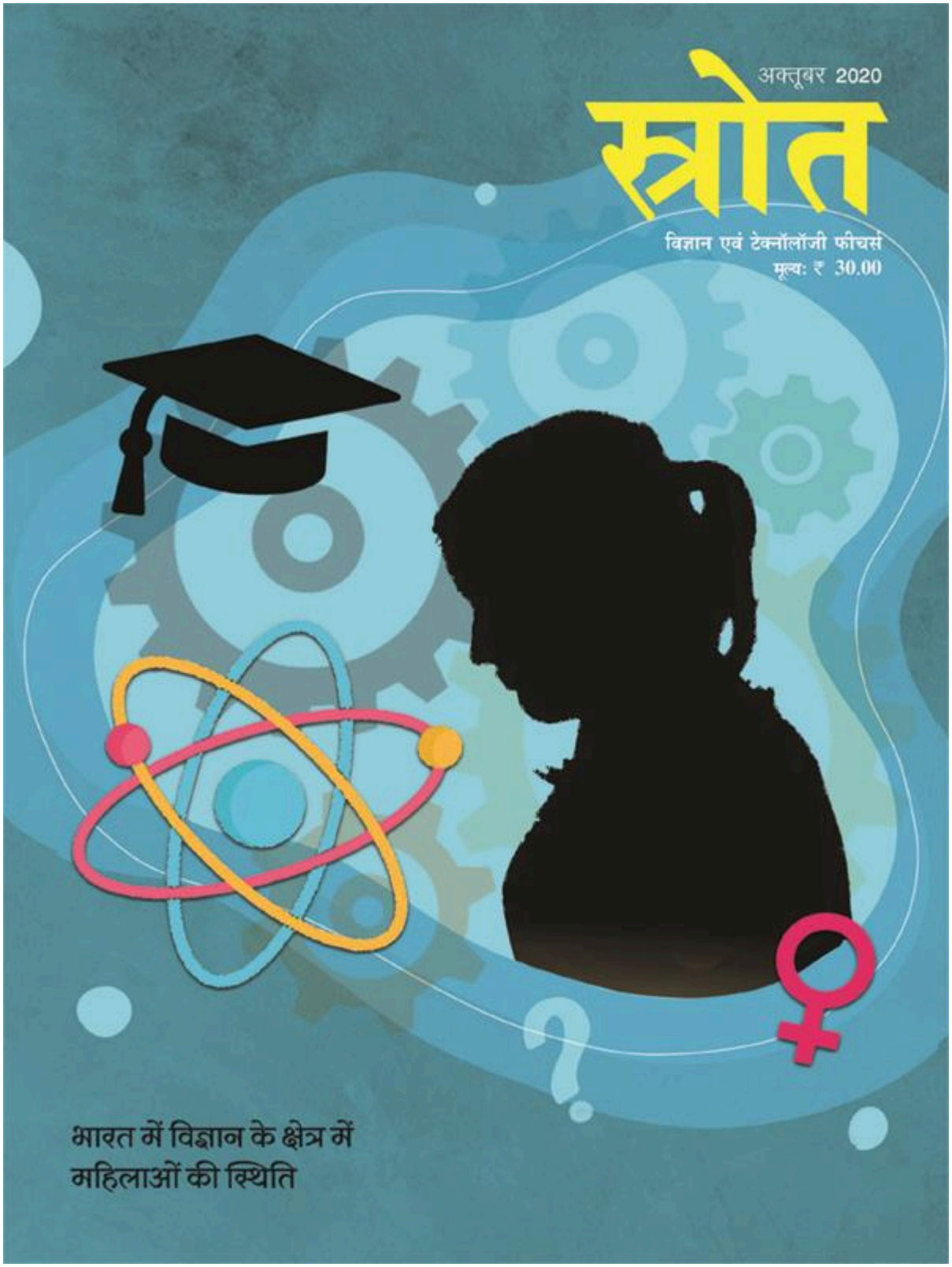
आर्कटिक समुद्र पर जमी बर्फ में सील की खुशबू खोजते-खोजते ये उन स्थानों पर पहुंच जाते हैं जहां बर्फ के मैदानों में छेद होते हैं। भालू को देखते ही सील छेदों से समुद्र के अंदर चली जाती है परंतु कुछ समय पश्चात उन्हें सांस लेने के लिए सतह पर आना ही होता है। सील के शिकार के लिए छेद के मुहाने पर बैठे भालू को इसी पल का इंतज़ार रहता है और वे सील का शिकार कर भोजन प्राप्त करते हैं। बढ़ते वैश्विक तापमान के कारण अब लंबे समय तक बर्फ नहीं जमती और सील के शिकार के लिए भालू को खूब भटकना पड़ता है जिससे वे भूखे और कमज़ोर हो जाते हैं और समुद्री किनारों पर भोजन खोजने लगते हैं। सील के शिकार से भालुओं को अत्यधिक वसा मिलती है जो उन्हें वर्ष के बाकी समय भूखा रहने पर भी बचा लेती है।

आर्कटिक में हाल के दशकों में तापमान बढ़ा है। 1981 की तुलना में 2010 में गर्मियों के दौरान बर्फ 13 प्रतिशत कम रही। आर्कटिक के वे स्थान जहां पहले गर्मियों में भी बर्फ पाई जाती थी, वहां बर्फ गायब है। डॉ. मोलनर और सहयोगियों ने ध्रुवीय भालू की 13 उप-आबादियों, जो कुल ध्रुवीय भालू की आबादी का 80 प्रतिशत है, पर अध्ययन करके भालुओं की ऊर्जा आवश्यकता पता की। जैसे, मादा भालू अकेले रहने या बच्चे पालने के दौरान कितने दिनों तक भूखा रह सकती है?

वैश्विक गरमाहट की इसी दर और बर्फ न जमने वाले दिनों को जोड़कर वर्ष 2100 के जलवायु-मॉडल अनुमानों को एक साथ देखने पर यह अनुमान लगाया जा सकता है कि 2100 में भालूओं को लंबे समय तक भूखा रहना पड़ेगा जो उनकी बर्दाश्त के बाहर होगा। भालुओं के लिए एक समय ऐसा भी

Log

उप-आबाादया खत्म हा जाएगा। ापछल कुछ साला म भालू वकाल्पक खाद्य स्रात क रूप म व्हल का भाजन बनाकर ऊजा प्राप्त कर रह ह ाकतु वाश्वक गरमाहट के कारण व्हेल भी मिलना बंद हो जाएगी। स्थिति इतनी गंभीर है कि अगर ग्रीन हाउस गैसों के उत्सर्जन का स्तर सामान्य रहा तो भी ध्रुवीय भालुओं का बचना असंभव है।**(स्रोत फीचर्स)**


अक्तूबर 2020
स्रोत
विज्ञान एवं टेक्नॉलॉजी फीचर्स
मूल्य: ₹ 30.00
भारत में विज्ञान के क्षेत्र में
महिलाओं की स्थिति

# Srote - October 2020

1. 99.9 प्रतिशत मार दिए, चिंता तो 0.1 प्रतिशत की है डॉ. सुशील जोशी
2. कोरोनावायरस का प्रतिरक्षा प्रणाली पर हमला
3. कोविड-19 की दीर्घकालीन समस्याएं
4. क्यों कम जानलेवा हो रहा है कोविड-19?
5. जंगल कटाई और महामारी की संभावना
6. सोने से भी महंगा उल्का पिंड
7. सस्ते परमाणु बिजली घर की सुरक्षा पर सवाल
8. वैज्ञानिक साक्ष्यों की गलतबयानी प्रतिका गुप्ता
9. हर बच्चा वैज्ञानिक है डॉ. डी. बालसुब्रामण्यन
10. भारत में विज्ञान के क्षेत्र में महिलाओं की स्थिति स्नेहा सुधा कोमथ
11. वैज्ञानिक प्रकाशनों में एक्रोनिम और संक्षिप्त रूप डॉ. डी. बालसुब्रामण्यन
12. स्तनपान माताओं को सुरक्षा प्रदान करता है
13. गर्भाशय मुख शुक्राणुओं में भेद करता है
14. वायरस व ततैया की जुगलबंदी में एक इल्ली की शामत कालू राम शर्मा
15. एक फल के नीले रंग का अद्भुत रहस्य
16. मच्छरों के युगल गीत डॉ. विपुल कीर्ति शर्मा
17. चमगादड़ों की हज़ारों किलोमीटर की उड़ान
18. डायनासौर भी कैंसर का शिकार होते थे
19. चींटियां कई जंगली पौधे उगाती है
20. मेंढक के पेट से ज़िंदा बच निकलता है यह गुबरैला
21. अमीबा भूलभुलैया में रास्ता ढूंढ सकते हैं

# मच्छरों के युगल गीत

दिन भर कठोर परिश्रम करने के बाद आप चैन की नींद लेने के लिए बिस्तर पर लेटकर नींद में गोते लगाने ही वाले थे कि कानों में मच्छरों की भिनभिनाहट ने आपको बैचेन कर दिया। क्या मच्छर आपके कान में भिनभिनाहट करके यह देखना चाहते थे कि आप सो गए हैं या नहीं? मच्छरों की भिनभिनाहट एक प्रकार का गाना है जिससे वे विपरीत सेक्स के सदस्य की पहचान करते हैं। मच्छरों की भिनभिनाहट भले ही हमारी नींद उड़ा देती है किंतु मच्छरों के लिए यह रोमांस का आमंत्रण गीत है।



तीन जोड़ी पैर वाले सभी सदस्यों को कीट परिवार (इनसेक्टा) में रखा गया है। इस परिवार के बहुत से सदस्य अपने प्रेम का प्रस्ताव आवाज़ उत्पन्न करके करते हैं। जब पूरा शहर या गांव सो जाता है तो शांत वातावरण में या बगीचों में इनकी आवाज़ आप बहुत अच्छी तरह से सुन सकते हैं।

जैसे हमारे कान में पर्दा, ऑसिकल एवं कॉकलिया होते हैं, जो सुनने में मदद करते हैं, वैसे ही कीटों के पास भी सुनने के अंग होते हैं जो हमसे भिन्न हैं परंतु हैं बेजोड़।

मच्छरों की भिनभिनाहट पंखों के फड़फड़ाने के कारण पैदा होती है। मच्छरों को अपनी छोटी-सी ज़िंदगी में केवल दो ही कार्य संपन्न करने होते हैं। एक तो भोजन ढूंढना और दूसरा प्रजनन के लिए साथी खोजना। अगर दृष्टि अच्छी नहीं है तो भोजन के लिए शिकार एवं प्रजनन के लिए मनपसंद साथी खोजना मुश्किल कार्य हो जाता है।

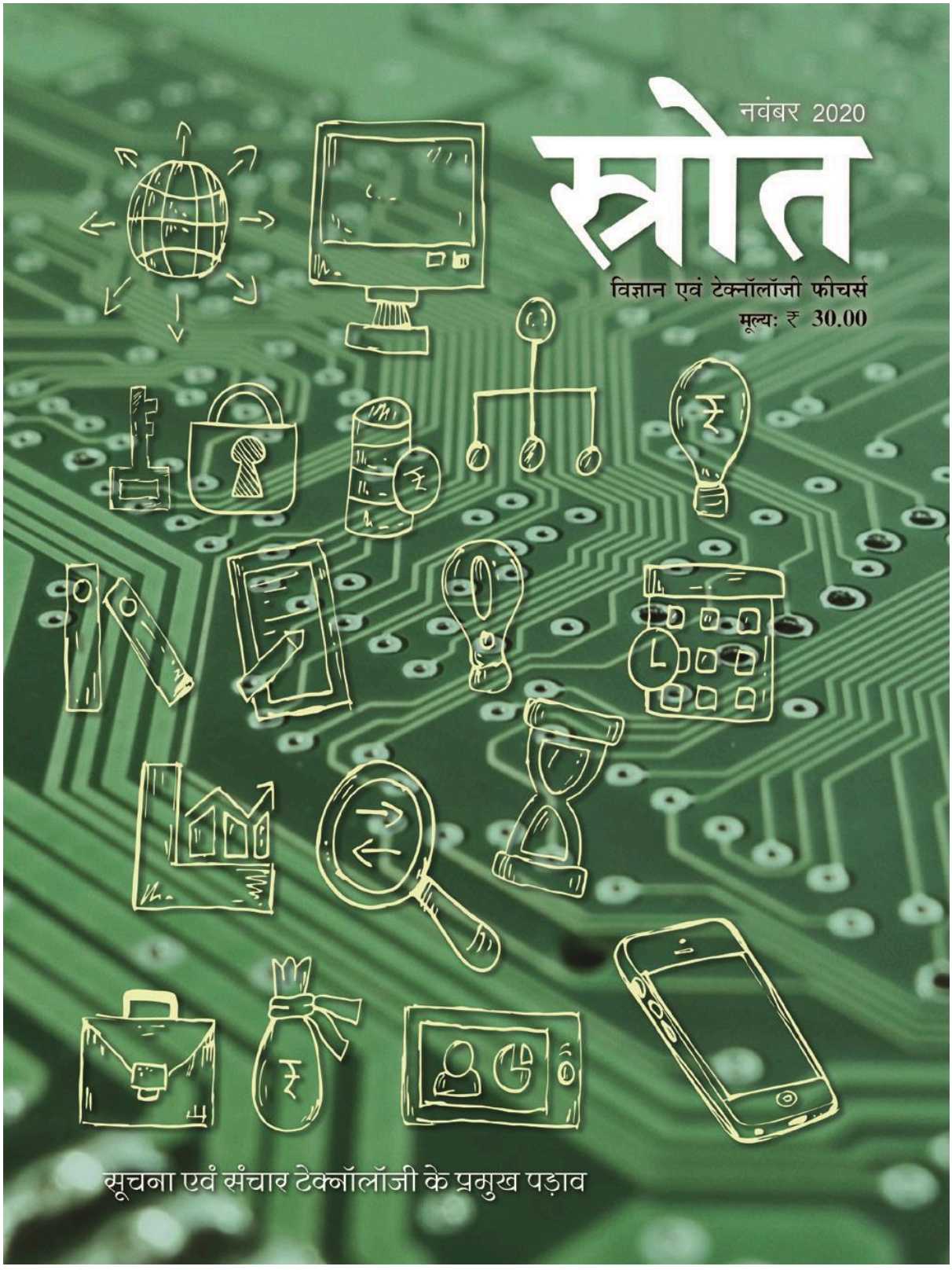
वैज्ञानिकों को लगता है कि उद्विकास में मादा मच्छरों ने अपने शिकार का खून पीना जब प्रारंभ किया तो वे गंध पर ज़्यादा आश्रित हो गए। ऐसा शिकार जिसके शरीर से तेज़ गंध आती थी या जो ज़्यादा कार्बन डाईऑक्साइड छोड़ते थे वे प्राणी मच्छरों को ज़्यादा आकर्षित करते थे। गंध पर ज़्यादा निर्भरता के कारण कालांतर में मच्छरों की आंखे ज़्यादा बेहतर विकसित नहीं हुई। और इसलिए विपरीत सेक्स को खोजने के लिए पंखों की भिनभिनाहट का उपयोग होने लगा। आपको यह जानकर आश्चर्य होगा कि छोटे-से मच्छर में श्रवण अंगों में 15,000 श्रवण कोशिकाएं होती है जबकि उससे कहीं बड़े आकार के मनुष्यों में मात्र 17,500। इतने छोटे-से मच्छर में इतनी सारी श्रवण कोशिकाएं अपने साथी को ढूंढने का कार्य अपेक्षाकृत आसान कर देती हैं।

शाम होते ही आसमान में नर मच्छरों के झुंड एकत्रित हो जाते हैं। मादा के इंतज़ार में एकत्रित नर हवा में गोते लगाते रहते हैं। एक नर मच्छर के पंख फड़फड़ाने से उच्च आवृत्ति की भिनभिनाहट उत्पन्न होती है क्योंकि मादा मच्छर की तुलना में नरों का आकार छोटा होता है और छोटे पंख तेजी से

Log

बड़े और बहुत झबरीले होते हैं।

नर की तुलना में मादा मच्छरों का आकार बड़ा होता है तो उनके पंख भी बड़े होते हैं और उनके धीमे-धीमे फड़फड़ाने से कम आवृत्ति की आवाज उत्पन्न होती है। मादा मच्छर में एंटीना छोटा तथा बेहद कम बालों से ढंका होता है, इसलिए मादाओं की सुनने की शक्ति कम होती है।


नवंबर 2020
स्रोत
विज्ञान एवं टेक्नॉलॉजी फीचर्स
मूल्य: ₹ 30.00
सूचना एवं संचार टेक्नॉलॉजी के प्रमुख पड़ाव

# Srote - November 2020

1. कोविड-19 से जुड़े मिथक
2. मोटे लोगों में कोविड-19 अधिक घातक क्यों?
3. आवश्यक वस्तु अधिनियम और खाद्य सुरक्षा सोमेश केलकर
4. पृथ्वी पर इतना पानी कहां से आया?
5. मछली के जीवाश्म से दुर्लभ मृदा तत्वों का खनन
6. पृथ्वी के डिजिटल जुड़वां से मौसम का पूर्वानुमान
7. जलवायु परिवर्तन के साथ फूलों के रंग बदल रहे हैं
8. केवल गाड़ियों से नहीं, सड़कों से भी प्रदूषण होता है
9. कोविड-19 के लिए वार्म वैक्सीन डॉ. डी. बालसुब्रामण्यन
10. चर्चित वनस्पति गिलोय डॉ. किशोर पंवार
11. सूचना एवं टेक्नॉलॉजी के प्रमुख पड़ाव डॉ. डी. बालसुब्रामण्यन
12. सपनों का विश्लेषण करते एल्गोरिद्म
13. उपकरणों से बिखरती ऊष्मा का उपयोग
14. कीटनाशक के उपयोग से पहले ही मच्छरों में प्रतिरोध
15. किराए की मधुमक्खियां डॉ. विपुल कीर्ति शर्मा
16. मधुमक्खियों की क्षति से जुड़ी हैं गंभीर समस्याएं भारत डोगरा
17. तालाबंदी में गोरैया ने अपना गीत बदला
18. वुडरैट के घोंसलों में एंटीबायोटिक निर्माता बैक्टीरिया
19. हाथियों की मृत्यु का कारण सायनोबैक्टीरिया! डॉ. विपुल कीर्ति शर्मा
20. हमिंगबर्ड की जीवन-रक्षक तंद्रा
21. इस वर्ष के इगनोबेल पुरस्कार प्रतिका गुप्ता
22. हीमोफीलिया का नया उपचार
23. कोविड-19 से हृदय को क्षति

# किराए की मधुमक्खियां

पांच बड़े-बड़े ट्रक अमेरिका के उत्तरी केरोलिना में ब्लूबेरी फार्म पर आकर रुकते हैं। तारपोलिन को हटाते ही एक के ऊपर एक जमे लगभग पांच सौ डिब्बों में से भिनभिनाहट सुनाई पड़ती है। प्रत्येक डिब्बे में लगभग 20,000 मधुमक्खियां हैं। फार्म के मालिक ने इन एक करोड़ मधुमक्खियों को किराए पर बुलाया है। मई का महिना यहां परागण का समय है और आसपास के सभी बागानों में मधुमक्खियों के ट्रक आ रहे हैं।

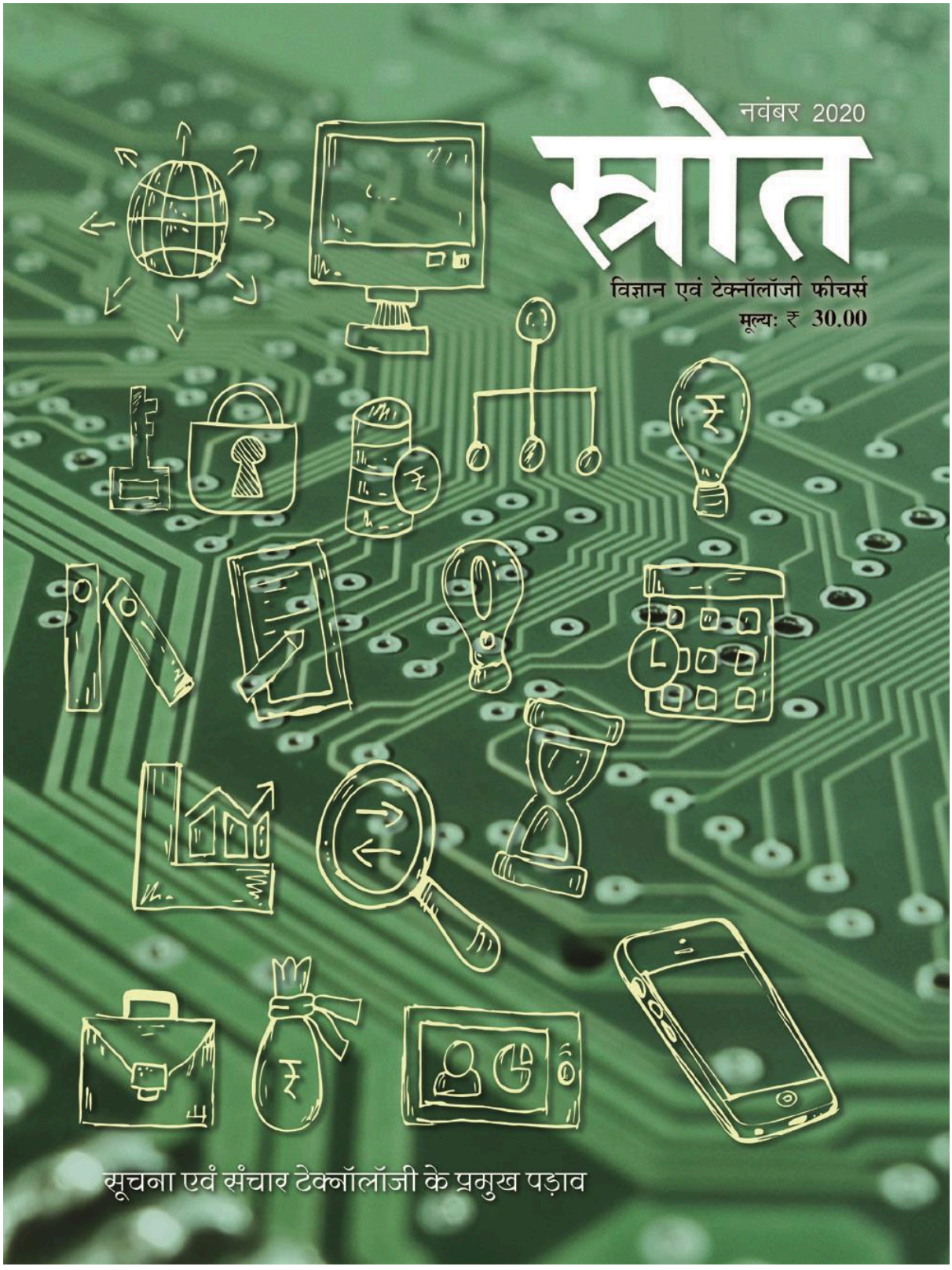


7000 एकड़ के इस फार्म हाउस के सभी भागों में मधुमक्खियों के ये डिब्बे, यानी मानव निर्मित छत्ते, रख दिए जाते हैं। अगले कुछ सप्ताह ये मधुमक्खियां अपनी नैसर्गिक प्रवृत्ति के अनुसार आसपास के इलाकों में अपना भोजन 'पराग' एकत्रित करने के लिए अपने छत्तों में से निकलेंगी और इस क्रिया के दौरान फूलों को परागित भी करेंगी। फूलों का पराग एकत्रित करके ये पुन: अपने-अपने दड़बे में आ जाती हैं। फिर उनका मालिक उन्हें एकत्रित करके परागण के लिए कहीं और ले जाएगा।

तीन सप्ताह तक मधुमक्खियों को फार्म में रखने के लिए प्रति डिब्बा 90 डॉलर का सौदा हुआ है। दोनों पक्षों के लिए सौदा बेहद फायदेमंद है। बगैर मधुमक्खियों के ब्लूबेरी के फूल परागित नहीं होंगे और उनमें फूल से बेरी नहीं बनेंगी और मधुमक्खी पालक को एक ट्रक के 45 हज़ार डॉलर प्रति सप्ताह मिल जाएंगे।

यद्यपि मधुमक्खियों को हम स्वादिष्ट शहद बनाने वाली मक्खियों के रूप में पहचानते हैं पर उनका एक महत्वपूर्ण काम परागण करना है। पौधों में लैंगिक प्रजनन के लिए परागण आवश्यक है। शोध से पता चला है कि मधुमक्खियां लगभग 16 प्रतिशत पुष्पधारी पौधों तथा 400 किस्म की फसलों का परागण करती हैं। हमारे भोजन का 35 प्रतिशत केवल मधुमक्खियों और अन्य कीटों द्वारा किए गए परागण से प्राप्त होता है।

मधुमक्खियां सामाजिक प्राणी हैं। एक छत्ते में एक बहुत बड़ी रानी और हज़ारों श्रमिक और नर मधुमक्खियां होती हैं। इनमें से अधिकांश श्रमिक होती हैं जो प्रजनन करने में असमर्थ होती हैं। श्रमिक मधुमक्खियों का कार्य दूर-दूर उड़कर फूलों को खोजना, उनसे पराग कण एकत्रित करना, शत्रुओं से छत्ते की रक्षा करना और रानी के बच्चों यानी इल्लियों का पालन-पोषण करना होता है। छत्ते में रानी मधुमक्खी को पराग से निर्मित अत्यंत पोषक पदार्थ खाने को दिया जाता है, जिसे 'रॉयल जेली' कहते हैं। इससे रानी लंबे समय तक जीवित रहती है और उसका प्रमुख कार्य छत्ते का प्रबंधन और निरंतर अंडे देते रहना है। शोध से ज्ञात हुआ है कि श्रमिक मधुमक्खियां यह निर्धारित कर सकती है कि कोई इल्ली श्रमिक बनेगी या रानी।


नवंबर 2020
स्रोत
विज्ञान एवं टेक्नॉलॉजी फीचर्स
मूल्य: ₹ 30.00
सूचना एवं संचार टेक्नॉलॉजी के प्रमुख पड़ाव

# Srote - November 2020

1. कोविड-19 से जुड़े मिथक
2. मोटे लोगों में कोविड-19 अधिक घातक क्यों?
3. आवश्यक वस्तु अधिनियम और खाद्य सुरक्षा सोमेश केलकर
4. पृथ्वी पर इतना पानी कहां से आया?
5. मछली के जीवाश्म से दुर्लभ मृदा तत्वों का खनन
6. पृथ्वी के डिजिटल जुड़वां से मौसम का पूर्वानुमान
7. जलवायु परिवर्तन के साथ फूलों के रंग बदल रहे हैं
8. केवल गाड़ियों से नहीं, सड़कों से भी प्रदूषण होता है
9. कोविड-19 के लिए वार्म वैक्सीन डॉ. डी. बालसुब्रामण्यन
10. चर्चित वनस्पति गिलोय डॉ. किशोर पंवार
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12. सपनों का विश्लेषण करते एल्गोरिद्म
13. उपकरणों से बिखरती ऊष्मा का उपयोग
14. कीटनाशक के उपयोग से पहले ही मच्छरों में प्रतिरोध
15. किराए की मधुमक्खियां डॉ. विपुल कीर्ति शर्मा
16. मधुमक्खियों की क्षति से जुड़ी हैं गंभीर समस्याएं भारत डोगरा
17. तालाबंदी में गौरैया ने अपना गीत बदला
18. वुडरैट के घोंसलों में एंटीबायोटिक निर्माता बैक्टीरिया
19. हाथियों की मृत्यु का कारण सायनोबैक्टीरिया! डॉ. विपुल कीर्ति शर्मा
20. हमिंगबर्ड की जीवन-रक्षक तंद्रा
21. इस वर्ष के इगनोबेल पुरस्कार प्रतिका गुप्ता
22. हीमोफीलिया का नया उपचार
23. कोविड-19 से हृदय को क्षति

# हाथियों की मृत्यु का कारण सायनोबैक्टीरिया!

इस साल 25 मई को बोत्सवाना के ओकावांगो पैनहैंडल के ऊपर विमान से निगरानी करते हुए वन संरक्षकों की टीम को 169 मृत हाथी दिखाई दिए। और अधिक खोज करने पर 356 हाथी मृत पाए गए। हत्यारों की खोज में जुटे विशेषज्ञों को कुछ खास सुराग नहीं मिल रहा था। चूंकि इतने सारे हाथियों का एक साथ मरना कोई सामान्य घटना तो थी नहीं, इसलिए संदेह था कि या तो उन्हें ज़हर देकर मारा गया है या इलाके में कोई अज्ञात बीमारी फैली है।

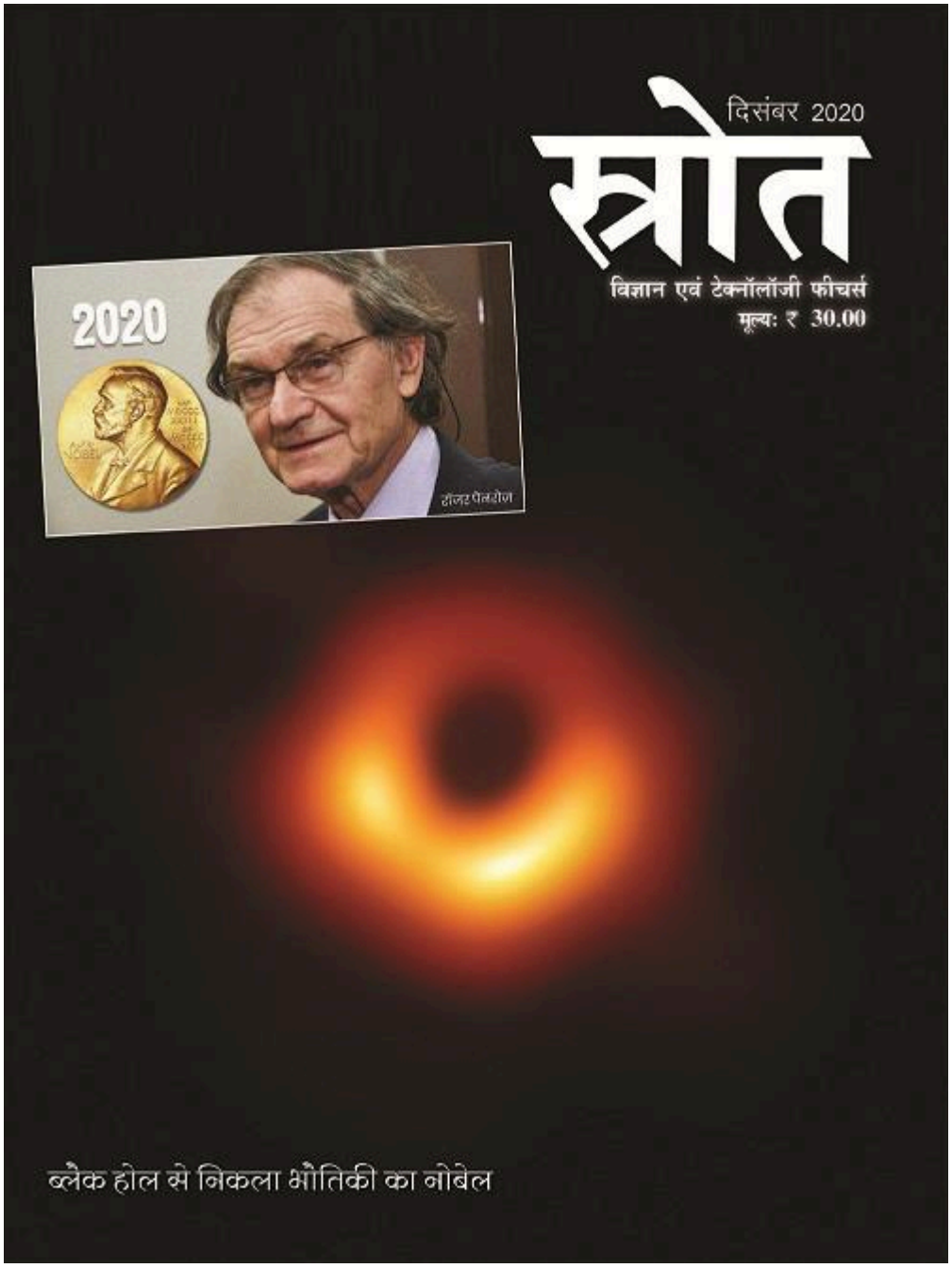


दुनिया भर के एक-तिहाई हाथी बोत्सवाना में पाए जाते हैं। हाथी और गेंडे के अवैध शिकार की कुछेक छुटपुट घटनाओं के अलावा बोत्सवाना हाथियों के संरक्षण के लिए सुरक्षित एवं महत्वपूर्ण ठिकाना साबित हुआ है।

किसी भी हाथी के शरीर में गोलियों के निशान नहीं थे और हाथी दांतों का ना निकाला जाना भी इस बात का सबूत था कि शायद इनका शिकार बहुमूल्य दांतों के लिए नहीं किया गया है। ज़मीन में पाए जाने वाले एंथ्रेक्स बैक्टीरिया के संक्रमण को भी बोत्सवाना की शासकीय प्रयोगशाला ने नकार दिया था।

प्रारंभ में बोत्सवाना सरकार द्वारा देश के बाहर से सहायता ना लेने और चुप्पी साधने के कारण हाथियों की हत्याओं का रहस्य बरकरार था।

फिर महीनों तक जिम्बाब्वे, दक्षिण अफ्रीका, कनाडा और अमेरिका के विशेषज्ञों ने मामले की जांच की। बोत्सवाना के अधिकारियों ने बताया कि हाथियों की मृत्यु का कारण सायनोबैक्टीरिया द्वारा उत्पन्न तंत्रिका विष है। वैज्ञानिकों का अनुमान है कि यह विष पीने के पानी के साथ हाथियों के शरीर में पहुंचा और उसने मस्तिष्क की कोशिकाओं पर बुरा असर डाला। नीले-हरे शैवाल के रूप में मशहूर सायनोबैक्टीरिया ठहरे हुए पानी में पाए जाते हैं और सायनोटॉक्सिन नामक विष बनाते हैं, जो मानव व जंतुओं को गंभीर रूप से बीमार कर सकता है। गर्मी बढ़ने से तथा फॉस्फोरस की उपलब्धता में सायनोबैक्टीरिया तेज़ी से वृद्धि करते हैं और सायनोटॉक्सिन अधिक मात्रा में उत्पन्न करते हैं। सायनोटॉक्सिन तंत्रिका तंत्र के अलावा लीवर और त्वचा पर भी गंभीर प्रभाव डालता है।


दिसंबर 2020
स्रोत
विज्ञान एवं टेक्नॉलॉजी फीचर्स
मूल्य: ₹ 30.00
2020
ब्लैक होल से निकला भौतिकी का नोबेल

# Srote - December 2020


1. संपूर्ण लॉकडाउन के विकल्प
2. कोविड-19 मौतों में वायु प्रदूषण का योगदान
3. कोरोनावायरस की जांच अब सिर्फ 5 मिनट में
4. कोविड-19 का तंत्रिका तंत्र पर प्रभाव
5. कोविड-19 और भू-चुंबकत्व: शोधपत्र हटाया गया
6. न्यूयॉर्क यूनिवर्सिटी ने हटाया सैकलर परिवार का नाम
7. कुछ टीकों से एड्स जोखिम में वृद्धि की चेतावनी
8. विज्ञान के नोबेल पुरस्कार चक्रेश जैन
9. ब्लैक होल से निकला भौतिकी का नोबेल डॉ. सुशील जोशी
10. रसायन शास्त्र का नोबेल जेनेटिक कैंची के लिए डॉ. सुशील जोशी
11. क्यूबा ने दिखाई पर्यावरण रक्षक खेती की राह भारत डोगरा
12. अंतर्राष्ट्रीय स्पेस स्टेशन में तीन हज़ार प्रयोग
13. जलवायु की उथल-पुथल का प्राचीन औज़ारों पर असर
14. वैश्विक तापमान में वृद्धि और खाद्य सुरक्षा डॉ. डी . बालसुब्रामण्यन
15. रूबेला वायरस को मिले दो साथी
16. कान बजने का झटकेदार इलाज
17. विद्युत-चुंबकीय क्षेत्र से मधुमेह के उपचार की संभावना
18. अल्ज़ाइमर की संभावना बताएगी कृत्रिम बुद्धि
19. नमक से बढ़ जाती है मिठास!
20. माइक्रोप्लास्टिक्स: इकोलॉजी व जीवों पर नया संकट सुदर्शन सोलंकी
21. ओज़ोन परत बचेगी तभी जीवन बचेगा प्रदीप
22. टार्डिग्रेड का सुरक्षा कवच है प्रतिदीप्ति
23. चीन के दुर्लभ पक्षियों के बदलते इलाके
24. कठफोड़वा में अखाड़ेबाज़ी डॉ. विपुल कीर्ति शर्मा
25. मैडागास्कर के विशालकाय जीव कैसे खत्म हो गए
26. बगैर बैटरी बिजली चालित वाहन सोमेश केलकर
27. मायोपिया से बचाव के उपाय डॉ. डी . बालसुब्रामण्यन

# कठफोड़वा में अखाड़ेबाज़ी

दो जंतुओं में भोजन एवं प्रजनन के लिए झगड़ा होना आम बात है परंतु झगड़े से पूरे समुदाय का दो पक्षों में बंटवारा और गुटों का निर्माण जंतुओं के समाज में कम ही देखा गया है। कठफोड़वा (मेलानिर्पस फार्मिसिवोरस) समूह में रहने और प्रजनन करने वाले पक्षी हैं। शरद ऋतु के आगमन पर ये मेवे (नट्स) एकत्रित कर, पेड़ों में बनाए गए छेदों (भंडार) में रख देते हैं। इससे भीषण ठंड के समय भोजन की उपलब्धता उनके जीवित रहने की संभावना और प्रजननशीलता दोनों को बढ़ाती है। प्रजननकारी सदस्य की असामयिक मृत्यु और उसके इलाके को हथियाने के लिए नर या मादाओं के बीच सत्ता संघर्ष प्रारंभ हो जाता है। पड़ोसी दल भी इस गुटबाज़ी में शरीक हो जाते हैं।



हाल ही में वैज्ञानिकों ने एक स्वचालित रेडियो-टेलीमेट्री प्रणाली का उपयोग कर कठफोड़वों में भोजन तथा प्रजनन के लिए संघर्ष, सत्ता परिवर्तन और सामाजिक ढांचे को बेहतर तरीके से समझा है। ओल्ड डोमेनियन युनिवर्सिटी के बायोलॉजिकल साइंस विभाग में कार्यरत डॉ. सहस बर्वे का शोध करंट बायोलॉजी नामक शोध पत्रिका में प्रकाशित हुआ है। डॉ. बर्वे और उनकी टीम ने अपना शोध कार्य कैलिफोर्निया और दक्षिण-पश्चिम संयुक्त राज्य अमेरिका के तटीय जंगलों में किया।

कठफोड़वा का समाज जटिल होता है। प्रत्येक परिवार में अधिकतम 7 वयस्क नर होते हैं जो रिश्ते में भाई होते हैं। पूरा परिवार लगभग 15 एकड़ के शाहबलूत (ओक) पेड़ों के इलाके की रखवाली करके एक साथ रहता है। प्रत्येक नर एक से तीन मादाओं से प्रजनन करता है जो अक्सर दूर के रिश्ते की बहनें होती हैं। इनके परिवार में बाद में जन्मे सदस्य भी होते हैं जिन्हें हेल्पर या मददगार कहते हैं। मददगार सदस्य अपने मूल परिवार के साथ 5-6 वर्षों तक बने रहकर अपने सहोदरों के लिए दाई मां यानी पालन-पोषण का कार्य करते हैं। जब वे खुद का परिवार बनाने जितने बड़े हो जाते हैं तो नए इलाके खोजकर मूल परिवार से दूर चले जाते हैं। यदि हेल्पर दाई मां के कार्य छोड़कर उसी समूह में प्रजनन का प्रयास करते हैं तो सत्ता संघर्ष प्रारंभ हो जाता है। ऐसी परिस्थितियां तब निर्मित होती हैं जब मुखिया और उसकी मादाएं वृद्ध और कमज़ोर हो जाते हैं।

डॉ. बर्वे और उनकी शोध टीम ने 2018 से 2019 के बीच मादाओं के अभाव के कारण तीन कठफोड़वा परिवारों के सत्ता संघर्ष का नज़दीकी से अध्ययन किया। इलाके पर अपना अधिकार जमाने के लिए बलशाली मादा या नर कठफोड़वों के बीच आपस में युद्ध होता है। प्रतिदिन युद्ध प्रारंभ होने के पहले ही सभी कठफोड़वों को संदेश मिल जाता है और तमाशा-ए-युद्ध को देखने के लिए एक ही घंटे में दूर-दूर से अनेक तमाशबीन कठफोड़वा जमा हो जाते हैं। प्रत्येक कठफोड़वा पंख फैलाकर तथा चोंच से हमले कर अपनी श्रेष्ठता सिद्ध करता है और प्रतिद्वंदी को खून से लथपथ, अंधा तथा अपंग कर देता है। विजेता कठफोड़वा को दर्जन भर परिवारों की लगभग 50 मददगार मादाओं का साथ मिलता हैं।

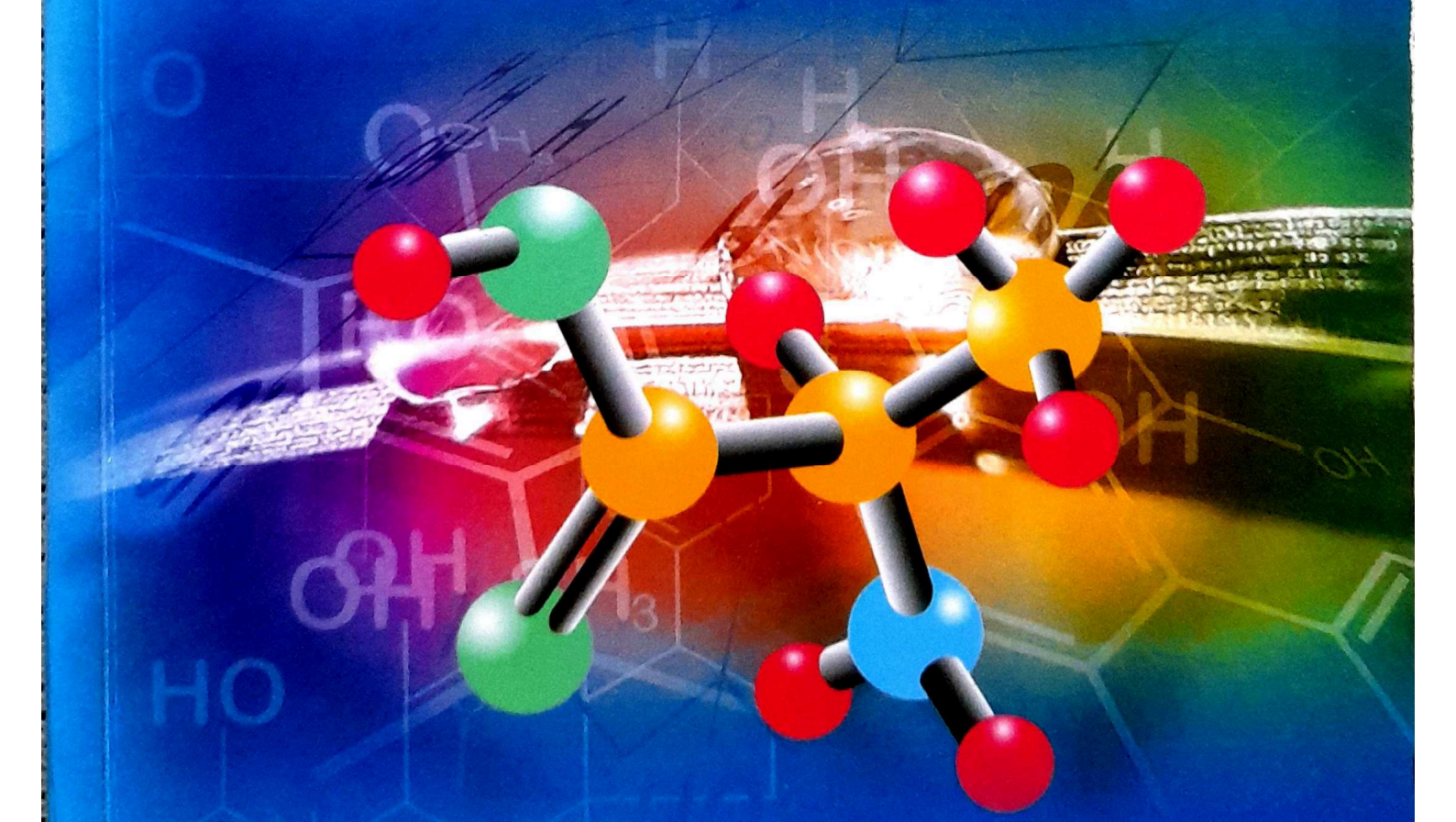
नई वयस्क कठफोड़वा मादाएं प्रतिदिन आसपास के इलाकों से आकर युद्ध करती थीं और वापस अपने आवास में लौट जाती थीं। मादाएं कई बार चार दिनों तक लगातार दस-दस घंटों तक युद्ध करती थीं। वैज्ञानिकों ने अनमान लगाया है कि इस दौरान सभी तमाशबीन कठफोडवा अपने समाज के

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# NOISE LEVEL NEAR EDUCATIONAL INSTITUTIONS AT INDORE, MADHYA PRADESH

**Chitnis[1], Smriti[2], Chitins[3], Uday[4] and Nirgude[5] Virendra**

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**Abstract-** Noise is unwanted sound. It is generated through an array of sources. Vehicular movements are one of them. Development of a country is also judged by its industrial development and the number of vehicles plying through it. Indore, the commercial capital of the central state Madhya Pradesh, has also been emerged as an educational hub. Khandwa Road is the area which is a landmark for educational institutions. An attempt has been made to measure the noise level around this area. As noise is known to affect auditory system, nervous system, circulatory system, human physiology and the performance behavior, so knowledge of noise level around educational areas is a fundamental need.

**Key Words:-** noise level, Indore, Educational Institutions.

## 1 INTRODUCTION

The word noise is derived from Latin word "Nausea" implying 'unwanted sound' or unexpected' or unpleasant sound (Pawar et al. 2010). Noise - the unwanted sound is a major factor of dissatisfaction with the environment in urban residential areas. In general, the noise pollution affects the auditory system, nervous system, circulatory system, human physiology and the performance behavior. Therefore, the assessment of noise originating infrastructures and industries, which are the most widespread noise source of today's

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## About Editors



Dr. Priyadarshini Agnihotri is working as Head of Geography Department in Arihant College, Indore. She is also a very active Environmentalist and a Social Worker. She has done M.A. (Geography), M.Phil and PhD (Geography) from Barkatulla University , Bhopal. She has also pursued B.Ed from Barkatulla University, Bhopal and M.Ed from IASE UNIVERSITY Rajasthan.

Dr. Priyadarshini Agnihotri is author of two books

1) Physical Geography 2) Regional Geography. In addition to this, she has edited over 13 books.

She is recipient of the awards

1. Awarded as "Vishishtha Seva Alankaran" on the occasion of International women's day by "Rashtriya Kshikshak Sanchetana and Rosary Club on March, 10, 2018 at Jhabua M.P. 2. International Award for "Innovative Dedicated Women Teaching Professional Award" in International Award Convention of 14th International Conference, (IC-GAEMP-DH), organized by Mathura Devi Group of Institutions, Indore, M. P. 19 & 20th January, 2019.3. International Award for "Achievement of Excellence in Career Guidance" in International Award Convention of "International Conference" organized by Mangalmay Institute and Management and Technology Greater Noida and KAAV Publication, New Delhi on 09th February, 2019. 4. International Award for "Contribution to the Social Sector" by Research Foundation of India on the occasion of 13th International Conference at Om Kothari Institute of Management and Research, Kota, Rajasthan on 23rd and 24th February, 2019. 5. Nominated as a "Brand Ambassador for Women Empowerment- 2019" by Rameshwarnath Social and Welfare Foundation, Allahabad, U.P. for the year 2018.6. International Award for "Professors with Excellence in Teaching in Higher Education" in International Award Convention of International Conference (IC-RASEM-2018) jointly organized by WFSR, ITCV Consulting and RFI on 29th September, 2018.7. "Education Icon Award" by Rangat News, M.P. 2018.8. International Award for "Professors with Excellence in Teaching in Higher Education", 10th International Conference 2018, SADE University, Indore9. International Award for "Pioneer Researches 2018", 9th International Conference LNCTS Indore by Research Foundation of India.10. "Person of the Conference Award 2018", 9th International Conference LNCTS Indore by Research Foundation of India.11. "Best Anchor Award 2018", 9th International Conference LNCTS Indore 12. "Remarkable Achievements in Research Work" Awarded by secretary of State for Central Panchayati Raj in 2016.13. "Nirbhaya Shakti Metro Women Award" by Rajasthan Patrika in Educational and Chamber of Commerce on the auspicious occasion of Women Day" in 2016.14. "Confederations of Education Excellence Teacher's Award-2015" (CCE), Delhi under the category of Research/Papers/Book published.15. "Young Geographer's Award" by the Institute of Indian Geography at Pt. Ravi Shankar Shukla University Raipur, M. P. in 1994.16. Secured Fourth Position in order of Merit in the University Examination in M. Phil . Dr. Priyadarshini Agnihotri has a rich experience of around 25 years in industry/Research/ Academy. Apart from this she is a very active member of Institute of Indian Geographers(IIG) and Rajasthan Geographers Association(RGA). She has also published more than 40 papers in various National and International journals and magazines.



Mr. Ravi Kant Anand (D.O.B. 19th April 1989) has been got selected by BPSC as Assistant professor of Geography in year 2017 and since december 2017 he has been working as assistant professor in department of Geography in H.L.N. College, Manjhul Segment, affiliated by Lalit Narayan Mithila University Darbhanga, Bihar. he has completed his Graduation from D. Nanda's College, Ranchi with 1st division and completed his P.G. from Ranchi university and he was being the gold medalist. He has also completed his M.phil from Centre for Russian and Central Asian Studies (CRCAS), School of International Studies(SIS), in JNU, New Delhi, and pursuing his Ph.D from JNU New Delhi. Along with having a excellent academic carrier he is also a very active participant in about more than 15 conferences, seminars and workshops. And about his 10 research articles has been published in different international and national peer reviewed journals and edited books. He is a young professor, passionate towards changing the scenario of education system and encourage students of Bihar to take education. He is actively working and has brought a very good change in his college campus since he is being appointed there.

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Dr. Priyadarshini Agnihotri is author of two books:
1) Physical Geography, 2) Regional Geography. In addition to this, she has published over 12 books.

Works recognized the awards:
1. The Long Geographical Research 2004 by the Institute of Indian Geo-
2. Received Co-Curricular Award of Excellence Scientist Award of 2010 (2012). Under Under the category of Research Paper Book published.
3. "Vitamin Bhakti Vanita Vitamin Award" by Rajasthan Patrika to international and chairman of commission on the occasion of Vitamin day 2018.
4. Awarded by Secretary of State for Central and Social Duty for her remarkable contribution in research work.
5. Received "International Award for Women Research Fellow 2018 BK International Commission (IACTS) Indore by Research Foundation of India.

Dr. Priyadarshini Agnihotri has a rich experience of at least 20 years in Indian Research Academy. Apart from this she is a very active member of Institute of Indian Geographers(IIG) and Rajasthan Geographers Association(RGA). She has also published more than 40 papers in various National and International journals and magazines.



Mr. Ram Kant Sahu (Ph.D. (Geography), UGC-NET-JRF) has a brilliant academic career. He has been awarded Gold Medal in M.A. (Geography) and Rajiv Gandhi Fellowship by Government of India. He has been awarded Junior Research Fellowship (JRF) by University Grants Commission (UGC), New Delhi. He has also cleared various competitive exams including NET, SLET/SET. He has qualified GATE exam also. He has been awarded Senior Research Fellowship (SRF) by UGC, New Delhi. Presently he is working as Assistant Professor in Department of Geography in M.L.B. College, Bhopal affiliated to Barkatullah University, Bhopal. He has also completed his Ph.D. from Bhopal. He has published more than 15 research papers in various reputed national and international journals including journals of UGC. He has also participated in more than 15 conferences, seminars and workshops. He has also presented papers in various national and international conferences, seminars and workshops. He has also been awarded Gold Medal for securing first position in Bachelor of Science examination from Barkatullah University, Bhopal. He has also been awarded Gold Medal for securing first position in Master of Science examination from Barkatullah University, Bhopal. He has also been awarded Gold Medal for securing first position in Master of Arts examination from Barkatullah University, Bhopal. He has also been awarded Gold Medal for securing first position in Master of Arts examination from Barkatullah University, Bhopal. He has also been awarded Gold Medal for securing first position in Master of Arts examination from Barkatullah University, Bhopal.

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# Various Aspect for Sustainable Development

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Mr. Ram Kant Sahu

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# Review on Touch DNA: An Emerging Detective Tool in Criminal Investigation

**Ankesh Ahirwar, Vijay R Chourey**
Department of Forensic Science, Government Holkar (Auto, Model) Science College, DAVV, Indore,

**Abstract:** *Forensic Science is a multidisciplinary science which helps in crime investigation. Touch DNA analysis is usually used to obtain information from biological materials to aid investigations associated with criminal offences, disaster victim identification and missing person's investigations. Touch DNA technology also called 'Contact Trace DNA' refers to the DNA is recovered from skin (epithelial) cells that are left behind when a person touches or comes in contact with items such as clothes, a weapon or other objects. Edmond Locard's evidence transfer theory states that when two entities come in mutual contact there is an exchange of traces. The simple act of picking up an object or touching a surface can lead to the identification of a criminal by generating a DNA profile and matching with DNA data base. A person sheds about 400,000 skin cells per day may help in linking the perpetrator to the crime scene. The sample collection, DNA extraction, amplification, profile generation and interpretation of touch DNA samples, contamination, transfer and forensic issues are also briefly discussed in this paper within the context of touch DNA analysis.*

**Key words:** DNA, touch DNA, Locard's principle, crime investigation.

1. **Introduction -** The crime rate in the world and in India in particular increasing worryingly and the need for rapid and effective methods of crime and criminal detection is also increasing. Individualization of human beings has long been a challenge facing law enforcement. At the crime scene various types of physical, chemical and biological evidences may left but in some cases there may be no any visible evidence available to the investigators. In such cases, traces of DNA transferred from the suspect through contact with evidences found at the crime scene can help in crime investigation. The perpetrator of the crime may deposit sufficient number of skin cells on items found at crime scene like murder weapon, clothing, victim. questioned document, etc. This opened up possibilities and led to the collection of DNA from a wider range of exhibits including: tools, clothing knives, vehicles, firearms, food, bedding, condoms, lip cosmetics, wallets, jewellery, glass, skin, paper, cables, windows, doors and stones. Extensive efforts have been made to collect touch DNA from numerous substrates; such as human skin, interiors of latex gloves, lip prints, steering wheels, door handles, and tool grips and shafts. These evidences if collected and DNA extracted may help in linking the perpetrator to the crime scene. Among possible substrates, clothing is often thought to be a source of important evidence for forensic DNA analysis in criminal investigations, e.g. in sexual assault cases.

2. **Methodology of touch DNA technology -** There are various steps involved in touch DNA technology.

2.1. ***Identifying the target surfaces -*** The first important task of a forensic investigator is to identify the target surfaces which may contain traces of suspect DNA. In case of homicide, touch DNA of perpetrator can be recovered from the surface of murder weapon like revolver, knife, pistol, etc. In case of sexual assault, it can be recovered from the skin and clothing of the victim. In cases of burglary the stolen item may have traces of DNA of the thief. In forgeries, the cells of the forgerer are transferred to the suspect document. These cells are sources of DNA which

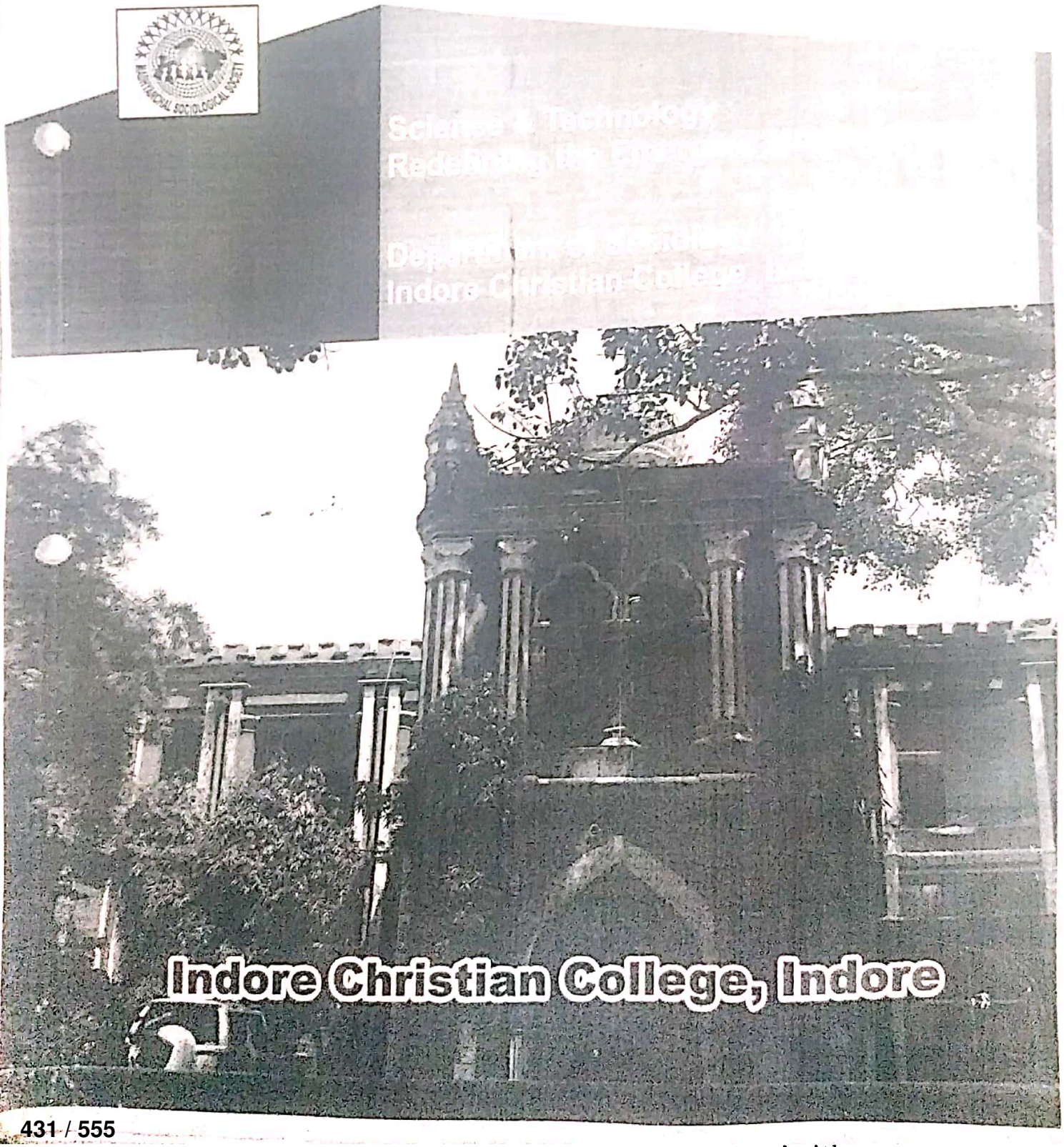




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# Preface: *Prof. Dinesh Varshney memorial* National Conference on Physics and Chemistry of Materials (NCPCM2018)

*Prof. Dinesh Varshney memorial* National Conference on Physics and Chemistry of Materials (NCPCM2018) was organized in the eve of birth anniversary of Dr Dinesh Varshney during December 27th - 28th, 2018. This conference is organized to pay tributes to departed Professor Dr Dinesh Varshney who deceased in an unfortunate accident on 9th May 2018. The conference has provided an ideal platform and opportunity to share research ideas with the eminent scientists, academicians, industrialists and policy makers working in the various fields of science and technology. The conference scope ranges from development in basic science to applied science and technology. Papers were presented in the form of keynote lecture, invited talks, contributed oral and poster presentations. The conference has covered various field of physics and chemistry, such as, condensed matter physics, plasma physics, nano materials, thin films technology, solar energy, computational physics and chemistry, analytical chemistry, etc.

We truly acknowledge the support received from various agencies, without which this event would have not been possible:

1. MP Council of Science and Technology, Bhopal
2. UGC-DAE CSR, Indore
3. RRCAT, Indore
4. Devi Ahilya University, Indore
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We also extend our heartiest thanks to our patrons, advisors, conveners, and all the members of the program committees for their herculean powers and helps.

Indore, 05 February, 2019

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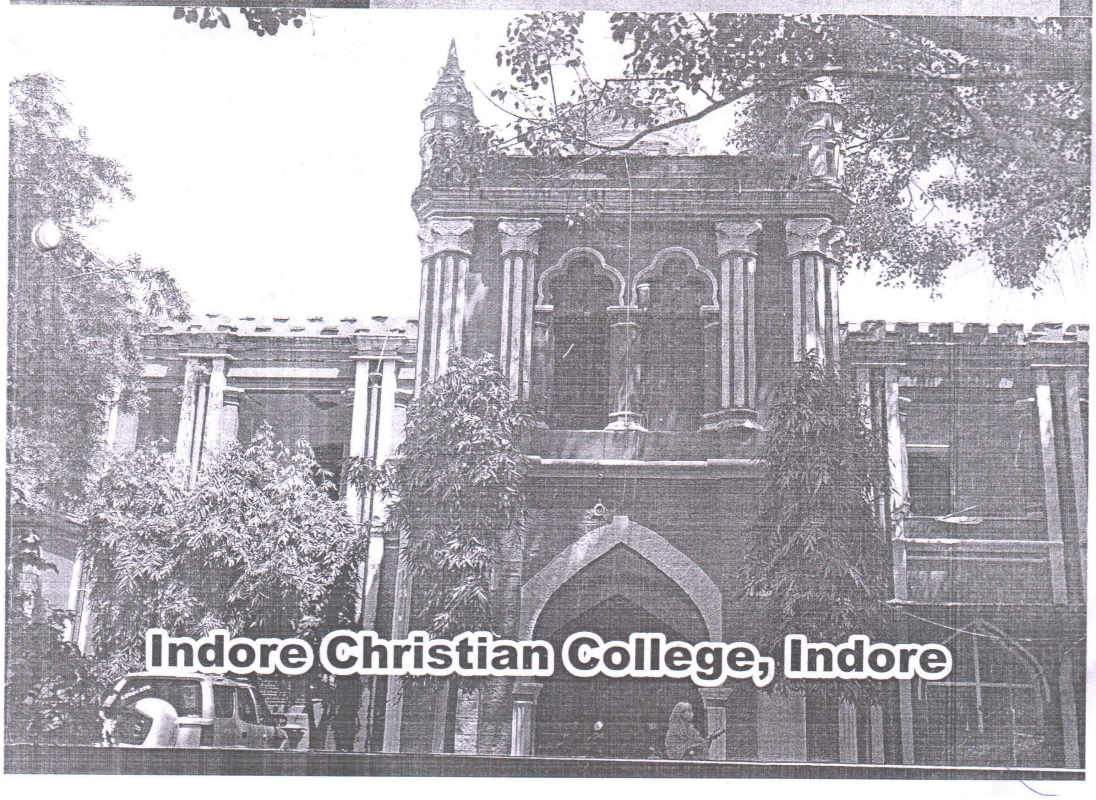
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and reduce global warming and climate change. New methods such as wind turbines, solar power and hydro-electric power are widely adopted now but there is a need to improve the efficiency of existing systems. ***All it's depend upon the vision.*** For example, *What is more important today, is nuclear weapon or green energy? Decision is in our hands...* Even possessing all knowledge we act contrarily in private and public arenas. Can we stop earthquake or tsunami, inactive the volcanoes, answer is no. But what we can do, is to stop nuclear weapon competitions, minimize uses of fossil fuels, planting a tree etc. ***Feel the power of green. The Future will either be green or not.***

**Conclusion:**

Priority setting is essential for defining the focus, scope, extent and direction that research and innovation systems should take to lead towards the path of sustainable development. The natural environment, far from improving, is degrading at a pace that climate change only accelerates. Sustainable development implies finding solutions that are effective. Promoting energy efficiency, green energy and energy conservation to residents, businesses and local government should be the main theme that works efficiently. We have ever more powerful and widely accessible technology for creating and accessing the information, as well as transmitting, treating, analyzing, relating, and, eventually, converting it into knowledge for use in problem solving. ***"Taking care of the present will take care of future. We must make better use of what we have. Go Green, Think Green, Act Green".***

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   - Stewart J. Cohen, Melissa W. Waddell


# Impact of Climate Change on Human Health the Major Issue of 21st Century


**Kirti Yadav[2] and Vijay R. Chourey[2]**

[a]Assistant Professor and [b] Professor and Head

[a] Kasturbagram Rural Institute, Indore (M.P.), [b] Govt. Holkar Science College Indore,



*Climate change is a major issue of 21st century. There are many reasons to change climate in this century. Global warming is one of the most important reason to change the weather cycle. In M.P. before a decade a proper weather cycle is observed i.e. 3-4 months winter, summer and rainy seasons respectively in a periodic trend. But due to the climate change weather cycle is disturbed. Because of this disturbance lots of disease every day comes across us. Crop production, rain fall, Human health etc. has been disturbed. This paper is focused on effect of climate change on health.*



**Key words:** climate change, weather cycle, 21st century, health.

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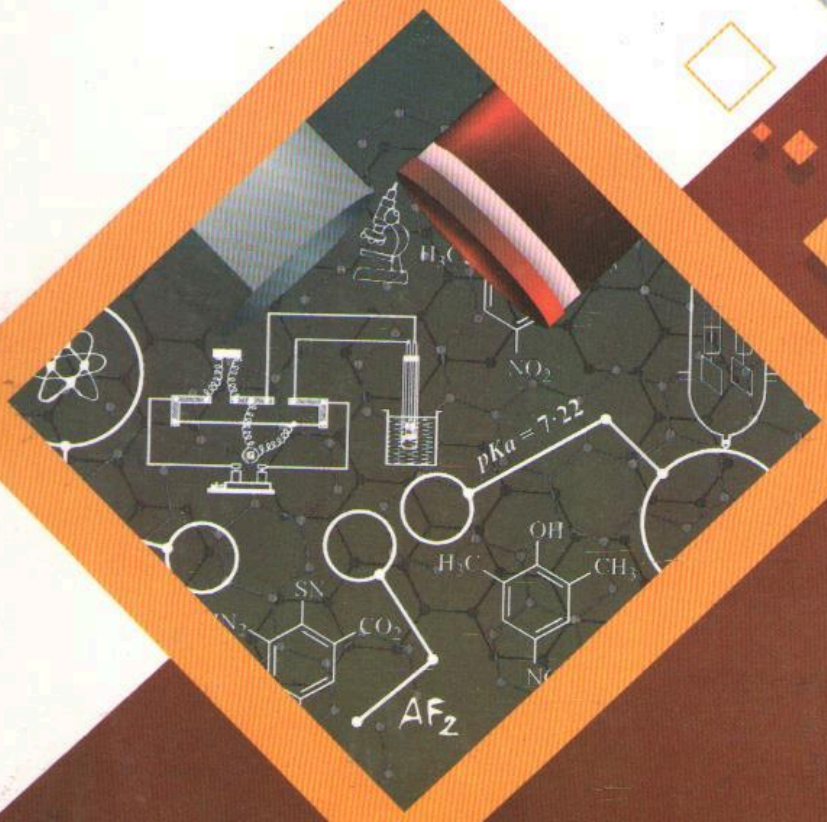
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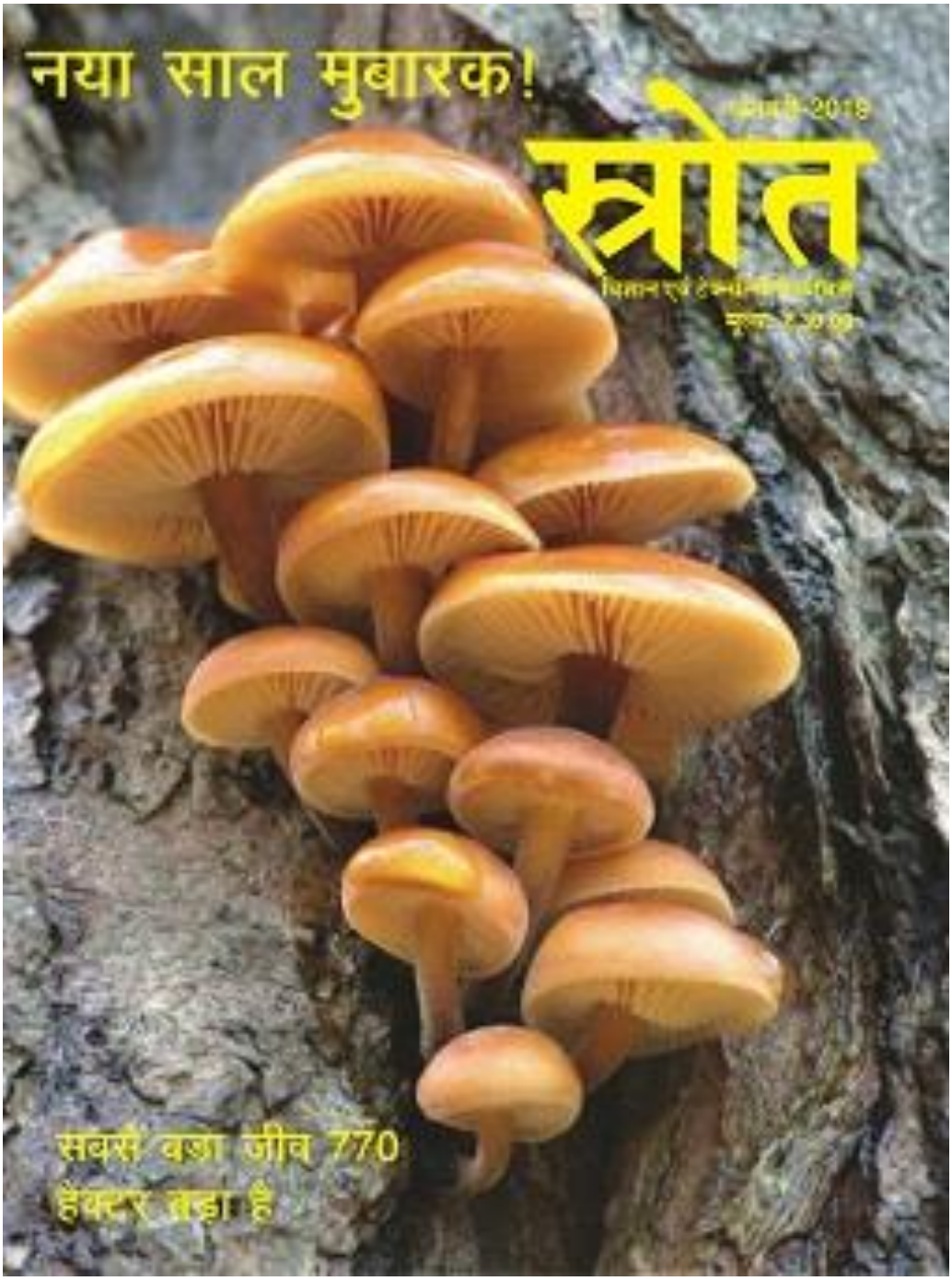
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3. विशेष पुताई करके घरों को ठंडा रखें
4. कार्बन डाईऑक्साइड से ईधन बनाने की जुगत - डॉ. डी. बालसुब्रमण्यन
5. पानी का बना नहीं सकते , संभाल सकते है - संध्या रायचौधरी
6. खरपतवारनाशी - सुरक्षित या हानिकारक
7. दाल की खाली होती कटोरी
8. बृहस्पति के चांद पर उतरने की मुश्किलें
9. मतदान से निर्धारित हुई मंगल पर उतरने की जगह
10. सौर मंडल का एक नया संसार खोजा गया
11. संपूर्ण व्यक्ति ही मौजूदा समस्याएं सुलझा सकता है - डॉ. डी. बालसुब्रमण्यन
12. विज्ञान में लिंगभेद उजागर करने की पहल
13. होम्योपैथी अध्ययन पर बवाल
14. माइक्रोस्कोप खुद हुआ माइक्रो - डॉ. दीपक कोहली
15. मीठा कागज पानी से बैक्टीरिया हटाएगा - डॉ. दीपक कोहली
16. नशा विरोधी प्रयासों के लिए अच्छी खबर - भारत डोगरा
17. क्या हमारे प्राइमेट रिश्तेदार भी वाचाल हैं? - डॉ. विपुल कीर्ति शर्मा
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21. रसायन में जैव विकास के सिद्धांत और नोबेल - डॉ. सुशील जोशी
22. जीवन की शुरुआत के और नज़दीक रसायनज्ञ
23. केंद्रक में डीएनए की स्थिति महत्वपूर्ण है
24. सुप्त जीन को जगाकर कैंसर का इलाज - डॉ. डी. बालसुब्रमण्यन
25. विलुप्त होने की कगार पर गिद्ध - डॉ. - दीपक कोहली
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27. क्यों होती है गाय के दूध से एलर्जी - नरेंद्र देवांगन
28. एक ही लिंग के चूहों के बच्चे

# क्या हमारे प्राइमेट रिश्तेदार भी वाचाल हैं?

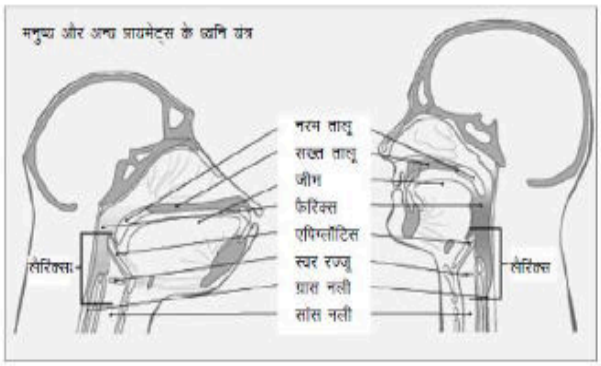
डॉ. विपुल कीर्ति शर्मा

मनुष्य की तुलना में अधिकांश प्राइमेट्स तरह-तरह की आवाज़ें नही निकाल सकते। प्राइमेट परिवार में एक ओर तो पेड़ों पर निवास करने वाले पश्चिमी अफ्रीका के वर्षा वनों में पाए जाने वाले कैलेबार आंगवानटिबो हैं जो केवल दो प्रकार की ही आवाज़ें निकलते हैं। दूसरे छोर पर मध्य अफ्रीका के कांगो बेसिन में पाए जाने वाले बौने चिम्पैंज़ी, बोनोबो हैं जो बेहद बातूनी हैं। ये कम से कम 38 प्रकार की आवाज़ें निकालने के लिए जाने जाते हैं।

फ्रंटियर इन न्यूरोसाइन्स में प्रकाशित एक नए अध्ययन में बताया गया है कि विभिन्न प्रकार की आवाज़ें निकालने के लिए केवल ध्वनि यंत्र (साउंड बाक्स) ही उत्तरदायी नहीं होता। पूर्व में वैज्ञानिक विभिन्न प्रकार की आवाज़ निकालने के लिए साउंड बाक्स को ही ज़िम्मेदार मानते थे और भाषा के विकास में इसे महत्वपूर्ण समझते थे। हाल ही में प्रकाशित शोध के अनुसार गैर मानव प्राइमेट में भी आवाज़ उत्पन्न करने वाली संरचना होमिनिड के सहोदरों के समान ही है। एंजलिया रस्किन विश्वविद्यालय के प्राणि विद जैकब डुन के अनुसार यदि शरीर की आवाज़ निकालने वाली संरचना एक जैसी है तो मुख्य मुद्दा मस्तिष्क की क्षमता का हो जाता है।

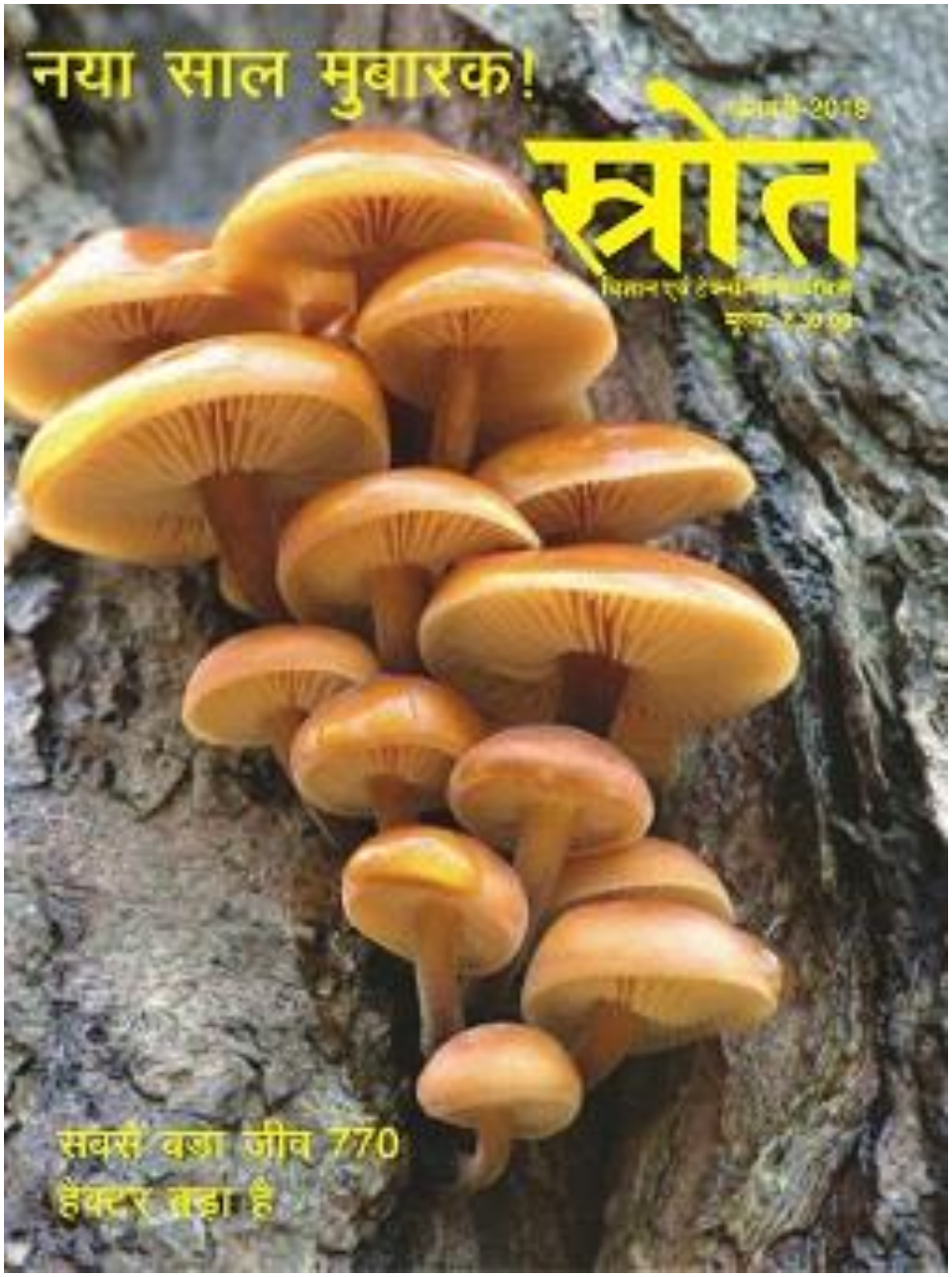
प्राइमेट्स में ध्वनि उत्पन्न करने का ढांचा काफी विकसित है लेकिन अधिकांश प्रजातियों में जटिल ध्वनियां बनाने के लिए उत्तरदायी संरचनाएं तंत्रिका तंत्र के नियंत्रण में नहीं है। शोधकर्ता के एक और साथी, स्टोनीब्रुक विश्वविद्यालय के नोरोन स्माअर्स ने 34 प्राइमेट्स की बोलने की क्षमता के आधार पर एक सूची बनाई। फिर दोनों वैज्ञानिकों ने प्रत्येक प्राइमेट प्रजाति की बोलने की क्षमता तथा मस्तिष्क के विकास के सम्बंध की जांच की।

जो ऐप्स (वनमानुष) विभिन्न प्रकार की आवाज़ें निकाल सकते थे उनमें विकसित तथा बड़े कॉर्टिकल और ब्रोन स्टेम पाए गए। ये मस्तिष्क के वे भाग हैं जो वाणि संवेदनाओं की प्रतिक्रिया तथा जीभ की मांसपेशियों का समन्वय करते हैं। परिणाम मस्तिष्क के कॉर्टेक्स से जुड़े भाग के आकार और विभिन्न प्रकार की आवाज़ निकालने की क्षमता के बीच सह-सम्बंध दर्शाते हैं। अर्थात बोलने की क्षमता स्वर निकालने की शारीरिक संरचनाओं की बजाय तंत्रिका नेटवर्क के कारण आती है। जिन प्राइमेट्स में मस्तिष्क के ध्वनि नियंत्रण क्षेत्र बड़े हैं वे अन्य के मुकाबले विभिन्न प्रकार की आवाज़ें निकाल सकते हैं।




उपरोक्त अध्ययन से पता चलता है कि बोलने की क्षमता का विकास मस्तिष्क के विकास के साथ-साथ ही हुआ है। मानव की विकास यात्रा में बोलचाल को ज़्यादा महत्व मिला और मस्तिष्क में उससे सम्बंधित भाग विकसित होते गए। दूसरी ओर एप्स में अन्य क्षमताएं विकसित हुईं और ध्वनि सम्बंधी संरचनाएं बनी तो रहीं किंतु बोलने के लिए आवश्यक तंत्रिका समन्वय नहीं हो पाया।

बोनोबो शोधकर्ताओं ने पाया है कि बोनोबो खाना खिलाने तथा यात्रा करने जैसी बिल्कुल भिन्न-भिन्न घटनाओं के लिए एक-सी आवाज़ निकालते हैं। यानी एक-सी आवाज़ से अलग-अलग संदेश देते हैं। यह समझ में नहीं आया है कि कैसे एक-सी आवाज से अलग-अलग संदेश दिए जाते हैं। (**स्रोत**


नया साल मुबारक!
स्रोत
सबसे बड़ा जीव 770
हेक्टर बड़ा है

# Srote - January 2019

1. सबसे बड़ा जीव 770 हैक्टर बड़ा है
2. एक खेल से जलवायु परिवर्तन की समझ
3. विशेष पुताई करके घरों को ठंडा रखें
4. कार्बन डाईऑक्साइड से ईंधन बनाने की जुगत - डॉ. डी. बालसुब्रमण्यन
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7. दाल की खाली होती कटोरी
8. बृहस्पति के चांद पर उतरने की मुश्किलें
9. मतदान से निर्धारित हुई मंगल पर उतरने की जगह
10. सौर मंडल का एक नया संसार खोजा गया
11. संपूर्ण व्यक्ति ही मौजूदा समस्याएं सुलझा सकता है - डॉ. डी. बालसुब्रमण्यन
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13. होम्योपैथी अध्ययन पर बवाल
14. माइक्रोस्कोप खुद हुआ माइक्रो - डॉ. दीपक कोहली
15. मीठा कागज पानी से बैक्टीरिया हटाएगा - डॉ. दीपक कोहली
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18. आप कितने चेहरे याद रख सकते हैं?
19. क्या आप ठीक से कंघी कर पाते हैं - डॉ. विपुल कीर्ति शर्मा
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23. केंद्रक में डीएनए की स्थिति महत्वपूर्ण है
24. सुप्त जीन को जगाकर कैंसर का इलाज - डॉ. डी. बालसुब्रमण्यन
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28. एक ही लिंग के चूहों के बच्चे

# पेंगुइंस की घटती आबादी

डॉ. विपुल कीर्ति शर्मा



पृथ्वी के दक्षिणी हिस्से में बर्फ से आच्छादित भाग में बहुत कम प्राणी जीवित रह पाते हैं। किंतु दो पैरों पर डोलते हुए चलने वाले, बर्फीले वातावरण के अनुकूल व उड़ने में असमर्थ पक्षी पेंगुइन के लिए यह स्वर्ग है। पेंगुइन का नाम सुनते ही हम काले-सफेद रंग के शरीर वाले छोटे आकार के जंतु की कल्पना करने लगते हैं। वास्तव में ये पक्षी अनेक आकार और रंग वाले भी होते हैं। कलगीदार (क्रेस्टेड) पेंगुइन को ही लीजिए जिनके सर पर नीले रंग के पंख मुकुट जैसे दिखते हैं। एंपरर और किंग पेंगुइन के चेहरे की पार्श्व सतह पर नारंगी और पीले रंग की आभा, काले चेहरे तथा सफेद छाती इन्हें बेहद सुंदर बना देती है। फिओर्डलैंड, स्नेयर, रॉयल तथा रॉकहॉपर पेंगुइंस की सफेद और पीले रंग के लंबे रेशों वाली भौहें इन्हें बाकी पेंगुइंस से अधिक आकर्षक बना देती है। येलो आइड पेंगुइन की आंखें पीले रंग से घिरी रहती है। कुल मिलाकर पेंगुइन की 17 प्रजातियां हैं।

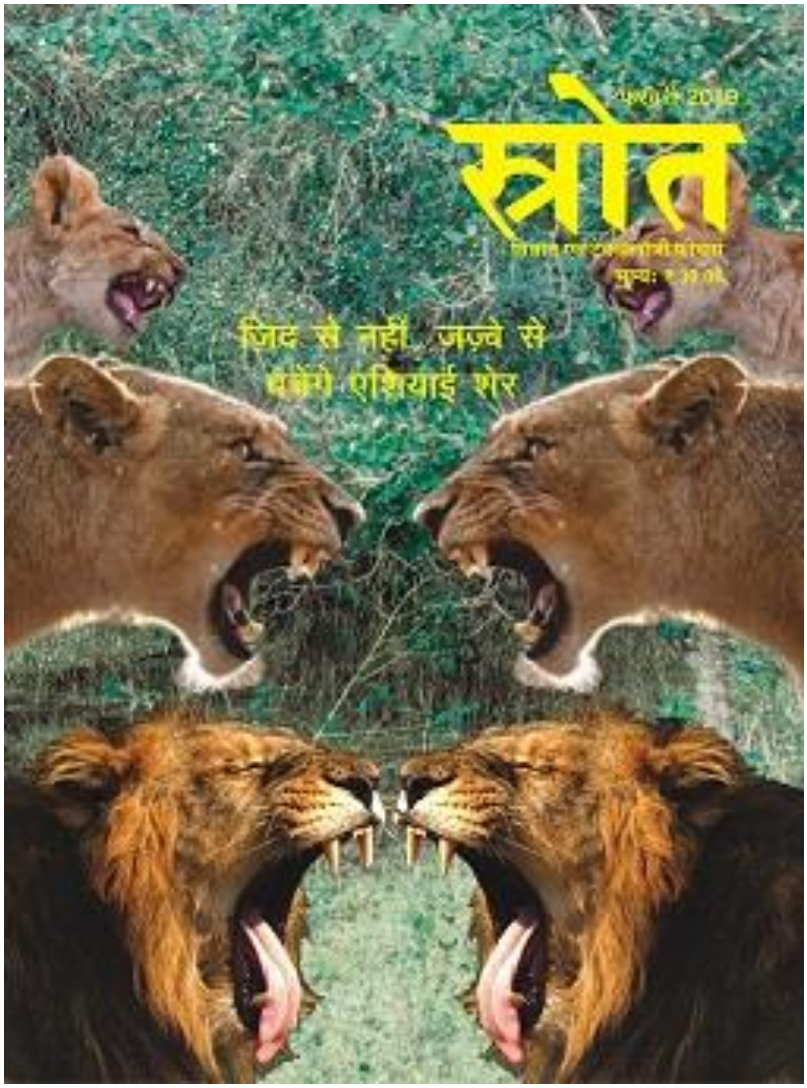
सबसे छोटे आकार की पेंगुइन प्रजाति लिटिल ब्लू लगभग 12 इंच की होती है तथा सबसे लंबी प्रजाति एंपरर पेंगुइन 44 इंच लंबी होती है।

**कहां रहते हैं पेंगुइंस?**

पेंगुइंस उड़ तो नहीं सकते परंतु चप्पू जैसे रूपांतारित हाथ इन्हें बेहद माहिर तैराक बनाते हैं। ये अपने जीवन का 80 प्रतिशत समय समुद्र में तैरते हुए ही बिताते हैं। सभी पेंगुइन दक्षिणी गोलार्ध में रहते हैं हालांकि यह एक आम मिथक है कि वे सभी अंटार्कटिका में ही रहते हैं। वास्तव में दक्षिणी गोलार्ध में हर महाद्वीप पर पेंगुइन पाए जा सकते है। यह भी एक मिथक है कि पेंगुइन केवल ठंडे इलाकों में पाए जाते हैं। गैलापगोस द्वीपसमूह में पाए जाने वाले पेंगुइन भूमध्य रेखा के उष्णकटिबंधीय समुद्री किनारों पर रहते हैं।

**क्या खाते हैं पेंगुइन?**

पेंगुइन मांसाहारी हैं। उनका आहार समुद्र में पाए जाने वाले छोटे क्रस्टेशियन जीव, स्क्विड और मछलियां हैं। पेंगुइन बहुत पेटू भी होते हैं। कई बार तो इनके समूह इतना खाते हैं कि इनकी आबादी के आसपास का क्षेत्र भोजन रहित हो जाता है। प्रत्येक दिन कुछ पेंगुइन तो औसत 200 बार गोता लगाकर समुद्र में 120 फीट नीचे तक भोजन की तलाश में चले जाते हैं।

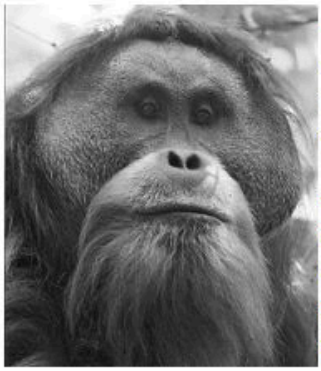

स्रोत
जिद से नहीं, जज़्बे से
बढ़ेंगे एशियाई शेर

# Srote - February 2019

1. स्पाइनल क्षति से ग्रस्त लोगों के लिए आशा की किरण
2. कार्बन उत्सर्जन का लक्ष्य पूरा नहीं कर पा रहे राष्ट्र
3. दिमाग की कोशिकाएं अपने जीन बदलती रहती हैं
4. वायरस से लड़ने मे मददगार गुड़ और अदरक - डॉ. डी. बालसुब्रमण्यन
5. हंसने से रोग प्रतिरोधक क्षमता बढ़ती है - नरेंद्र देवांगन
6. गर्भाशय में भ्रूण की सुरक्षा
7. मलेरिया का बढ़ता प्रकोप - नवनीत कुमार गुप्ता
8. मस्तिष्क को भी प्रभावित करता है वायु प्रदूषण - डॉ. विजय कुमार उपाध्याय
9. एक दशक में प्रति व्यक्ति शराब खपत दुगनी हुई - भरत डोगरा
10. मनुष्य का शिशु असहाय क्यों? - गंगानंद झा
11. मंगल पर मीथेन का रहस्य
12. नकली चांद की चांदनी से रोशन होगा चीन! - प्रदीप
13. सितारों की आतिशबाज़ी का अंदेशा
14. दक्षिण अफ्रीका में घुसपैठी प्रजातियों का आतंक
15. पर्यावरण शिक्षा का एक अनोखा कार्यक्रम - डॉ. सुशील जोशी
16. अरावली पहाड़ियां बची रहीं, तो पर्यावरण भी बचा रहेगा - जाहिद खान
17. उजड़े वनों में हरियाली लौट सकती है - भारत डोगरा
18. मकड़ी का रेशम स्टील से 5 गुना मज़बूत
19. हवा में टंगे आलू - डॉ. किशोर पंवार
20. खतरे में है ओरांगुटान की नई प्रजाति - डॉ. विपुल कीर्ति शर्मा
21. ओरांगुटान अतीत के बारे में बात करते हैं
22. ज़िद से नहीं, जज़्बे से बचेंगे एशियाई शेर - जाहिद खान
23. बिना इंजन के विमान ने भरी उड़ान
24. बिच्छू का ज़हर निकालने वाला रोबोट - डॉ. विपुल कीर्ति शर्मा
25. यौन हिंसा के खिलाफ आवाज़ों को मिला सम्मान - जाहिद खान
26. परीक्षाएं: भिन्न-सक्षम व्यक्तियों के लिए समान धरातल - सुबोध जोशी
27. सावधान! ऐप चुरा रहे हैं निजी डेटा - मनीष श्रीवास्तव
28. बिल्लियां साफ-सुथरी कैसे बनी रहती हैं

# खतरे में है ओरांगुटान की नई प्रजाति

डॉ. विपुल कीर्ति शर्मा

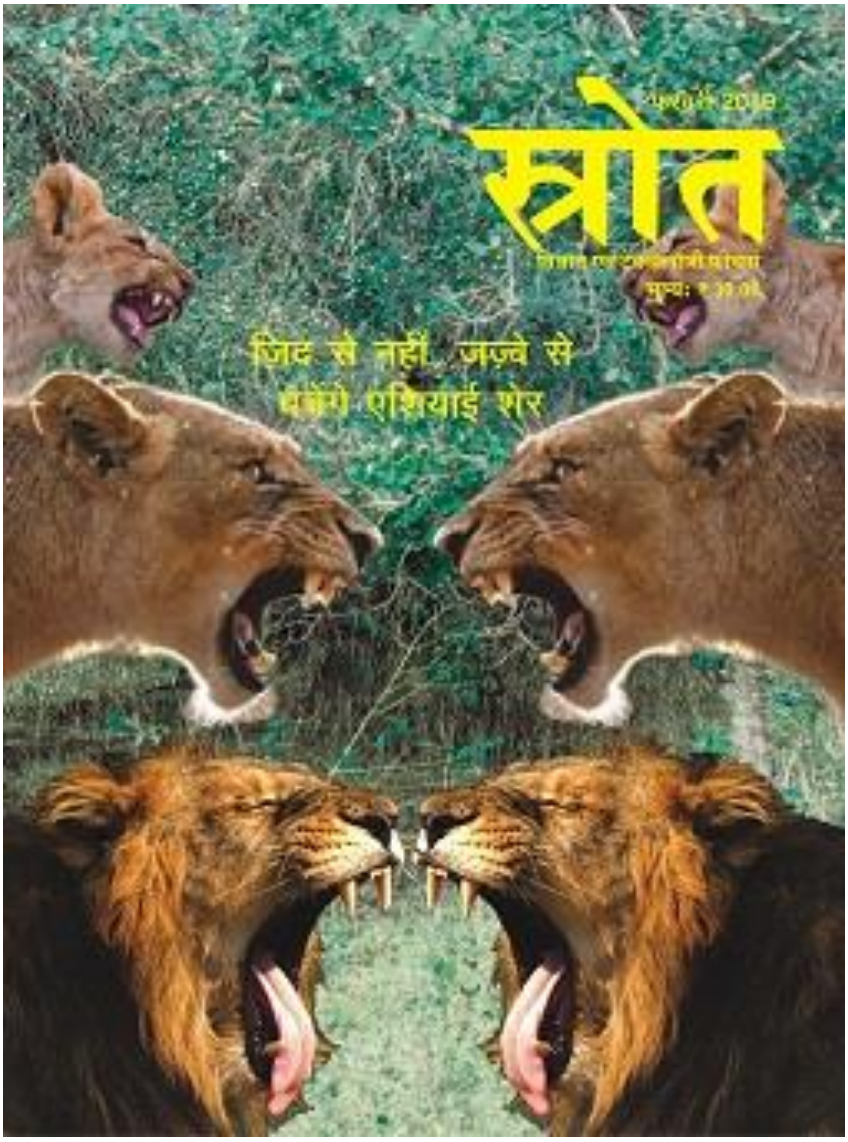


ओरांगुटान हमारे करीबी रिश्तेदार हैं क्योंकि इनका जीनोम और मानव जीनोम 96.4 प्रतिशत समान है। ये अपने खास लाल फर के लिए पहचाने जाते हैं तथा पेड़ों पर रहने वाले सबसे बड़े स्तनधारी हैं। ये लंबी तथा शक्तिशाली भुजाओं से एक से दूसरे पेड़ पर छलांग लगाते हैं और इस दौरान हाथ और पैरों से मज़बूत पकड़ बनाए रखते हैं।

ब्रुनेई, इंडोनेशिया, मलेशिया तथा सिंगापुर में बोली जाने वाली मलय भाषा में ओरांगुटान का मतलब होता है 'जंगल का मानव'। ये निचले भूभाग के जंगलों में अकेले रहना पसंद करते हैं। लीची, मैंगोस और अंजीर जैसे जंगली फल इनकी खुराक हैं। रात होने के पूर्व ये वृक्ष की शाखाओं का घोंसला बनाकर सोते हैं। 90 कि.ग्रा. के भारी भरकम नर ओरांगुटान को उनके गालों के गद्दे (फ्लेंज) तथा ज़ोरदार लंबी आवाज लगाने के लिए गले की थैली से आसानी से पहचाना जा सकता है।

ब्रुनेई तथा सुमात्रा में पाए जाने वाले ओरांगुटान व्यवहार तथा दिखने में कुछ भिन्न होते हैं। सुमात्रा के ओरांगुटान के परिवार में सदस्यों का एक-दूसरे से जुड़ाव ज़्यादा होता है तथा चेहरे के बाल लंबे होते हैं। ब्रुनेई के ओरांगुटान पेड़ों को छोड़कर बेझिझक ज़मीन पर भी आ जाते हैं। हाल ही के वर्षों में दोनों प्रजातियों की आबादी में बेहद ज़्यादा गिरावट देखी गई है। एक शताब्दी पूर्व ही ब्रुनेई तथा सुमात्रा में इनकी संख्या 2,30,000 थी। अब ब्रुनेई में कुल जमा 1,04,700 तथा सुमात्रा में लगभग 7500 ओरांगुटान बचे हैं और इन्हें क्रमश: संकटग्रस्त व लुप्तप्राय श्रेणियों में रखा गया है। 2017 में तपानुली ओरांगुटान के नाम की नई प्रजाति उत्तरी सुमात्रा से खोजी गई है जिनकी संख्या केवल 800 है। यह वनमानुषों में सबसे कम है। नई प्रजाति सुमात्रा के बटांग तोरू के परिस्थितिक तंत्र में 1225 वर्ग कि.मी. के ऊंचाई पर स्थित घने जंगलों में पेड़ों पर मिलती है। ऐसा अनुमान है कि लगभग 10-20 हज़ार साल पहले ही बाकी ओरांगुटान प्रजातियों से अलग होकर तपानुली ओरांगुटान प्रजाति अस्तित्व में आई है। इनके आवास का क्षेत्रफल छोटा, बिखरा हुआ तथा संरक्षण से वंचित रहा है। इनके आवास क्षेत्र के अधिकांश हिस्से कृषि, सड़क या रेल मार्ग, शिकार, पनबिजली परियोजनाओं तथा बाढ़ के कारण सिकुड़ गए हैं।

यद्यपि इक्कीसवीं सदी में वनमानुष की नई प्रजाति खोजना उत्साहजनक है परंतु इनको संरक्षित करने की कार्रवाई तुरंत की जानी चाहिए। कहीं ऐसा न हो कि नई खोजी गई प्रजाति हमारे सामने ही विलुप्त हो जाए। (**स्रोत फीचर्स**)

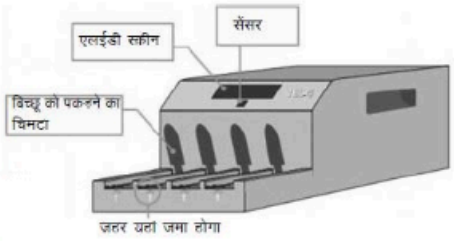

स्रोत
ज़िद से नहीं, ज़ज़्बे से
बनेंगे एशियाई शेर

# Srote - February 2019

1. स्पाइनल क्षति से ग्रस्त लोगों के लिए आशा की किरण
2. कार्बन उत्सर्जन का लक्ष्य पूरा नहीं कर पा रहे राष्ट्र
3. दिमाग की कोशिकाएं अपने जीन बदलती रहती हैं
4. वायरस से लड़ने मे मददगार गुड़ और अदरक - डॉ. डी. बालसुब्रमण्यन
5. हंसने से रोग प्रतिरोधक क्षमता बढ़ती है - नरेंद्र देवांगन
6. गर्भाशय में भ्रूण की सुरक्षा
7. मलेरिया का बढ़ता प्रकोप - नवनीत कुमार गुप्ता
8. मस्तिष्क को भी प्रभावित करता है वायु प्रदूषण - डॉ. विजय कुमार उपाध्याय
9. एक दशक में प्रति व्यक्ति शराब खपत दुगनी हुई - भरत डोगरा
10. मनुष्य का शिशु असहाय क्यों? - गंगानंद झा
11. मंगल पर मीथेन का रहस्य
12. नकली चांद की चांदनी से रोशन होगा चीन! - प्रदीप
13. सितारों की आतिशबाज़ी का अंदेशा
14. दक्षिण अफ्रीका में घुसपैठी प्रजातियों का आतंक
15. पर्यावरण शिक्षा का एक अनोखा कार्यक्रम - डॉ. सुशील जोशी
16. अरावली पहाड़ियां बची रहीं, तो पर्यावरण भी बचा रहेगा - जाहिद खान
17. उजड़े वनों में हरियाली लौट सकती है - भारत डोगरा
18. मकड़ी का रेशम स्टील से 5 गुना मज़बूत
19. हवा में टंगे आलू - डॉ. किशोर पंवार
20. खतरे में है ओरांगुटान की नई प्रजाति - डॉ. विपुल कीर्ति शर्मा
21. ओरांगुटान अतीत के बारे में बात करते हैं
22. ज़िद से नहीं, जज़्बे से बचेंगे एशियाई शेर - जाहिद खान
23. बिना इंजन के विमान ने भरी उड़ान
24. बिच्छू का ज़हर निकालने वाला रोबोट - डॉ. विपुल कीर्ति शर्मा
25. यौन हिंसा के खिलाफ आवाज़ों को मिला सम्मान - जाहिद खान
26. परीक्षाएं: भिन्न-सक्षम व्यक्तियों के लिए समान धरातल - सुबोध जोशी
27. सावधान! ऐप चुरा रहे हैं निजी डैटा - मनीष श्रीवास्तव

# बिच्छू का ज़हर निकालने वाला रोबोट

डॉ. विपुल कीर्ति शर्मा



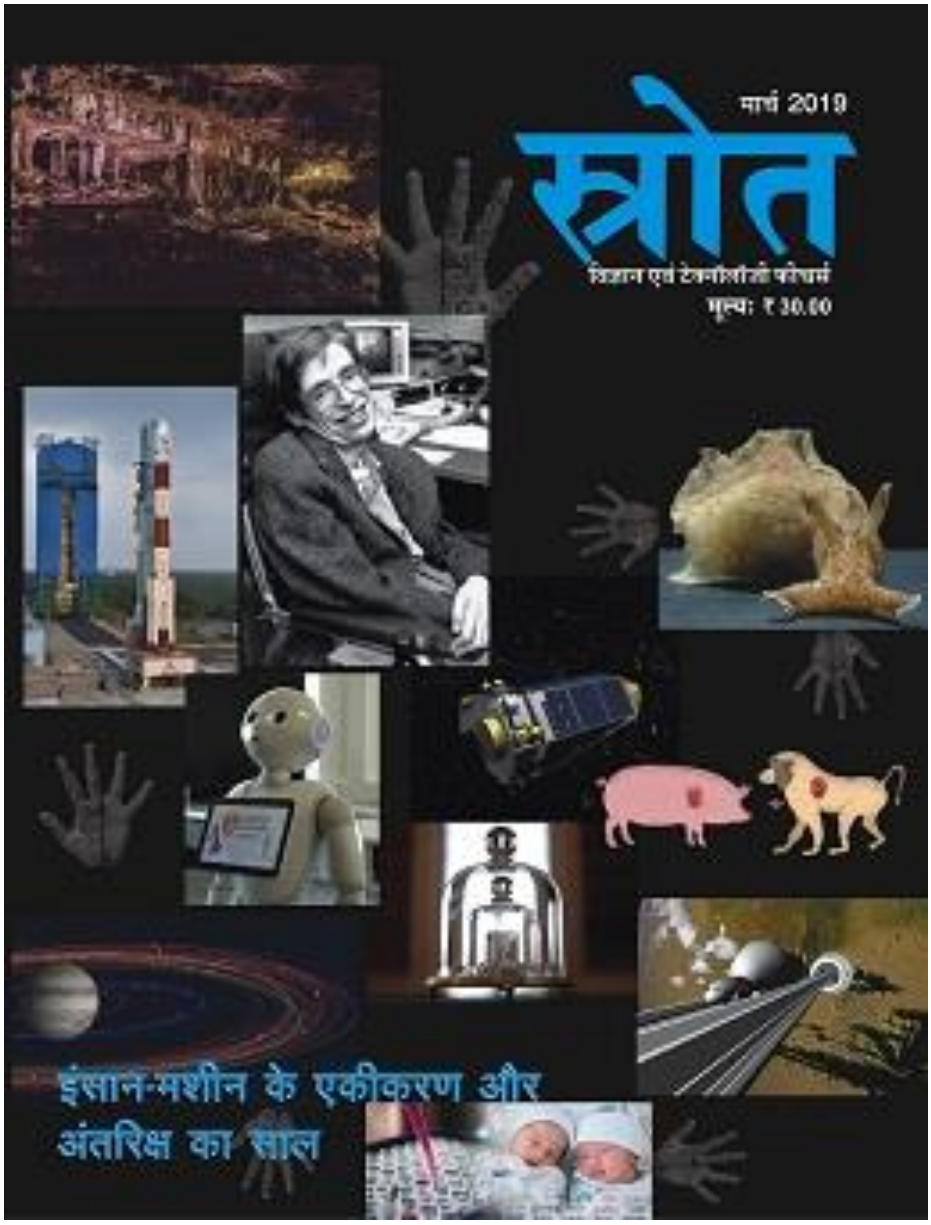

बचपन से ही माउद मकमल को पालतू जानवर के रूप में सांप और बिच्छू पालने का शौक था। बड़े होते-होते यह शौक परवान चढ़ा। शोध के लिए उन्होंने बिच्छुओं को चुना। मकमल अब मोरक्को के किंगहसन केसाब्लांका विश्वविद्यालय में बिच्छू के ज़हर पर शोध कर रहे हैं। हाल ही में उन्होंने बिच्छू का ज़हर निकालने के लिए एक रोबोट बनाया है। रोबोट बनाने का विचार इसलिए आया क्योंकि चिकित्सकीय महत्व के कारण अन्तर्राष्ट्रीय बाज़ार में एक ग्राम बिच्छू के ज़हर की कीमत 4.5-5.50 लाख रुपए होती है। यानी यह दुनिया के सबसे महंगे द्रवों में से एक है।

बिच्छू मकड़ियों के नज़दीकी रिश्तेदार हैं। इनका शरीर खंडों वाला, टांगें जोड़ वाली तथा शरीर का बाह्य भाग कठोर आवरण से ढंका रहता है। कठोर आवरण कवच का कार्य करता है तथा रेगिस्तानी बिच्छुओं को असहनीय गर्मी तथा शत्रुओं के हमले से बचाता है।

बिच्छुओं में शिकार को ज़हर से मारने के लिए टेलसन होता है। टेलसन बिच्छू के पूंछ का छोटे रोमों से आच्छादित अंतिम सिरा होता है। डंक के साथ टेलसन में दो विष ग्रंथिया भी होती हैं। बिच्छू का ज़हर विभिन्न प्रकार के प्रोटीन का मिश्रण होता है। प्रत्येक बिच्छू प्रजाति में प्रोटीन अलग प्रकार के होते हैं। बिच्छू शिकार के अनुसार ज़हर में प्रोटीनों की मात्रा तथा प्रकार बदल भी सकते हैं। मतलब एक चूहे या टिड्डे को मारने के लिए ज़हर की मात्रा एवं प्रकार में बदलाव किया जा सकता है। बिच्छू की अधिक ज़हरीली प्रजातियों में अल्फा तथा बीटा स्कॉर्पियान नामक दो प्रोटीन ज्ञात किए गए हैं। ये दोनों प्रोटीन संवेदनशील सोडियम एवं पोटेशियम चैनलों को अवरूद्ध कर तंत्रिका तंत्र को आघात पहुंचाते हैं।

बिच्छू को पालना बेहद आसान है पर बिच्छू का ज़हर निकालना बेहद ही कठिन है। ज़हर निकालने के लिए बिच्छू को चिमटे से पकड़कर टेबल पर टेप से चिपका दिया जाता है। टेलसन के अंतिम सिरे पर उपस्थित डंक को एक छोटी ट्यूब में रखा जाता है और इलेक्ट्रोड से 12 वोल्ट का करंट दिया जाता है। उत्तेजना में डंक से ज़हर की बूंदें निकलती हैं। ट्यूब में आई बूंदों को तुरंत ही फ्रीज़ कर दिया जाता है।

मकमल की टीम ने बिच्छू से ज़हर निकालने के लिए लेब या फील्ड में उपयोग में लाए जा सकने वाले हल्के व वहनीय रोबोट VE.4 का निर्माण किया है। रोबोट की बनावट ऐसी है कि बिच्छू से ज़हर निकालते समय उसे चोट भी नही पहुंचती। VE.4 रोबोट में बिच्छू का एक चेम्बर होता है तथा पूंछ वाले हिस्से को दबाए रखने के लिए दो क्लिप की सहायता ली जाती है। चेम्बर के दरवाज़े से केवल पूंछ बाहर आ सकती है बिच्छू नहीं। पूंछ के अंतिम सिरे टेलसन के नीचे एक ट्यूब में ज़हर को एकत्रित किया जा सकता है। चेम्बर के ऊपर एक ख़ुकक़ स्क्रीन होती है जो बिच्छू की लंबाई के अनुसार चेम्बर तथा पूंछ के प्लेटफार्म को लंबा या छोटा कर सकती है। रिमोट कंट्रोल से कार्य करने के लिए एक इन्फ्रारेड सेन्सर भी होता है। जैसे ही बिच्छू को चेम्बर में डालकर पूंछ को सीधा किया जाता है, रिमोट कंट्रोल का बटन दबाने से दो क्लिप में करंट से बिच्छू का ज़हर ट्यूब में आ जाता है।


मार्च 2019
स्रोत
विज्ञान एवं टेक्नोलॉजी फीचर्स
मूल्य: ₹ 30.00
इंसान-मशीन के एकीकरण और
अंतरिक्ष का साल

# Srote - March 2019

1. भटकती परमाणु घड़ी से आइंस्टाइन के सिद्धांत की पुष्टि
2. 4000 वर्ष पूर्व भी बोर्ड गेम खेला जाता था
3. मलेरिया परजीवी को जल्दी पकड़ने की कोशिश
4. माहवारी के समय इतनी पाबंदियां क्यों? - सीमा
5. कितनी स्वच्छ थी मेरी दिवाली - डॉ. डी. बालसुब्रमण्यन
6. इंसान-मशीन के एकीकरण और अंतरिक्ष का साल - चक्रेश जैन
7. याददाश्त से जुड़ी समस्याओं में कसरत मददगार - डॉ. डी. बालसुब्रमण्यन
8. डेढ़ सौ साल जी सकते हैं मनुष्य - संध्या राय चौधरी
9. ब्लैक विडो मकड़ी - डॉ. विपुल कीर्ति शर्मा
10. पराग कण: सूक्ष्म आकार, बड़ा महत्व - डॉ. दीपक कोहली
11. स्कूल में भूत का नज़ारा - संतोष शर्मा
12. सूरज को धरती पर उतारने की तैयारी - प्रदीप
13. क्या विश्व सतत विकास लक्ष्य प्राप्त कर सकेगा? - भारत डोगरा
14. जैव विविधता का तेजी से होता ह्रास - नवनीत कुमार गुप्ता
15. जंतु प्रजातियां अभूतपूर्व खतरे के दौर में - भरत डोगरा
16. कैफीन-रहित चाय का पौधा - डॉ. अरविंद गुप्ते
17. प्रकृति की तकनीकी की नकल यानी बायोनिक्स - डॉ. दीपक कोहली
18. बांध टूटे तो नदी ने अपना मलबा साफ किया

# ब्लैक विडो मकड़ी

डॉ. विपुल कीर्ति शर्मा



वैसे तो मकड़ी नाम ही डराने के लिए काफी है लेकिन अगर मकड़ी ब्लैक विडो हो तो चिंता होना स्वाभाविक है। वास्तव में तो ये बेहद शालीन होती हैं और एक कोने में दुबककर बैठ जाती हैं पर अनजाने में यदि काट लें तो तेज़ दर्द के साथ पेशियों में ऐंठन और घबराहट होती है तथा डायफ्राम के शिथिल होने के कारण सांस लेने में भी परेशानी होने लगती है। फिर भी काटने के अधिकांश मामलों में विशेष चिकित्सकीय उपचार की आवश्यकता नहीं होती।

यूं तो ब्लैक विडो मकड़ी का वैज्ञानिक नाम लेट्रोडेक्टस है लेकिन इसके अभिलक्षण के आधार पर इसको कई नामों से जाना जाता है। जैसे पीठ पर लाल पट्टी के कारण रेडबैक मकड़ी, बेतरतीब जाले के कारण टेंगल्ड वेब मकड़ी, और कंघेनुमा टांगों के कारण कॉम्ब फूटेड मकड़ी कहा जाता है। कई बार अपने साथी नर को मैथुन के पश्चात खा जाने के कारण इसे आम तौर पर ब्लैक विडो कहा जाता है। लेट्रोडेक्टस मकड़ियां थेरिडिडी कुल से सम्बंधित हैं। इस बड़े कुल में 100 वंशों की लगभग 2200 प्रजातियां सम्मिलित हैं। ये ऊनी रेशम की बजाय चिपचिपे रेशम के द्वारा शिकार को पकड़ती हैं। ब्लैक विडो का विष चिकित्सकीय अध्ययन के लिए बहुत महत्वपूर्ण है। इनके द्वारा सावित रेशमी धागे की रासायनिक संरचना का अध्ययन और इसकी उपयोगिता भी वैज्ञानिक शोध के आकर्षक क्षेत्र हैं। इनकी लैंगिक स्वजाति भक्षण की प्रवृति भी रहस्यमय है और शोध का आमंत्रण देती है। अत: ब्लैक विडो वैज्ञानिक शोध के लिए प्रयोगशाला के आदर्श जीव हैं।

मेरी प्रयोगशाला में तीन साल पहले कुल 45 वयस्क ब्लैक विडो थीं जिनमें 30 मादा और 15 नर थे। नर की कम संख्या का कारण उनकी आयु कम होना तथा प्रजनन के बाद उनका शहीद हो जाना है। पालने के लिए हमने लैब में प्लास्टिक की पारदर्शी पानी की बोतल में इनका घर बनाया। ढक्कन के ऊपर छोटे-छोटे छेद श्वसन के लिए और बोतल में पानी में भीगा रूई का फाहा पानी पीने के लिए रखा जाता है। सभी मकड़ियां परभक्षी होती हैं, इसलिए खुराक में उन्हें तीन दिन में एक बार दो घरेलू मक्खियां या एक टिड्डा दिया जाता है। ब्लैक विडो मकड़ियां जाला बनाकर रहती हैं और वे शिकार करने के लिए पूर्णत: जाले पर ही निर्भर रहती हैं।

बोतल में छोड़ने के बाद ये मकड़ियां सामान्यत: रात में बोतल में उपलब्ध जगह के अनुसार जाला बनाती हैं। कम जगह में छोटा जाला और खुली जगह या प्राकृतिक निवास में बड़ा जाला बनाया जाता है। जाला जितना बड़ा होता है, शिकार की उसमें फंसने की सम्भावनाएं भी उतनी ही अधिक प्रबल होती हैं। दिखने में यह जाला भले ही भद्दा और बेतरतीब हो परंतु शिकार को फांसने में बेजोड़ होता है।


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स्रोत
आकाश गंगा के 11
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1. क्या युवा खून पार्किंसन रोग से निपट सकता है?
2. अंग प्रत्यारोपण के साथ एलर्जी भी मिली
3. जैव-विद्युत संदेश और अंगों का पुनर्जनन
4. चीनी यान चांद के दूरस्थ हिस्से पर उतरा
5. चांद पर पौधे उगाए गए - संकलन डॉ. दीपक कोहली
6. चांद पर कपास के बीज उगे, अंकुर मर गए
7. समुद्र के पेंदे से 200 फीट नीचे सूक्ष्मजीव पाए गए
8. कैंसर को चुनौती के नए आयाम
9. आकाश गंगा : कुछ रोचक तथ्य
10. क्या असमय मृत्यु की शिकार होगी आकाशगंगा?
11. रोगों की पहचान में जानवरों की भूमिका - डॉ. डी. बालसुब्रमण्यन
12. जीन संपादन: संभावनाएं और चुनौतियां - प्रदीप
13. घाव के इलाज में तैनात इल्लियां
14. प्रयोगशाला में अनेक सिर वाला जीव बनाया गया
15. एक महिला जो पुरुषों की आवाज़ नहीं सुन सकती
16. एक टिकाऊ भविष्य के लिए आहार में परिवर्तन - डॉ. डी. बालसुब्रामण्यन
17. यदि आपके बच्चे सब्ज़ियां नहीं खाते - डॉ. विपुल कीर्ति शर्मा
18. मानव शिशु चिम्पैंज़ी-शब्दकोश का उपयोग करते हैं - डॉ. डी. बालसुब्रमण्यन
19. अदृश्य पदार्थ का ताज़ा अध्ययन
20. पृथ्वी ने एक ग्रह को निगला और जीवन अस्तित्व में आया
21. सामान्य तापमान पर अतिचालकता
22. नववर्ष में धरती की रक्षा से जुड़ें - भारत डोगरा
23. निशस्त्रीकरण आंदोलन की बढ़ती ज़रूरत - भारत डोगरा
24. प्राकृतिक तटरक्षक: मैंग्रोव वन - डॉ. दीपक कोहली
25. चावल की भूसी से लकड़ी
26. तोंद की चर्बी का सम्बंध दिमाग से है
27. विज्ञान के दर्शन और इतिहास के पुरोधा: देबीप्रसाद चट्टोपाध्याय - डॉ. रामकृष्ण भट्टाचार्य
28. विज्ञान का मिथकीकरण - प्रदीप

# यदि आपके बच्चे सब्ज़ियां नहीं खाते

डॉ. विपुल कीर्ति शर्मा



सभी मांओं की एक ही कहानी है - मेरा बच्चा सब्ज़ियां नहीं खाता। उसे तो केवल क्रीम बिस्किट्स, चॉकलेट और आईसक्रीम ही चाहिए। और फिर शुरू होता है धमकी और रिश्वत का एक सौदा। मां अपने बच्चे से कहती है कि जब तक तुम सब्ज़ी नहीं खाओगे तब तक मिठाई नहीं मिलेगी। इस रणनीति में कुछ बच्चे आलू और भिंडी तो खाने के लिए हां कर देते हैं और बाकी बेचारों को पालक, गिलकी, लौकी-कद्दू और टिन्डों की ज़बरदस्ती स्वीकार करते बड़ा होना पड़ता है।

हम सभी को मीठा पसंद है। मीठे की ओर आकर्षण हमें हमारे पूर्वज प्रायमेट्स से विरासत में मिला है। उस समय हमारे पूर्वज भी आज के बंदरों और वनमानुष की तरह खुशबूदार पके मीठे फलों को खोजते दिन बिताते थे। अधिक ऊर्जा और पानी के लिए पके और मीठे फल को कच्चे और कड़वे फल पर प्राथमिकता मिलती थी। पेड़ों पर पके मीठे फल मिलने पर पानी की खोज भी पूरी हो जाती थी।

तो आपका बच्चा अगर मिठाई की ओर ललचाई निगाह से देखता है तो इसमें बच्चे का दोष नहीं है। दोष है हमारे प्रायमेट पूर्वजों और उनको मिली परिस्थितियों का और हमारे आनुवंशिक लक्षणों का।

आज भी हमारे नज़दीकी रिश्तेदार चिम्पैंज़ी जंगलों में जब भी मधुमक्खी के छत्ते को देखते हैं, तो सैकड़ों मधुमक्खियों के दंश की परवाह न करते हुए शहद खाने के मौके को कभी भी हाथ से जाने नहीं देते। शहद को खाने की उत्कंठा चिम्पैंज़ियों में इतनी तीव्र होती है कि अफ्रीका के विभिन्न स्थानों पर पाए जाने वाले स्थानीय चिम्पैंज़ियों ने शहद को खाने के लिए उपयुक्त तरीके भी निकाल लिए हैं। पूर्वजों के समान अगर हम भी मीठे की ओर आकर्षित होते हैं तो कोई आश्चर्य नहीं होना चाहिए। यही कारण है कि मानव के पूर्वजों ने गन्ने को पूरे विश्व में फैला दिया है।

अधिकांश ज़हरीले भोज्य पदार्थ कड़वे होते हैं और हमारे पूर्वजों ने भी कड़वे पदार्थों से दूरी बनाना सीख लिया था। मीठे, खट्टे और नमकीन की तुलना में कड़वे पदार्थों के स्वाद के लिए मनुष्यों में अन्य सभी प्राणियों से 25 जीन्स अधिक पाए जाते हैं।

तो मांओं की यह चिंता जायज़ है कि बच्चे सब्ज़ियां नहीं खाते जो स्वास्थ्य के लिए आवश्यक हैं। कई प्रकार के खाद्य पदार्थ तो अधिकता में शरीर के लिए नुकसानदायक होते हैं। वसा एवं शर्करा ज़्यादा मात्रा में लेने पर वे चयापचय को धीमा करते हैं, वज़न बढ़ाते हैं तथा धमनियों में जमा होकर उन्हें कठोर कर देते हैं, खासकर जब बच्चे खेलना-कूदना छोड़ देते हैं। तो क्या हम बच्चों को मिठाई की बजाय सब्ज़ी खाने के लिए तैयार कर सकते हैं। उत्तर है, हां।

विज्ञान की नई शाखा ऑप्टोजेनेटिक्स इसमें बहुत उपयोगी होगी। ऑप्टोजेनेटिक्स एक ऐसी तकनीक है जिसमें प्रकाश द्वारा जीवित ऊतक, खासकर जेनेटिक तौर पर बदले गए न्यूरॉन्स को प्रकाश संवेदी बनाकर कार्य करने के लिए उकसाया जाता है।

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21

# Arrival and Departure of Aquatic Winter Migratory Birds at Sirpur Lake, Indore (M.P.)

M. Malhotra, M.M. Prakash, K. Pawar* and S. Gaherwal

ABSTRACT

The present study describes arrival and departure of fifteen aquatic winter migratory birds visited in Sirpur lake Indore. This study was conducted during October 2008 to July 2010. The study reveal that *Fulica atra*, *Anas poecilorhyncha*, *Anas querquedula* and *Fulica atra* arrive in October. *Anas acuta*, *Anas crecca*, *Anas poecilorhyncha*, *Anas strepera*, *Rhodonessa rufina*, *Aythya ferina* and *Aythya nyroca* arrived in November. *Aythya fuligula* arrived in December and *Anser indicus*, *Anas platyrhynchos* and *Anas clypeata* arrived in January. Out of the studied birds *Anser indicus*, *Anas platyrhynchos*, *Anas clypeata* and *Aythya fuligula* depart in February. *Anas acuta*, *Anas crecca*, *Anas strepera*, *Anas penelope* and *Aythya ferina* in March. *Fulica atra* in May, *Anas poecilorhyncha* in June and *Fulica atra* depart as late as July. Interesting point of observation was the gradual increase in number from October to February and conversely gradual decrease in number from March on word. This suggests that they arrive in groups in different months. Similarly depart from this habitat in parts. Greatest flocks of above 50 included, Anas acuta, *Anas poecilorhynchos*, *Anas strepera*, *Anas penelope*, *Anas querquedula*, *Rhodonessa rufina*, *Aythya nyroca*, *Fulica atra* and flocks of small number (below 50) included, *Anser indicus*, *Anas crecca*, *Anas platyrhynchos*, *Anas clypeata*, *Aythya ferina*, *Aythya fuligula* etc. Comparison of stay duration of each bird is also discussed in the present study.

**Keywords:** Arival, Departure, Migratory birds, Sirpur lake

## Introduction

Diel variation in waterfowl during winter and waterfowl population during summer at sirpur lake has been previously reported by Malhotra

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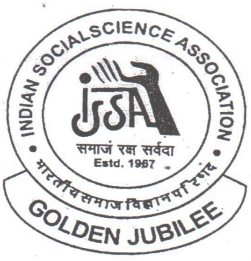
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individual needs." Referring to the responsibility of the state in the context of India's new economic strategy, it is pragmatic. "The rolling back of the state on the economic issues necessitates a redefining of its new role and re-examination of its structures and process. It may no longer stay to be the holder of planned industries, but it is still a supervisor, a pro-consumer regulator that oversees and prevents abuses of market and provides the legal, physical and human infrastructure. It has to concentrate in development economics that would help mainly the poor and the unfavorable." LPG i.e., Liberalization, Privatization and Globalization, sometimes lead to cut throat opposition which causes corruption, diminishes quantity of manufacture and influences the quality of life. To ensure customer satisfaction, one should draw upon the excellence in manufacture and encourage fair trade practices. In off-market dealings there is necessitate to have fair and rational rules and well-organized and efficient governance. But good governance, necessary for economic development, peace and sustainable development, depends on services and talents of a well-organized, devoted and committed civil service. Good governance empowers and encourages people to take increasingly greater control of their lives through their contribution, in a way that does not impose upon the conventional rights of others. The civil servants are expected to lead and have the responsibility to hold the scales even and do what is excellent for the common man. The civil servants are necessary to gear up the administration and create constancy by keeping themselves politically disinterested and dedicated to the cause of the people. They can show greater skill to serve up the civilization and make the people more aware of their human rights. Therefore, to be successful in a globalised system of economics, civil servants have to strike a fine equilibrium between participation and responsibility; competition and conflict; user and people; public interests and market interests and old and new. Laws have to be forced impartially and the weaker sections are to be protected by them as the operations of the company may not take care of them. The civil servants must promote efficiency not only in public services but also within government. In developing countries, governments are the major promoters of public welfare, and civil servants should work hard to achieve their predetermined targets. In a globalised economy, local entrepreneurs can ill afford to compete with giant overseas corporations, and this conduces to monopolistic utilization of the locals

CONCLUSION

The march of globalization is unstoppable. It is no longer an option; it is a fact. It is spreading its tentacles everywhere and the developed nations use it as a means to manage world economy. Some name it as yet another shape of economic colonialism. Under these conditions the civil services should strive to save the country from the thrall Dom of imperialistic and monopolistic globalization. By protecting them from the dangers of globalization they should act as defensive shields. In the words of D. C. Pande and P. S. Bisht, the state "must encourage" ethics in politics and allow only those truthful persons into politics who firmly consider that they are there simply because of political need for economic development and undoubtedly not because of any political wish of their own." In brief, to label globalization in complete terms as either a totally positive or negative phenomenon is a naive approach. in the end, globalization benefits society at large in countries that enjoy some degree of political constancy, that have in place sufficient communications, equitable social safety nets and in general strong democratic institutions. Experience has shown that globalization requires strong, not weak States. Thus, one of the major preconditions to ensure that the benefits of globalization are consistently spread throughout the developed and the developing world and within a given country is good governance, as well as an efficient and effective public administration.

## Study of Physico Chemical Parameter of Mahi River

Vijay R. Chourey* and P.C. Choyal
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ABSTRACT: The present work deals with the study of various water quality parameters of Mahi River in M.P. region. Seasonal variability of parameters was studied during the period from March 2015 to February 2016. The samples from six different places were analysed for odour, colour, cation, anions, temperatures, conductivity and for pH parameters. The relationship between parameters has been discovered. Result of analyzed parameters




# Exploration of Fuzzy System With Applications ⊗

Shivlal Mewada, Pradeep Sharma, S. S. Gautam

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## Abstract

Fuzzy system was altered from a ‘buzz word' to an important technological area, with various publications in international conferences and transactions. Several Japanese products applying fuzzy logic concepts, such as household appliances and electronic equipment, power engineering, robotics, and optimization have been manufactured. This system is capable to process and learn mathematical data as well as linguistic data. Fuzzy system user linguistic explanations for the variables and linguistic procedures for the I/P-O/P behavior. In this chapter, present the application of fuzzy system with data mining, neural networks, fuzzy automata, and genetic algorithms. It also presents the foundation of fuzzy data Mining, with the fuzzification inference procedure and defuzzification procedure, fuzzy systems and neural networks with feed forward neural network, FNN with it features generalization of Fuzzy Automata, and sixth fuzzy systems and genetic algorithms. The chapter explores a popular fuzzy system model to show complex systems and an application of fuzzy system.

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## 2. Fuzzy Data Mining

With the development of electronic data processing, more and more data were available electronically. This led to the situation in which the masses of data, for instance in data warehouses, exceeded the human capabilities to recognize important structures in these data. Classical methods to ‘data mine’, such as cluster techniques, and so on, were available, but often they did not match the needs. Cluster techniques, for instance, assumed that data could be subdivided crisply into clusters, which did not fit the structures that existed in reality.

Fuzzy set theory seemed to offer good opportunities to improve existing concepts. Bezdek was one of the first, who developed fuzzy cluster methods with the goals, to search for structure in data to reduce complexity and to provide input for control and decision making. Different approaches have been followed: hierarchical approaches, semi-formal heuristic approaches, and objective function clustering. Because the area of (intelligent) data mining becomes more and more important, the development of further fuzzy methods in this area can be expected.

A lot of work has already been done to explore the utility of fuzzy set theory in various subareas of systems analysis. However, the subject of systems analysis is too expensive to be covered here in a comprehensive fashion. Hence, we can cover only a few representative aspects and rely primarily on the Notes at the end of this chapter to overview the rapidly growing literature on this subject. The most successful application area of fuzzy systems has undoubtedly been the area of fuzzy control. It is thus appropriate to cover fuzzy control in greater detail than other topics. Our presentation of fuzzy control includes a discussion of the connection between fuzzy controllers and neural networks, the importance of which has increasingly been recognized. Furthermore, we also discuss the issue of fuzzifying neural networks, Genetic Algorithms.

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Editors
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Chapter

6

# Courses Personalization in an E-Learning Environment : An Approach for Adaptive Learning Systems Based on User Model

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## INTRODUCTION

### Basic Principles

Every student has individual feature such as; knowledge, goal, experience, interest, background, learning style, time availability, preferences etc. Therefore, there is an emerging demand for *tailoring the learning material* (course content) according to the needs of each learner. Thus, the process of tailoring the same course in different ways, according to the need of each learner, is known as *courses personalization* and system, which supports this process, is called *Adaptive Learning System.*

Following figure shows the general idea about personalization mechanism in Adaptive learning system in which course personalization is achieved using user profile. Learner is offered a pre-test and his/her profile is created in adaptive learning

system. On the bases of learner's profile and personalization mechanism, a personalized course is generated and is served to the learner by his/her own individual learning path.

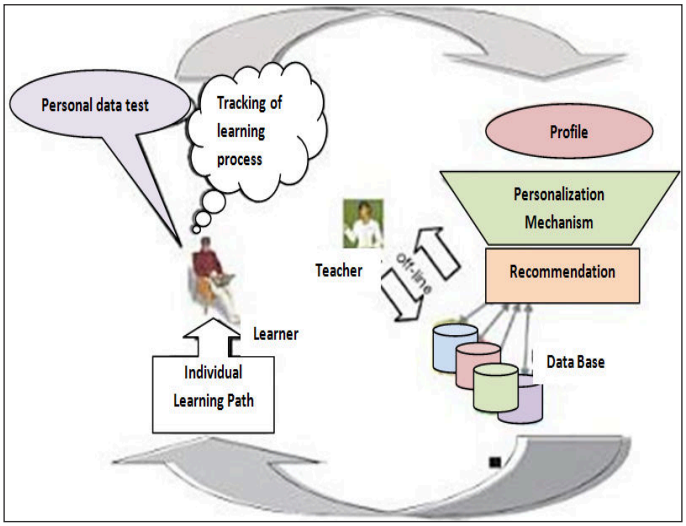



**Fig. 1** : The general idea of courses personalization in Adaptive learning systems[1,2,3,4,5,6]

According to Loc Nguyen and Phung Do in[6], In Adaptive Learning System, adaptation is ability to change system's behavior according to the learner's preferences to tune with learner model. Adaptive system tunes learning material and teaching method to learner model.

The terminologies: user model and user profile are often used interchangeably but they have slight difference. A profile contains personal information without inferring or interpreting. User model has a higher level than profile, expresses abstract overview of learner. Moreover, it is able to deduce more extra information about learner from model. User model is often applied in special domain.

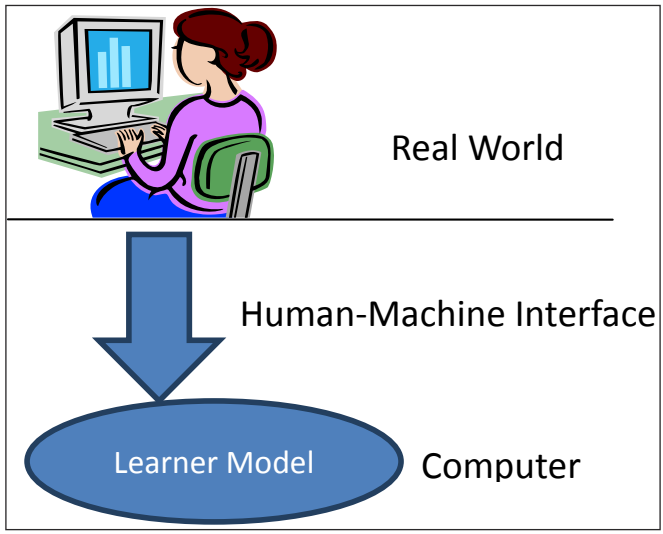



**Fig. 2: User Modeling**[6]

To be able to react in the way expected by the user, a system needs to have an idea about the user's expectations and preferences. To provide a system with this information, at least a user profile is needed to gather this "raw data". To answer to more particular questions, the system needs the raw data stored within a user profile is not enough. The user has to be modeled in more detail. This task is accomplished by a user model. A user model (Fig. 2) stores semantically enriched information about the user, restricted to clearly defined areas and domains. For example, a user model provides information about the user's learning styles, educational curriculum, history of interactions with the system and the domain knowledge. This allows adaptive e-learning systems to adapt the learning content to a specific user.

In Adaptive Learning System, Individual differences are related with how learners are similar and how they are differ in their thinking, feeling and behavior. So course developers

environments must be personalized according to the different needs of learners.

However the problem of e-learning is that it works on the concept of *"one-size-fits-all"*. Human beings are different, and as such they learn and process information in different ways (as shown in Fig. 4). Instead of delivering the same content (course) to all users, e-Learning systems should be able to adapt each individual's characteristics in order to increase the relevance and appropriateness of the learning material.

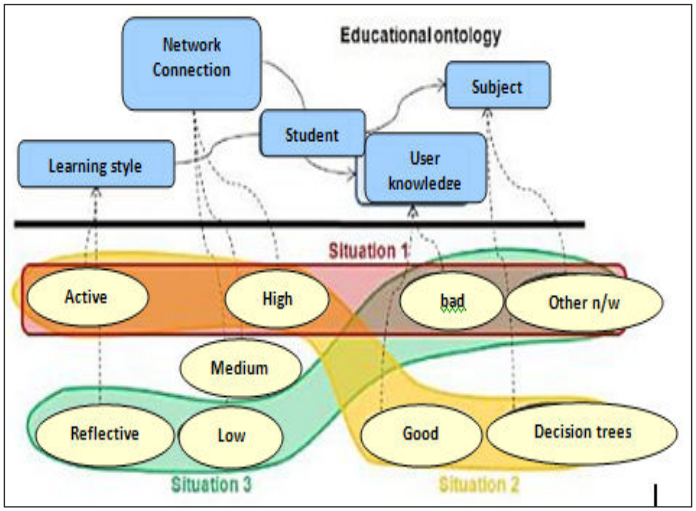



**Fig. 4: Different views and capabilities of learners**[1]

Individual student/learner on any course will have different requirements and characteristics. A challenging part of an educator's role is to adopt their teaching or pedagogical style to suit the variety of students in a classroom environment. A designer of an e-learning course also has to make such provision when developing a course. Today, it is widely accepted that during the design and development of educational material attention must be focused on the learner's characteristics and requirements. There exist a need therefore to move away from

# A Novel Approach to Automatic Detection of Chaupai Chhand in Hindi Poems

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**Abstract— The availability of material in Indian languages in general and Hindi in particular, on the internet is common now. The material includes the literary work. Unfortunately, very little work has been done to analyze such text. Our aim is to automate the detection of Chaupai Chhand in Hindi poems. This is the maiden attempt to autodetect Chaupai Chhand in Hindi poems. This would help analyze really big poems like RamCharitManas which has more than 85% Chaupais among all pads.**

**Index Terms— Hindi Poems, Chaupai, Chhand Sastra, Natural Language Processing, Ancient Indian Poetic Literature, Avadhi.**

## I. Introduction

One of the most dominating fields of human-computer interaction is the Natural Language Processing (NLP). The pedagogy of NLP encompasses computer science, artificial intelligence and computational linguistics.

The history of NLP dates back to 1950s. The research in NLP was given a kick-start by the seminal paper written by Alan Turing [1]. Since then many people have attempted to understand inner concepts of various natural languages. The progress in NLP has witnessed the development of various translators, parsers, compilers etc.

Hindi is the third largest spoken language of the world. Its script is Devnagari which is the script of some other Indian languages. Hindi (Devnagari) is quite scientific in the sense that each character has a unique sound when pronounced. The character set of Devnagari is given in Figure 1.

When it comes to NLP, Hindi is becoming center of attraction among people from the sub-continent. But few areas of Hindi have not been explored much so far. Most of Hindi literature, specifically ancient is in poetic form. In this paper we attempt to auto-detect one of the most frequently used form of Hindi poems i.e. Chaupai Chhand.

## II. Work done so far

In their paper, Joshi and Selot present a bilingual dictionary (Hindi-English) using hypertext technique [2]. The characters of both the languages were encoded uniformly using 2-byte unsigned integers. The system was demonstrated under MS-DOS and was developed using C-language.

Joshi developed a bilingual (Hindi-English) text editor that does not allow entry of syntactically wrong Hindi characters

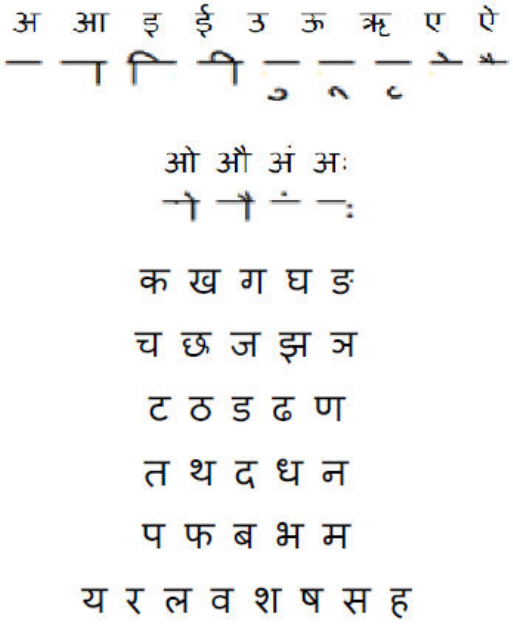



Fig. 1. Devnagari character set with modifiers (Matra's).

(along with modifiers). He also developed an assembler and a compiler (for a C-like language) in Hindi [3].

Zone based algorithm to detect Hindi modifiers was proposed by Kushwah and Joshi. The input Hindi character image is divided into five zones to detect the modifiers. The accuracy of the algorithm is 87.78% [4].

A structure based spell checker for Hindi words has developed by Joshi and Kushwah [5]. To check the correctness of word they proposed a new strategy, called Micro-Parsing. In this strategy, they parse Hindi word at character level. Now at this level they applied the rules of word formation on characters. They also developed another algorithm, which does not allow formation of structurally wrong Hindi words. Through this they have tried to improve use of the Google Input Tool.

Another word formation technique in Hindi is Sandhi. Based on rules of Sandhi new structurally correct words can be formed by joining two or more structurally correct words. Joshi and Kushwah [6] developed and implemented an algorithm for this purpose. The accuracy of this algorithm is 75% at sentence or paragraph level. They have considered Sandhi of only two

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constituent words and that is why a bit lower accuracy.

A poem is a combination of different types of Chhand. Chhand is the base of ancient Hindi poems. Though the Hindi literature is very rich, a very little work on automation of Hindi poems has been done. In their paper, authors describe the properties of a Rola Chhand which is an Eui-Matrik Chhand 7 They also provide a working algorithm to detect Rola Chhand in Hindi poems. The accuracy of the algorithm is 89.83%.

e focus on commonly used Chhand called Chaupai. Since no work has been done on this so far, no technical data are available for comparison/analysis. Lot of data are available in printed form but very few data are in digital form.

In this paper, we propose an algorithm to detect the Chaupai Chhand. This Chhand increases the lucidity of a poem and results in melodious listening. It is the base Chhand of many epics like RamCharitManas, Padmavat etc. or example, oswami Tulasi as wrote in RamCharitManas a Chaupai that is given in igure 2.

Next, we discuss the properties of a Chaupai chhand so that its detection can be taken up.

III.

stored in pankti string. This pankti has two Charans. So, we split pankti string into two parts on the basis of single purn viram. These first and second Charans are stored in fPad and sPad strings respectively. Now we convert these Charans into a mathematical string. Each mathematical string of a Charan is

stored in mtrAr1 and mtrAr2 integer arrays. Now we apply the properties of Chaupai on fPad, sPad, mtrAr1 and mtrAr2. If all properties are satisfied, then that pad is a Chaupai Chhand. The properties are described in section 2. The algorithm is given in form of flow diagram in figure 6.

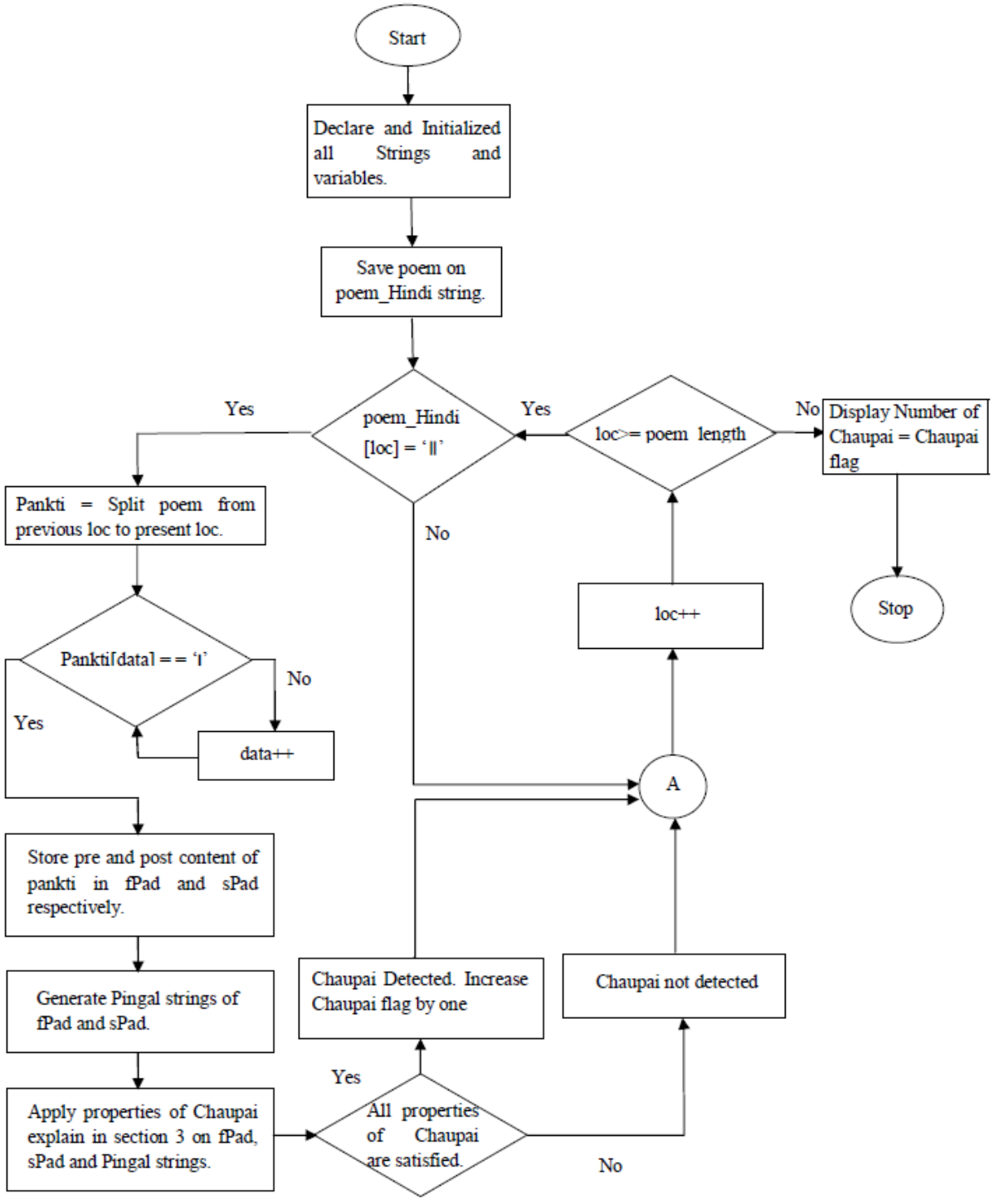
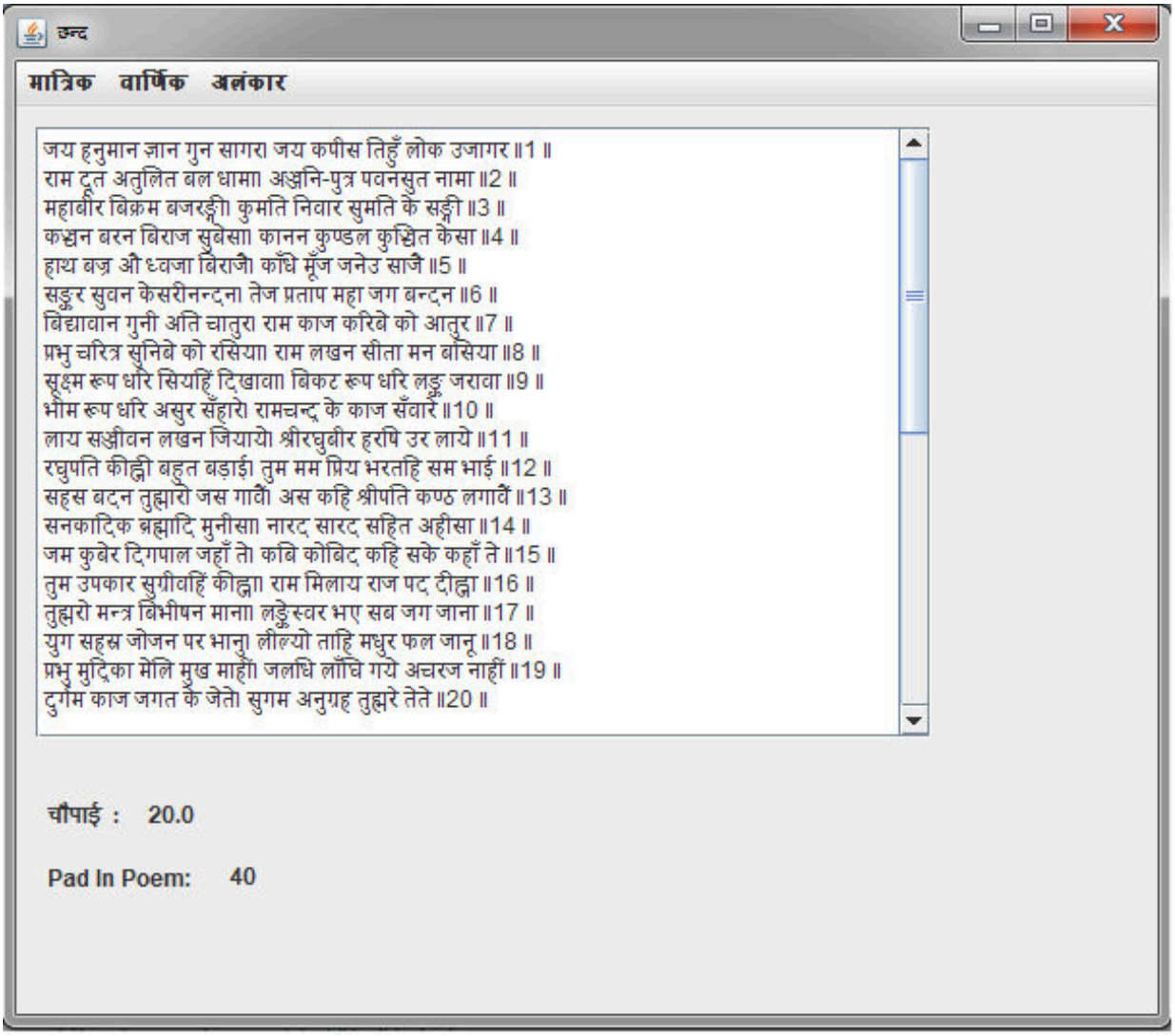



fig. 6.

□

15 and ig̃ure 16 depicts the result of application of this algorithm on Hanuman Chalisa.




ig̃. 15.

**Information Security, ōl-14, No 11, pp 261-265, November 2016.**

**6□**

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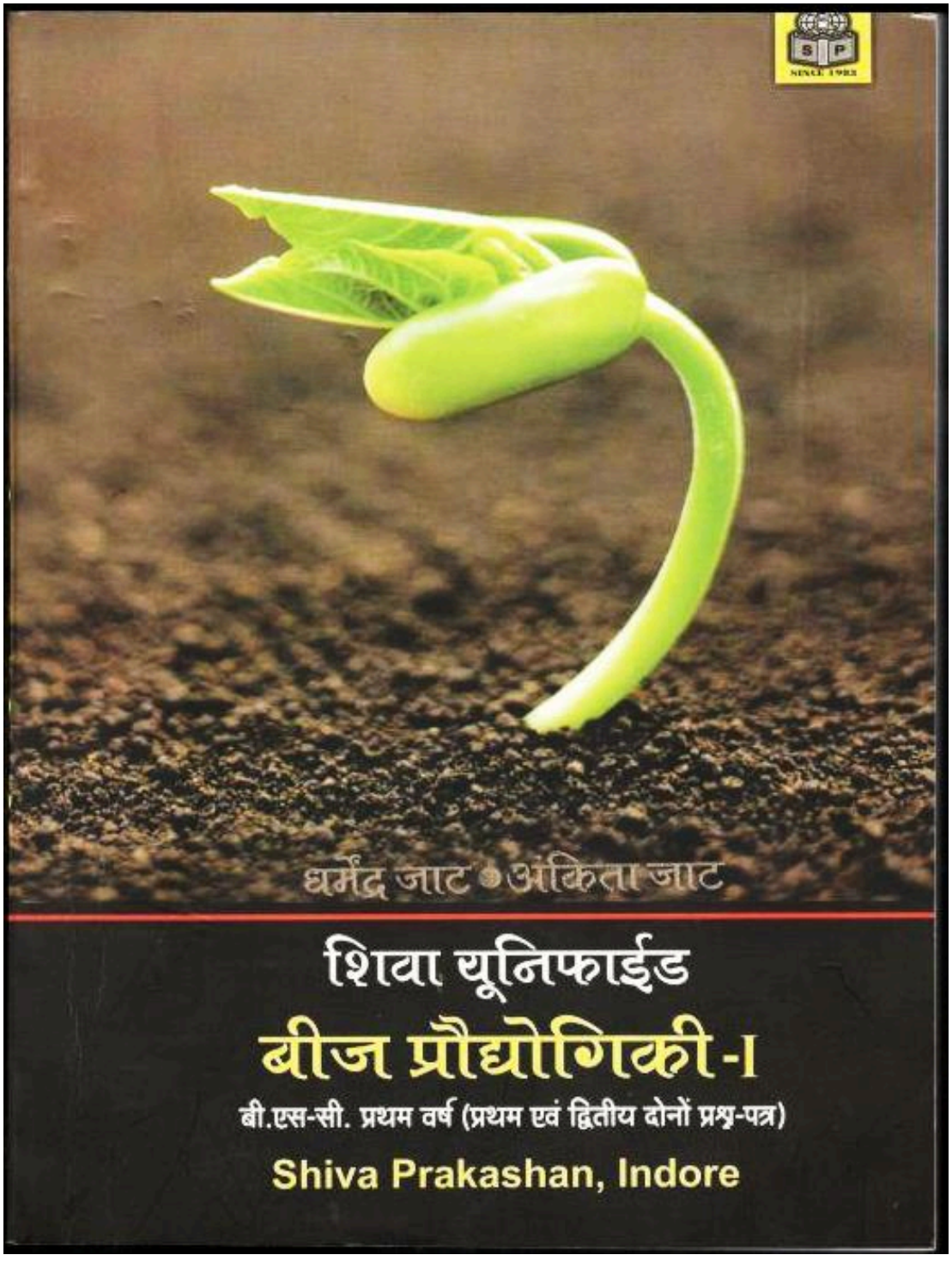
# Model for the waiting time of the first conception Bayesian approach

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Work on models of human reproductive process comprised of both discrete and continuous models postulating both homogeneity and heterogeneity of the population. A historical review of the models reveals that the models differ only in-treatment of time as "Discrete" or "Continuous". In many of the models, the probability of conception is held constant and further assumption is made in regard to all conceptions which lead to live births and which are associated with a fixed non-susceptible period covering the gestation period and the period of post-partum amenorrhea. However, introducing further the notion of time when conception is recorded has also evolved new type of more flexible and realistic probability models.

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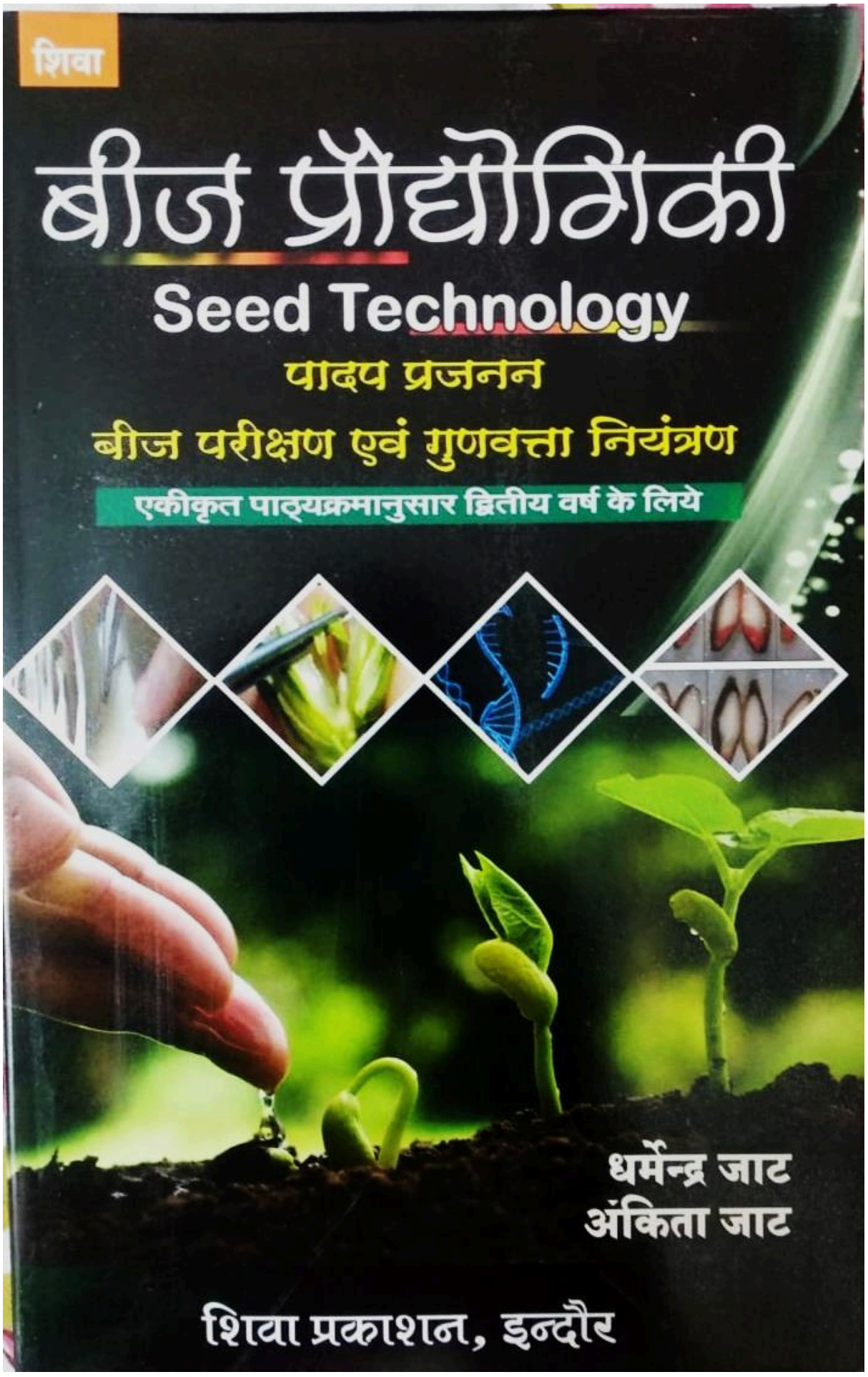
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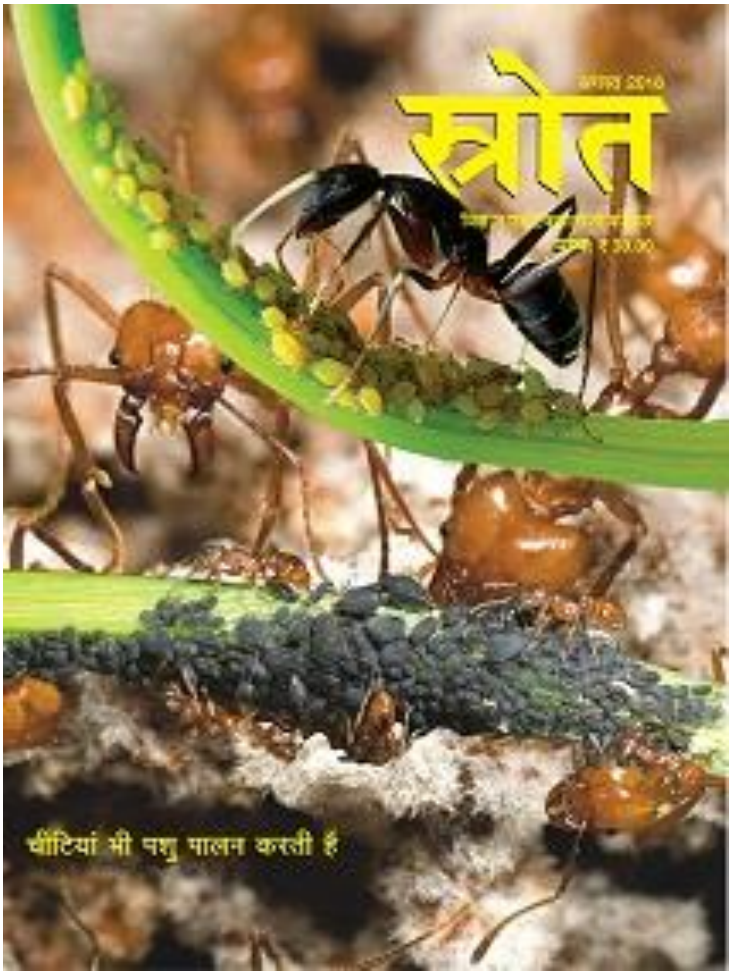
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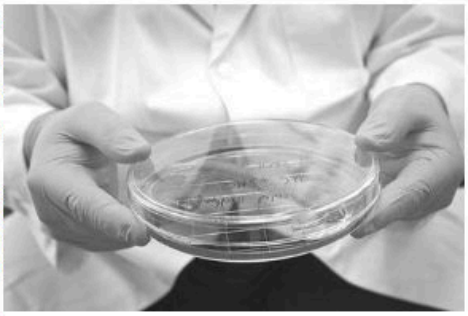

स्रोत
चींटियां भी पशु पालन करती हैं

# Srote - August 2018

1. मंगल पर हेलिकॉप्टर उड़ेगा
2. पर्यटन उद्योग और जलवायु परिवर्तन
3. एक-तिहाई आरक्षित क्षेत्र बरबाद हो रहे हैं
4. बुढ़ापे में खुजली की समस्या क्यों बढ़ती है?
5. प्रतिरक्षा तंत्र की मदद से आंत में बसता बैक्टीरिया
6. सूर्य का रोहिणी में प्रवेश और नौतपा - प्रतिका गुप्ता
7. पुरामानव मस्तिष्क बनाने के प्रयास
8. मानव भ्रूण में संयोजक कोशिकाएं पहचानी गई
9. प्रयोगशाला मे अंग निर्माण संभव है - डॉ. विपुल कीर्ति शर्मा
10. चिकित्सीय यंत्र हानिकारक हो सकते हैं
11. दवा उत्पादन में खमीर की भूमिका - डॉ. डी. बालसुब्रमण्यन
12. मशहूर दकियानूस वैज्ञानिक की प्रशंसा का खामियाजा
13. इटली में तीन हज़ार वर्ष पूर्व वाइन उद्योग - एस. अनंतनारायण
14. अंडे के छिलके की महत्वपूर्ण भूमिका - डॉ. डी. बालसुब्रमण्यन
15. लोग, पर्यावरण और तूतीकोरिन - जाहिद खान
16. पी.सी. वैद्य: एक गांधीवादी भौतिक शास्त्री - अपराजित रामनाथ
17. सबसे बड़ा उभयचर विलुप्ति की कगार पर
18. प्रोफेसर सी.वी. विश्वेश्वरा - वेंकटेश्वरण, शर्मा एवं गुप्ता
19. प्लूटो करोड़ों धूमकेतुओं के मेल से बना है
20. एक बदनाम दवा की नई संभावनाएं
21. प्राचीन पक्षियों की चोंच का रहस्य
22. मुश्किल इलाकों में वैज्ञानिक विचारों का प्रसार
23. चींटियां भी पशु पालन करती हैं - डॉ. अरविंद गुप्ते
24. प्लास्टिक: एक और मौका हाथ से गया - गुरुस्वामी कुमारस्वामी
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26. ब्रिटेन का युरोप से अलगाव पहले भी हुआ है - एस. अनंतनारायण

# प्रयोगशाला मे अंग निर्माण संभव है

डॉ. विपुल कीर्ति शर्मा



पिछले कुछ समय से प्रशासन एवं सामाजिक संगठनों के जागरूकता अभियानों के चलते कॉर्निया और त्वचा के दान में काफी वृद्धि हुई है। ब्रेन डेड व्यक्ति के महत्वपूर्ण अंगों जैसे हृदय, गुर्दे, लीवर को मरीज़ों के परिजनों की सहमति से निकालकर, ज़रूरतमंदों को दान देने की अनूठी पहल ने कई लोगों को जीवन दान दिया है।

भारत में प्रत्यारोपण के लिए अंगों की मांग और उपलब्धता के बीच बहुत बड़ी खाई है। प्रति वर्ष देश में करीब 5 लाख लोग अंगों की अनुपलब्धता की वजह से मर जाते हैं। उपरोक्त निराशाजनक आंकड़े न केवल अंगदान करने के लिए समाज में जनचेतना के महत्व को रेखांकित करते हैं अपितु शोध द्वारा प्रयोगशाला में अंग-निर्माण की कल्पना को साकार करने के लिए भी प्रेरित करते हैं।

विश्व के कुछ चुनिंदा वैज्ञानिक 1996 से ही प्रयोगशाला में मानव अंगों के निर्माण का सपना बुनने लगे थे। स्कॉटलैंड स्थित रोसलिन इंस्टिट्यूट के वैज्ञानिकों को वयस्क कोशिकाओं की सहायता से डॉली नामक भेड़ को क्लोन करने में सफलता प्राप्त हुई थी। उन्होंने अनिषेचित अंडे का केंद्रक हटाकर दूसरी भेड़ की सामान्य कोशिका का केंद्रक उस अंडे में डाला और एक भेड़ (डॉली) को जन्म दिया। डॉली के जन्म के बाद से ही मानव क्लोन और मानव अंग निर्माण जैसे विषयों पर कई वैज्ञानिक उत्साहित हैं तो कई समूह इस प्रकार के प्रयोगों की नैतिकता से जुड़े प्रश्न भी उठाने लगे हैं।

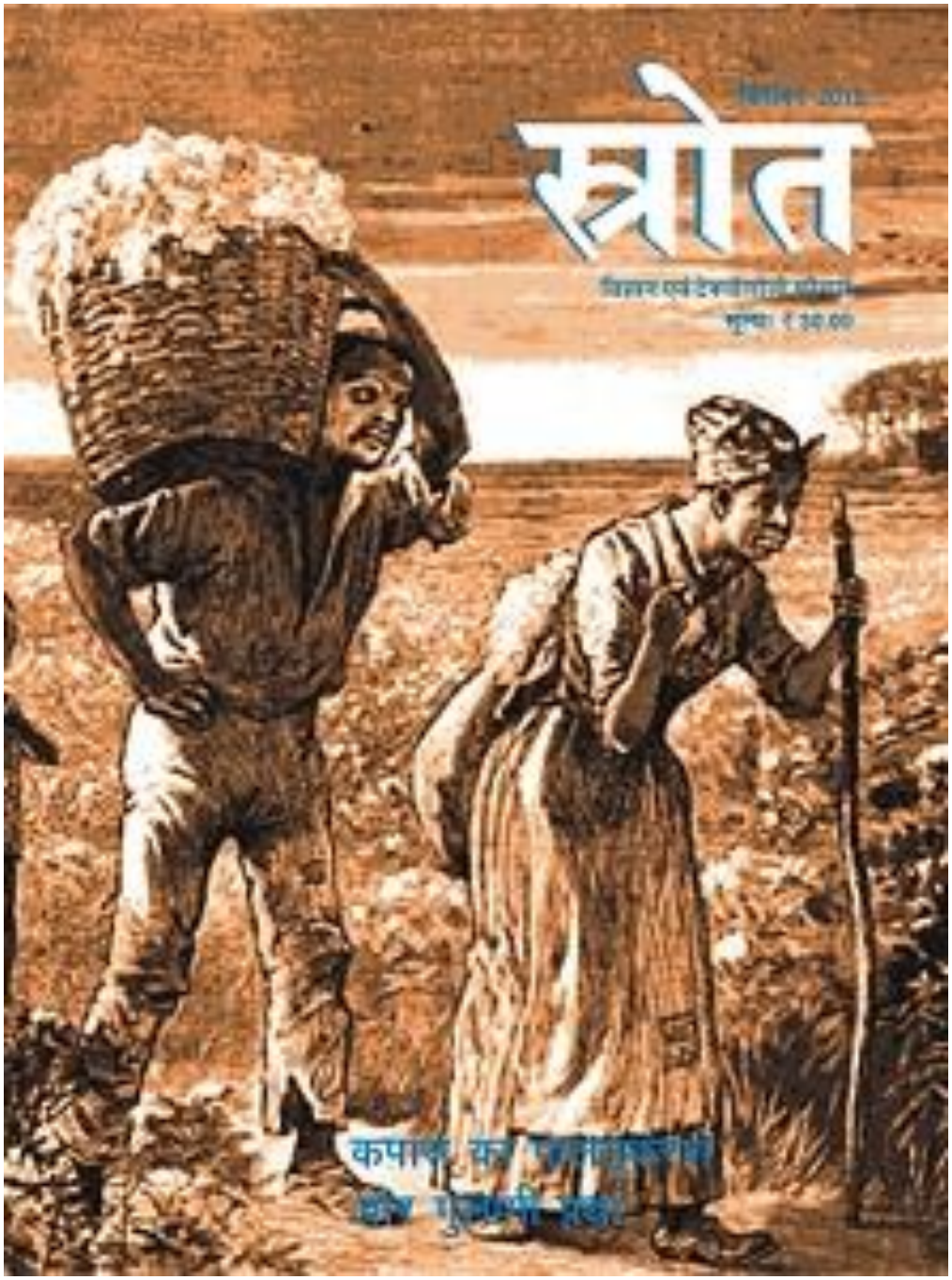
वैज्ञानिक शोध तथा खोज कदम-दर-कदम आगे बढ़ने वाली धीमी किंतु निरंतर प्रक्रिया है। 1996 में देखे गए स्वप्न निश्चित ही अभी पूरे नहीं हुए हैं परंतु वैज्ञानिक शोधों ने कई मील के पत्थर पार किए हैं।

विश्व भर के वैज्ञानिक तीन तरीकों से मानव अंग बनाने के लिए प्रयासरत हैं - पहला आर्गेनॉइड बैंक द्वारा; दूसरा, मानव कोशिका या पालतू पशुओं में संवर्धन के द्वारा; और तीसरा, 3D प्रिंटर की सहायता से अंगों का निर्माण करके।

### आर्गेनॉइड बैंक

1900 के प्रारंभ में ही भ्रूण वैज्ञानिक जान चुके थे कि पानी में रहने वाले अल्प विकसित पोरीफेरा (स्पंज) वर्ग के जीवों के शरीर की कोशिकाओं को अलग कर दिया जाए तो कुछ ही समय में ये कोशिकाएं आपस में जुड़कर पूरे स्पंज का निर्माण कर लेती हैं। स्टार फिश की भुजाएं, प्लेनेरिया के शरीर के भाग और छिपकली की पूंछ के पुनर्निर्माण की क्षमता के उदाहरण वैज्ञानिकों को मानव अंग बनाने के लिए प्रेरित करते रहे हैं।

सन 2008 में जापानी वैज्ञानिकों ने बताया कि उन्होंने मानव भ्रूण की स्टेम कोशिका को प्रेरित कर कई परतों वाले सेरेब्राल कॉर्टेक्स (मस्तिष्क का एक भाग) बनाने में सफलता प्राप्त कर ली है। तब से ही स्टेम कोशिकाओं से अंग विकसित करने के प्रयासों को पंख लग गए हैं।


स्रोत

# Srote - December 2018


1. वैज्ञानिक गोपनीय जानकारी बेचने के आरोप से मुक्त
2. जेंडर समानता के लिए वैज्ञानिकों की पहल
3. क्षुद्रग्रह पर पहली बार चलता-फिरता रोवर
4. जल्दी ही भारत अंतरिक्ष में मानव भेजेगा
5. रहस्यमयी मस्तिष्क कोशिका खोजी गई
6. कपास का पालतूकरण और गुलामी प्रथा - डॉ. डी. बालसुब्रमण्यन
7. क्या डायनासौर जीभ लपलपा सकते थे? - डॉ. विपुल कीर्ति शर्मा
8. अंडों का आकार कैसे तय होता है?
9. एक चींटी की विचित्र जीवन शैली
10. आपदाओं की क्षति कम करने की नीतियां - भारत डोगरा
11. खेल-खेल में जलवायु परिवर्तन पर कार्रवाई
12. आंत और दिमाग की हॉटलाइन
13. मकड़ियों के रेशम से बने वैक्सीन - डॉ. विपुल कीर्ति शर्मा
14. आंखों के आंसू पीता पतंगा
15. शाकाहारी, अति-शाकाहारी और परखनली मांसभक्षी - डॉ. डी. बालसुब्रमण्यन
16. आनुवंशिक इंजीनियरिंग द्वारा खरपतवार का इलाज - डॉ. अरविंद गुप्ते
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19. चोर के घर चोरी की मिसाल - डॉ. किशोर पंवार
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21. जीव विज्ञान में अमूर्त का महत्व - डॉ. आश्विन साई नारायण शेषशायी
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23. पेड़-पौधे भी संवाद करते हैं
24. पेड़ - पवित्र, आध्यात्मिक और धर्म निरपेक्ष - डॉ. डी. बालसुब्रमण्यन
25. दाढ़ी-मूंछ रखने के फायदे और नुकसान - डॉ. ओ.पी.जोशी
26. अमेरिका में अगले चुनाव मत पत्रों से करवाने का सुझाव
27. इस वर्ष के इगनोबल पुरस्कार
28. मां के बिना ज़्यादा सहयोगी गुबरैले शिशु

# क्या डायनासौर जीभ लपलपा सकते थे?

डॉ. विपुल कीर्ति शर्मा



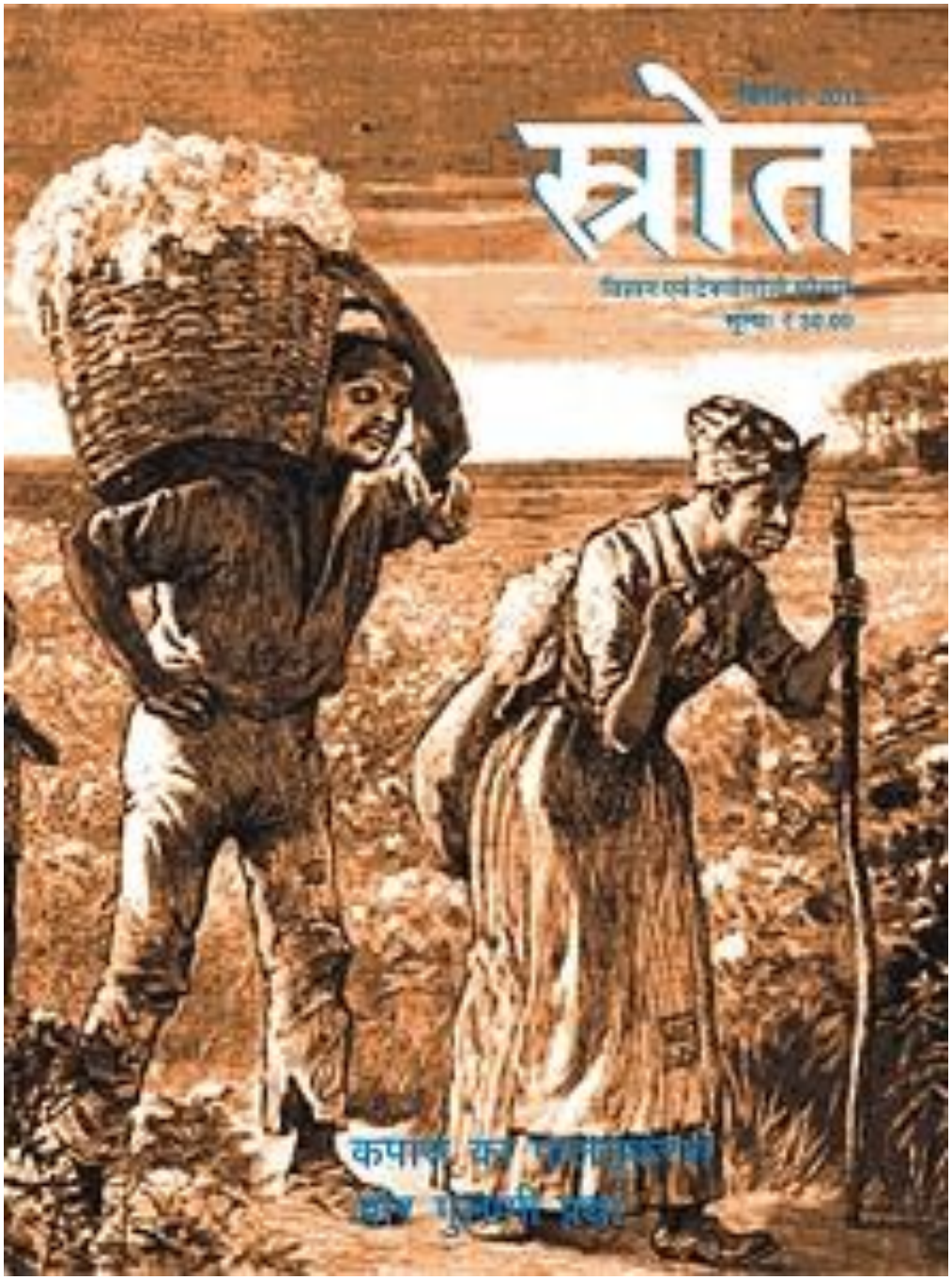
पृथ्वी से डायनासौर का अस्तित्व 6.6 करोड़ वर्ष पूर्व समाप्त हो गया था। किंतु जीव वैज्ञानिकों और जीवाश्म वैज्ञानिकों के प्रयासों से हम इनके बारे में बहुत कुछ जान पाए हैं। और ये डायनासौर अब भी हमारे बीच विज्ञान की रोचक कथाओं और एनीमेशन फिल्मों के रूप में 'जीवित' हैं।

सभी डायनासौर प्रजातियों में सबसे बड़ा और मांसाहारी डायनासौर टायरेनोसौरस रेक्स (टी.रेक्स) रहा है। इसे 'आतंकी छिपकलियों का राजा' भी कहा जाता है। इसमें बड़े आकार के सिर द्वारा, बेहद मज़बूत जांघों और ताकतवर पूंछ का संतुलन किया जाता था। 2011 में प्रकाशित एक शोध से यह ज्ञात हुआ है कि इनमें शरीर की बनावट और उसका संतुलन इतना गज़ब का था कि अपनी विशाल काया के बावजूद टी. रेक्स 20 से 40 किलो मीटर प्रति घंटे की रफ्तार से दौड़ सकते थे। टी. रेक्स की अगली टांगों में दो-दो उंगलियां भी थी। परंतु अगली टांगें कमज़ोर थी। टांगों की कमज़ोरी की भरपाई उन्होंने जबड़ों की बेहतर पकड़ से कर ली थी। इस तरह टी. रेक्स बेहद सफल शिकारी रहे होंगे।

पर कई पिक्चरों और मॉडल्स में उनकी लपलपाती जीभ दिखाई जाती है। तो क्या वे अपनी जीभ से बर्फ के गोलों और लालीपॉप्स को चूस या चाट सकते थे, जैसे हम करते हैं। क्या वे आइसक्रीम के कोन के किनारों से बहती-टपकती आइसक्रीम को चाटने का मज़ा ले सकते थे?
वैज्ञानिकों को लगता है कि टी. रेक्स ऐसा नहीं कर सकते थे क्योंकि उनकी जीभ काफी हद तक निचले जबड़े से जुड़ी हुई थी। हाल ही में एक नए शोध ने डायनासौर के चित्रकार एवं मॉडल बनाने वाले विशेषज्ञों की कला में खामियों की विवेचना की। एनिमेटर्स प्राय: टी. रेक्स को आधुनिक छिपकलियों के समान जीभ लपलपाते दिखाते हैं। किंतु वैज्ञानिकों को लगता है कि यह चित्र गलत है।

सरिसृप परिवार में सांप एवं कई छिपकलियां जीभ बाहर निकालकर अनेक कार्यों को अंजाम देते हैं। सभी सांपों में तो जीभ काफी लंबी तथा सिरे से द्विशाखित होती है। शिकार की गंध के कण हवा से पकड़कर लपलपाती जीभ उन्हें ऊपरी जबड़ों के समीप स्थित गंध संवेदी अंग जेकबसंस आर्गन में ले जाती है। कुछ गंध संवेदी तंत्रिकाएं इस अंग से मस्तिष्क में संदेश पहुंचा कर शिकार की पहचान बताने में मदद करती है।

केमेलियॉन जैसे गिरगिट में तो जीभ बेहद लंबी, चूषक युक्त और चिपचिपी भी हो गई है। कुछ दूर बैठे शिकार पर अचानक हमला कर उसे पकड़ने का कार्य हाथ-पैर के बजाय बहुत लंबी जीभ से ही बहुत कुशलता से संपन्न होता है। जीभ की मांस-पेशियां ही शिकार को खींचकर जबड़ों के हवाले कर देती हैं।
कुछ रेगिस्तानी छिपकलियों में तो जीभ मुंह से बाहर निकलकर आंखों की साफ सफाई और गर्मी में थूक को माइस्चेराइज़र्स की तरह लगाने में मददगार होती है।


स्रोत

# Srote - December 2018


1. वैज्ञानिक गोपनीय जानकारी बेचने के आरोप से मुक्त
2. जेंडर समानता के लिए वैज्ञानिकों की पहल
3. क्षुद्रग्रह पर पहली बार चलता-फिरता रोवर
4. जल्दी ही भारत अंतरिक्ष में मानव भेजेगा
5. रहस्यमयी मस्तिष्क कोशिका खोजी गई
6. कपास का पालतूकरण और गुलामी प्रथा - डॉ. डी. बालसुब्रमण्यन
7. क्या डायनासौर जीभ लपलपा सकते थे? - डॉ. विपुल कीर्ति शर्मा
8. अंडों का आकार कैसे तय होता है?
9. एक चींटी की विचित्र जीवन शैली
10. आपदाओं की क्षति कम करने की नीतियां - भारत डोगरा
11. खेल-खेल में जलवायु परिवर्तन पर कार्रवाई
12. आंत और दिमाग की हॉटलाइन
13. मकड़ियों के रेशम से बने वैक्सीन - डॉ. विपुल कीर्ति शर्मा
14. आंखों के आंसू पीता पतंगा
15. शाकाहारी, अति-शाकाहारी और परखनली मांसभक्षी - डॉ. डी. बालसुब्रमण्यन
16. आनुवंशिक इंजीनियरिंग द्वारा खरपतवार का इलाज - डॉ. अरविंद गुप्ते
17. 'फेयर एंड लवली' बनाम 'डार्क एंड हैंडसम' - डॉ. डी. बालसुब्रमण्यन
18. शांतिस्वरूप भटनागर पुरस्कार के छह दशक - चक्रेश जैन
19. चोर के घर चोरी की मिसाल - डॉ. किशोर पंवार
20. दुनिया का सबसे ऊष्मा प्रतिरोधी पदार्थ - डॉ. दीपक कोहली
21. जीव विज्ञान में अमूर्त का महत्व - डॉ. आश्विन साई नारायण शेषशायी
22. औद्योगिक कृषि से वन विनाश
23. पेड़-पौधे भी संवाद करते हैं
24. पेड़ - पवित्र, आध्यात्मिक और धर्म निरपेक्ष - डॉ. डी. बालसुब्रमण्यन
25. दाढ़ी-मूंछ रखने के फायदे और नुकसान - डॉ. ओ.पी.जोशी
26. अमेरिका में अगले चुनाव मत पत्रों से करवाने का सुझाव
27. इस वर्ष के इगनोबल पुरस्कार
28. मां के बिना ज़्यादा सहयोगी गुबरैले शिशु

# मकड़ियों के रेशम से बने वैक्सीन

डॉ. विपुल कीर्ति शर्मा



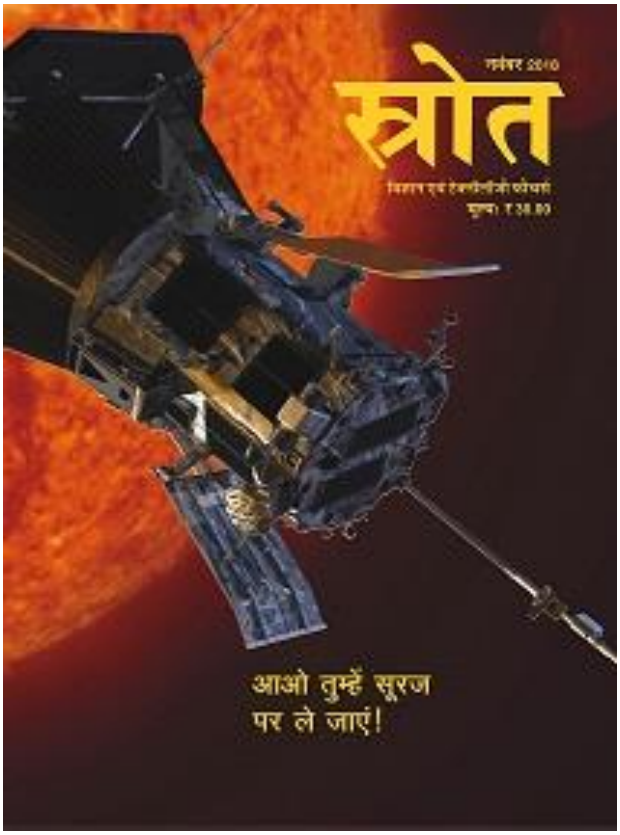
कैंसर की कोशिकाएं सामान्य कोशिकाओं से प्रमुख रूप से इस बात में भिन्न होती हैं कि वे निरंतर विभाजित होती हैं। इस कारण उनकी संख्या में लगातार अनावश्यक वृद्धि होती जाती है। हमारे शरीर की प्रतिरक्षा तंत्र की कोशिकाएं इन्हें नष्ट करने की कोशिश तो करती हैं किंतु हर बार ही इनकी कोशिश सफल हो इसकी संभावना कम ही होती है। कैंसर के इलाज के लिए वैक्सीन के द्वारा प्रतिरक्षा तंत्र की कोशिकाओं को उत्तेजित किया जाता है ताकि वे भी तेज़ी से विभाजित होकर अपनी संख्या बढ़ाएं और कैंसर कोशिकाओं को मार सकें।

जेनेवा व फ्राइबर्ग विश्वविद्यालय तथा जर्मनी के म्युनिक और बायरुथ विश्वविद्यालय के साथ एक स्टार्टअप कंपनी ए.एम. सिल्क के मित्रों की मंडली ने संयुक्त रूप से एक आश्चर्यजनक प्रयोग किया है। उन्होंने मकड़ी के जाले से बने सूक्ष्म कैप्सूल में वैक्सीन को भरकर प्रतिरक्षा तंत्र की कोशिकाओं में प्रविष्ट करा दिया। इससे ये कोशिकाएं तेज़ी से विभाजित होंगी और कैंसर कोशिकाओं की भारी संख्या को पराजित करने के लिए इनकी भी पर्याप्त संख्या उपलब्ध होने लगेगी। अगर यह प्रयोग सफल हुआ तो इस प्रकार के कैप्सूल अनेक गंभीर बीमारियों के इलाज में प्रयुक्त हो सकेंगे।

हमारे शरीर में हर पल रोगाणु प्रवेश करते रहते हैं। शरीर को स्वस्थ रखने की ज़िम्मेदारी प्रतिरक्षा तंत्र के दो तरीकों पर निर्भर करती है। एक तरीका सेल मेडिएटेड प्रतिरक्षा कहलाता है, जिसमें विशेष टी-कोशिकाएं रोगाणुओं को चुन-चुन कर मारती हैं। दूसरे प्रकार का तरीका ह्युमोरल प्रतिरक्षा कहलाता है। इसमें बी-कोशिकाएं उत्तेजित होकर प्लाज़्मा कोशिकाओं का उत्पादन करती हैं जो एंटीबॉडी बनाकर रोगाणुओं को नष्ट करती हैं।

कैंसर और टी.बी. जैसी कुछ संक्रमणकारी बीमारियों में टी-कोशिका को उत्तेजित करने की ज़रूरत होती है। टी-कोशिकाएं तभी कार्य करती हैं जब रोगाणुओं की पहचान बताने वाले प्रोटीन के अंश (पेप्टाइड्स) टी-कोशिका द्वारा पहचान लिए जाते हैं।
एक अकेली टी-कोशिका की बजाय अनेक प्रकार की टी-कोशिकाएं ट्यूमर कोशिका पर सम्मिलित रूप से आक्रमण करके मारती हैं। ये टी-कोशिकाएं हैं - CL, TC और NK कोशिकाएं। इस कार्य को अंजाम देने के लिए कुछ मित्र कोशिकाएं भी साथ देती हैं जैसे- मेक्रोफेज, मास्ट कोशिकाएं तथा डेंड्राइटिक कोशिकाएं।

वर्तमान में उपयोग में आने वाले अधिकांश वैक्सीन केवल बी-कोशिकाओं को उत्तेजित करते हैं। अब तक हम टी-कोशिकाओं की कार्यक्षमता का दोहन नहीं कर पाए हैं। टी एवं बी दोनों कोशिकाओं को उत्तेजित करने से वैक्सीन बेहद कारगर हो सकते हैं।


स्रोत
आओ तुम्हें सूरज
पर ले जाएं!

# Srote - November 2018

1. आइंस्टाइन एक बार फिर सही साबित हुए
2. मंगल ग्रह के गड्ढों से उसके झुकाव की जानकारी
3. आओ तुम्हें सूरज पर ले जाएं!
4. मुंबई की इमारतें विश्व धरोहर - जाहिद खान
5. मिट्टी में आर्सेनिक विषाक्तता - सरोज कुमार सान्याल
6. मल-जल के विश्लेषण से नशीली दवाइयों की निगरानी
7. थोड़ी-सी शराब भी हानिकारक है - भारत डोगरा
8. कंप्यूटर बताएगा रसायनों का विषैलापन
9. एक अनुपस्थित रोग की दवा
10. बायोमार्कर देगा सिलिकोसिस की जानकारी - नवनीत कुमार गुप्ता
11. बीमारी की गोपनीयता पर उठे नैतिकता के सवाल
12. कंप्यूटर और संस्कृत भाषा - प्रतिका गुप्ता
13. आपकी चमड़ी बोलेगी और सुनेगी
14. होंठों को पढ़ेगी कृत्रिम बुद्धि
15. बोतलबंद पानी का कारोबार - प्रमोद भार्गव
16. क्या पैदाइशी दांत चिंता का विषय है? - डॉ. विपुल कीर्ति शर्मा
17. भारतीय विश्वविद्यालयों और महाविद्यालय में शोध - डॉ. नटराजन पंचापकेसन
18. एक अलग दुनिया का निर्माण किया न्यूटन ने - नरेन्द्र देवांगन
19. चींटी को वशीभूत करने वाला परजीवी - डॉ. विपुल कीर्ति शर्मा
20. जेनेटिक्स और स्कूल में बिताए वर्ष
21. टापुओं पर निवास का विचित्र असर
22. गोताखोरों के अध्ययन में नैतिक नियमों का उल्लंघन
23. एक उल्टी चलनी
24. पेड़ बड़े मगर कमज़ोर हो रहे हैं
25. मल भक्षण मोल चूहिया में मातृत्व जगाता है
26. सूंघने की क्षमता गंवाती मछलियां
27. टोकियो चिकित्सा परीक्षा: लड़कियों के अंक कम किए गए
28. विश्व उबलने की राह पर

# क्या पैदाइशी दांत चिंता का विषय है?

डॉ. विपुल कीर्ति शर्मा

दांत आना बच्चे के जीवन के पहले वर्ष की सबसे महत्वपूर्ण घटना होती है। पहला दांत निकलना माता-पिता एवं परिवार के लिए बेहद खुशी का अवसर होता है। कुछ संस्कृतियों में इस समय बच्चे को दूध के अलावा पहला भोजन दिया जाता है।

सामान्यत: बच्चों में दांतों का पहला जोड़ा 6 माह की उम्र में दिखता है। इन्हें कृंतक दांत कहते हैं। कुछ ही हफ्तों बाद ऊपरी चार कृंतक भी दिखने लगते हैं। इसके बाद अन्य दांत आने लगते हैं। ढाई-तीन साल में निचले जबड़े और ऊपरी जबड़े में 10-10 दांत निकल आते हैं। ये दूध के दांत कहलाते हैं। फिर 6-12 वर्ष की आयु में दूध के दांत गिरने लगते हैं तथा उनकी जगह नए तथा मज़बूत दांत ले लेते हैं। जैव-विकास के क्रम में हमारे जबड़े छोटे हुए हैं और उनमें 32 दांतों के लिए जगह नहीं बची है। इसलिए अक्सर 28 दांत ही आते हैं और कई बार तो एक के ऊपर दूसरा दांत आ जाता है।

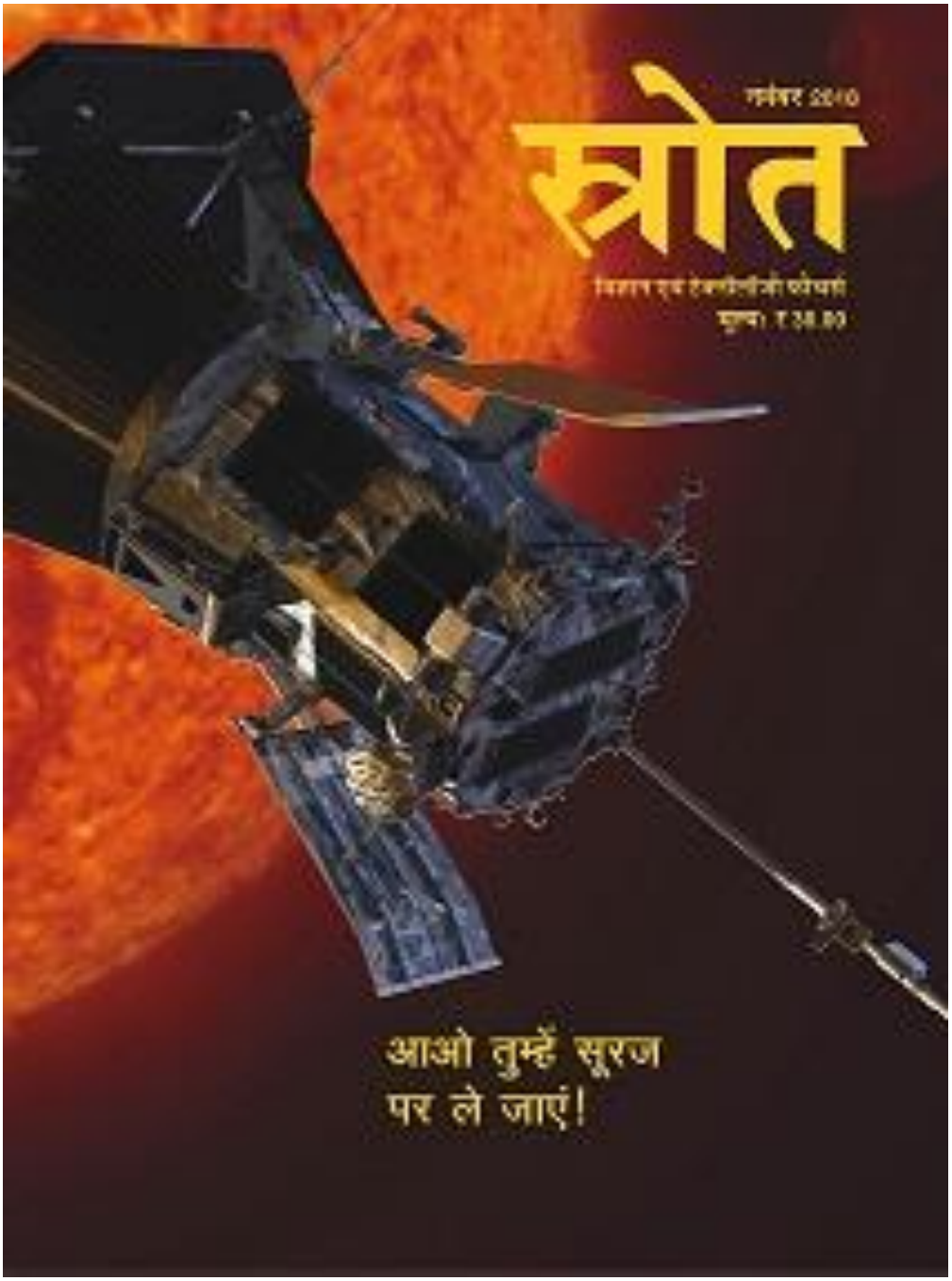
हाल ही में एक नवजात बच्ची ने सबको आश्चर्य में डाल दिया क्योंकि 12 दिन की आयु में ही उसके निचले मसूड़े में एक दांत चमक रहा था। जन्म के समय या एक महीने के भीतर दांतों का आना एक बिरली बात है। इस प्रकार के दांतों को पैदाइशी या प्रसव दांत कहते हैं और ये 2500 में किसी एक बच्चे में देखे जाते हैं। पैदाइशी दांत जबड़ों में मज़बूती से न जुड़े होने के कारण मसूड़ों में हिलते रहते हैं। दांतों के डॉक्टर ऐसे दांतों को निकाल देते हैं क्योंकि खुद निकलकर ये सांस की नली में भी जा सकते हैं हालांकि चिकित्सा साहित्य में पैदाइशी दांत के सांस की नली में जाने का कोई उदाहरण नहीं मिलता। इसके अलावा दर्द और अड़चन के कारण बच्चे अक्सर दूध पीना छोड़ देते हैं। मां को भी दूध पिलाने में दिक्कत हो सकती है।

इंडियन जनरल ऑफ डेंटिस्ट्री में सन 2012 में छपे एक शोध के अनुसार पैदाइशी दांतों के मामले में आनुवंशिकी की भी भूमिका होती है। अगर माता-पिता, नज़दीकी रिश्तेदार या भाई-बहन में पैदाइशी दांत थे तो नवजात में इसकी संभावना 15 प्रतिशत ज़्यादा होती है। अक्सर पैदाइशी दांत पर एनेमल की मज़बूत परत भी नहीं होती है और ये पीले-भूरे रंग के होते हैं।



कई संस्कृतियों में पैदाइशी दांत को शगुन-अपशगुन माना जाता है। रोमन इतिहासज्ञ टाइटस लिवियस (ईसा पूर्व पहली सदी) ने इन्हें विनाशकारी घटनाओं का संकेत बताया था। दूसरी ओर, प्लिनी दी एल्डर नामक इतिहासकार ने पैदाइशी दांतों को लड़कों में शानदार भविष्य तथा लड़कियों में खराब घटना का द्योतक बताया था। इंग्लैंड के लोग पैदाइशी दांत वाले बच्चों को मशहूर सैनिक और फ्रांस एवं इटली में ऐसे बच्चों को भाग्यशाली मानते थे। चीन, पोलैंड और अफ्रीका में ऐसे बच्चों को राक्षस एवं दुर्भाग्य का वाहक समझा जाता था।

आजकल बेहतर इलाज की उपलब्धता के चलते पैदाइशी दांतों के आने पर बच्चों को तुरंत ही दांतों के डॉक्टर को दिखाना चाहिए और सावधानीपूर्वक बच्चे की जांच की जानी चाहिए। माता-पिता की जागरूकता बढ़ाने के लिए चिकित्सकीय परामर्श भी बेहद आवश्यक है। (**स्रोत फीचर्स**)


स्रोत
आओ तुम्हें सूरज
पर ले जाएं!

# Srote - November 2018

1. आइंस्टाइन एक बार फिर सही साबित हुए
2. मंगल ग्रह के गड्ढों से उसके झुकाव की जानकारी
3. आओ तुम्हें सूरज पर ले जाएं!
4. मुंबई की इमारतें विश्व धरोहर - जाहिद खान
5. मिट्टी में आर्सेनिक विषाक्तता - सरोज कुमार सान्याल
6. मल-जल के विश्लेषण से नशीली दवाइयों की निगरानी
7. थोड़ी-सी शराब भी हानिकारक है - भारत डोगरा
8. कंप्यूटर बताएगा रसायनों का विषैलापन
9. एक अनुपस्थित रोग की दवा
10. बायोमार्कर देगा सिलिकोसिस की जानकारी - नवनीत कुमार गुप्ता
11. बीमारी की गोपनीयता पर उठे नैतिकता के सवाल
12. कंप्यूटर और संस्कृत भाषा - प्रतिका गुप्ता
13. आपकी चमड़ी बोलेगी और सुनेगी
14. होंठों को पढ़ेगी कृत्रिम बुद्धि
15. बोतलबंद पानी का कारोबार - प्रमोद भार्गव
16. क्या पैदाइशी दांत चिंता का विषय है? - डॉ. विपुल कीर्ति शर्मा
17. भारतीय विश्वविद्यालयों और महाविद्यालय में शोध - डॉ. नटराजन पंचापकेसन
18. एक अलग दुनिया का निर्माण किया न्यूटन ने - नरेन्द्र देवांगन
19. चींटी को वशीभूत करने वाला परजीवी - डॉ. विपुल कीर्ति शर्मा
20. जेनेटिक्स और स्कूल में बिताए वर्ष
21. टापुओं पर निवास का विचित्र असर
22. गोताखोरों के अध्ययन में नैतिक नियमों का उल्लंघन
23. एक उल्टी चलनी
24. पेड़ बड़े मगर कमज़ोर हो रहे हैं
25. मल भक्षण मोल चूहिया में मातृत्व जगाता है
26. सूंघने की क्षमता गंवाती मछलियां
27. टोकियो चिकित्सा परीक्षा: लड़कियों के अंक कम किए गए
28. विश्व उबलने की राह पर

# चींटी को वशीभूत करने वाला परजीवी

कीर्ति विपुल शर्मा

कल्पना कीजिए एक छोटी-सी चींटी के बहुत छोटे-से दिमाग को एक परजीवी कृमि ने पूरी तरह काबू में कर लिया है। अब चींटी एक चलती-फिरती लाश भर है। अपनी सुरक्षा के प्रति लापरवाह वह चरने वाले जंतु द्वारा खाए जाने के इंतज़ार में घास पर बैठी है। हाल ही में वैज्ञानिकों की टीम ने चींटी के दिमाग को परजीवी कृमि द्वारा नियंत्रित करने की आश्चर्यजनक घटना का खुलासा किया है।




उत्तल लेंस के समान दिखने वाला तथा 1 से.मी. से भी छोटा लैंसेट लीवरफ्लूक (Dicrocoelium dendriticum) भेड़ और अन्य मवेशियों में पाया जाने वाला एक परजीवी कृमि है। समशीतोष्ण भागों में पाया जाने वाला यह कृमि अपना जीवन चक्र तीन जीवों में पूरा करता है: कोई मवेशी, घोंघा और चींटी।

वयस्क लीवरफ्लूक मवेशियों की पित्त वाहिनी में रहकर अंडे देता है। ये अंडे पित्त के साथ छोटी आंत से होते हुए मवेशी के मल के साथ शरीर से बाहर निकल जाते हैं। अब कोई घोंघा उस मल को खा ले तो ये अंडे उसके शरीर में प्रवेश कर जाते हैं। यहां अंडे फूटते हैं और लार्वा निकलते हैं जो उसके श्वसन अंगों में चिपचिपे पदार्थ से बनी 'स्लाइम बॉल' के साथ शरीर से बाहर आ जाते हैं। चींटियां स्लाइम बॉल को अपना भोजन बना लेती हैं। चींटियों के शरीर में ये लार्वा रूपांतरित होकर उनके मस्तिष्क में पहुंच जाते हैं। यहां पहुंचकर वे चींटियों के स्वभाव में परिवर्तन कर देते हैं।

अब जैसा नाच यह परजीवी नचाता है वैसा नाच चींटी नाचती है। हालात इतने बुरे हो जाते हैं कि वशीकृत चींटी आत्मघाती हो जाती है। वह पौधों के ऊपरी भाग, जैसे घास या फूलों की पंखुड़ी के सिरे पर बैठ जाती है और अपने पैने जबड़ों से पौधे को कसकर पकड़ लेती है। पकड़ इतनी मज़बूत होती है कि तेज़ बारिश और हवा में भी चीटीं गिरती नहीं। पौधों के ऐसे हिस्से पर बैठने से इस बात की संभावना बढ़ जाती है कि घास के साथ-साथ चरने वाला कोई पशु उसे भी खा लेगा। पशु की पाचन क्रिया से चींटी का शरीर पच जाता है और उसके अंदर के परजीवी (जो चींटी की आंत में बैठे हैं) पशु की आहारनाल से होते हुए अंतत: पित्त वाहिका में पहुंच जाते हैं। वहां विकसित हो कर वे वयस्क बन जाते हैं और प्रजनन करके अपना जीवन चक्र फिर से शुरू कर देते हैं।

चींटी और परजीवी के इस आश्चर्यजनक रिश्ते को समझने की कोशिश में वैज्ञानिकों की एक टीम ने माइक्रो-सीटी नामक तकनीक का उपयोग करके संक्रमित चींटियों के मस्तिष्क का त्रि-आयामी चित्र प्राप्त किया। संरचनाओं को स्पष्ट देखने के लिए अंदरूनी भागों को रंजकों द्वारा रंगीन करके भी अवलोकन किए गए।

# ENVIRONMENTAL AWARENESS: CLEAN AND GREEN EARTH TODAY, TOMORROW AND FOREVER

Principal
Kusumlata Nigwal

**Edited By**

Prof. Maneesha Dandawate

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# CONTENT


| | | Page No. |
|---|---|---|
| 01. | "The Role of Judiciary in Protection of Environment in India"<br>**Abhishek Singh** | 01 |
| 02. | "Aeroponics - Green Technology of Today for Sustainable Tomorrow"<br>**Dr. Rasheeda Kanchwala** | 07 |
| 03. | "Pollution Control and Waste Management: Adaptations of Green Technology"<br>**Dr. Swagata Gupta** | 11 |
| 04. | "Environmental Issues, Policies and Clean Technology In Reference to India"<br>**Dr. J. K. Jain** | 15 |
| 05. | "Environmental Awareness and Practices among Common People"<br>**Dr. Rekha Killedar** | 18 |
| 06. | "Global Environment - Awareness & Synced Behavior by School Children"<br>**Dr. Shobha Chaturvedi** | 22 |
| 07. | "The Impact of Hydro Fluorocarbons (HFC's) on Environment Kigali Summit"<br>**Dr. (Mrs.) Sunita Phadnis** | 26 |
| 08. | "Pollen Allergy – A Negative Aspect of Plants"<br>**Uday Chitnis, D.K. Billore, Smriti Chitnis** | 29 |
| 09. | "Golden Rays of Hope between Black & White Picture of Environmental – A Newspaper Survey Report"<br>**Prof. Maneesha Dandwate** | 33 |
| 10. | "Benefits of Indoor Plants with Especial Reference to Indoor Air Quality (IAQ)"<br>**Dr. Ranjana Verma** | 37 |
| 11. | "Role of Education in Environmental Awareness"<br>**Prof. Sapna Malviya** | 40 |

# POLLEN ALLERGY- A NEGATIVE ASPECT OF PLANTS

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## ABSTRACT

Plants are considered as the objects which are there to support human life, to sustain it and to fulfill practically each and every need of human being. We always talk about the bright side of the plants but sometimes some sensitive people may develop allergic reactions against pollen grains of some plants. Indore is one of the important cities of Madhya Pradesh. A large number of populations at Indore suffer from various allergenic ailments like allergic rhinitis, bronchial asthma, atopic dermatitis, urticaria and allergic conjunctivitis. In the present study an attempt has been made to identify and manage such menaces. Some criteria have also been suggested to select the plants for large scale plantation.

Key words – pollen allergy, pollen grains Indore

## INTRODUCTION

Vegetation of a particular area is a result of many factors as climatic, geographic, topographic and anthropogenic factors. These plants particularly angiosperms bear flowers as a part of their life – cycle. These flowers have anthers and carpels as the male and female reproductive units respectively. Anthers produce pollen grains which reach to the stigma of the carpel to complete the most crucial phase of the life-cycle - the reproduction. Flowering is a periodical event which is repeated in a particular season, but the time of blooming may differ for different geographical regions and even from year to year in same area.

The journey of pollen grains from anthers to stigma may need a carrier agency like wind, insects, or through a combination of two. This journey also affects the ecosystem in many ways. The pollen grains, which become air-borne, are of special interest as they are the main cause of some forms of human allergic disorders such as allergic rhinitis, bronchial asthma, atopic dermatitis, urticaria and allergic conjunctivitis. The concentration of these pollen grains, or the pollen spectrum as it may be called, is determined by the floristic composition of that particular area.

## MATERIAL & METHODS

The study area, i.e. Indore and its adjoining areas, was periodically visited to observe the vegetation type and the flowering period for a period of three years from July 2009 to June 2012. The flowering period is considered with the commencement of budding to the shedding of all the flowers of the plant.

A modified form of classical Durham's sampler was used to trap the pollen grains prevailing in the atmosphere of Indore. Sticky slides were exposed in it by using standard techniques. Pollen grains trapped through these slides were identified by using the artificial key. This artificial key was prepared on the basis of reference slides and available literature

Clinics of local allergologists were visited periodically to report the cases of allergy. Cases including nasobronchial allergy & urticaria were recorded & results of the skin tests being carried out were analyzed.

## OBSERVATIONS AND RESULTS

Vegetation of Indore represents all types of plants. Old Indore and outer Indore still harbour the old trees and other plants as remnants of natural vegetation. Residential areas show presence of common ornamental & fruit yielding plants including some exotic ones. The road side plantations show many introduced and exotic plant species. Beautiful ornamentals and foliage plants are grown in public and private gardens these include some noteworthy plants like *Crescentia* sp. *Barringtonia* sp, *Ficus krishnaii*, etc. Crop plants are grown in surrounding rural areas. Weeds and grasses grow wherever they find space. So, the vegetation of Indore is a fine assortment of native and introduced plant species. Present study listed 354 plants 89 of which were found to be allergenically significant.

It is a general consideration that pollen grains belonging to anemophilous species become air-borne; so, the atmosphere of a place should only be loaded with the pollen grains belonging to this category. Contrary to this belief, aerial surveys have reported amphiphilous (pollination by air and insects both) and entomophilous (insect pollinated) pollen grains in a sizeable amount. (Tripathi, 1978; Singh, 1987) All these categories together form the pollen flora of air and could trigger on allergenic manifestations in sensitive people. In the present study, the mode of pollination was determined by observations and with the help of relevant literature. The anemophilous pollen grains reported in this study are *Ailanthus*, Cheno-amaranthus, Poaceae, Cyperaceae etc. Their contribution to total aerospora is – 43.59%; these pollen grains become air borne through various mechanisms. Anthers may vibrate, shake or explode to release the pollen grains in air. These pollen grains are produced in large number, light in weight, generally have smooth exine and are powdery in nature, so that, they can be carried away by air currents to long distances.

Some plants usually get pollinated through insect visits, but, they also liberate their pollen grains in air to ensure pollination. Such plants are known as amphiphilous plants. Amphiphilous pollen grains reported in this study are *Melia, Azadirachta, Acacia, Cassia, Brassica, Eucalyptus, Prosopis* and *Xanthium.* These pollen grains particularly, were reported to give significant positive reactions in patients of allergy.

Various types of insects like bees, moths, flies etc. help to disseminate pollen grains from male plants to female plants. Plants provide special attractions like nectar, fragrance, colour etc. to maximise their visits. They even develop special mechanisms to ensure their specificity. The pollen grains produced by such plants are large in size, have ornamented exine and are sticky in nature. Their stickiness helps them to adhere one other and also to the legs and mouthparts of pollinators (insects).They become air borne during the flight of insects. Some important entomophilous pollen grains reported from the atmosphere of Indore are *Bauhinia, Delonix, Peltophorum, and Hibiscus.*

Plants with any of the three modes of pollination not only become air borne and contribute significantly to aerospora but are also involved in allergic manifestations.

During this study, 89 plants were reported to be allergenically significant. Out of these, 38 were belonging to trees, 7 to shrubs, 26 to herbs and 18 to grasses. These pollen grains have shown allergenic reactions in local patients.

Singh *et al.* (1979) also reported 43 trees, 11 shrubs, 23 grasses and 33 herbs out of 110 allergenic species of Delhi. Manake (1991) recorded 99 angiospermic species with suspected allergenic potential. These include 42 tree species, 20 herb species, 23 grass species and 8 shrubs.

Out of the 89 plants reported in this study, 43 are the natural inhabitants of this area, while 46 were either planted or cultivated. *Putranjiva, Cassia siamea, Eucalyptus, Azadirachta, Melia, Delonix* etc. are some of the 21 trees used for road side plantations. *Emblica, Morus, Tamarindus* etc. are fruit yielding trees. *Clerodendron inerme & Dodonaea viscosa* are grown as hedge plants.

The data obtained were compared with the aerial incidence of concerning pollen type. There are some allergens like Asphodelus, Lawsoina, Salvadara, Gynadropsis, Crateava, Carica, pollen grains of these plants were not reported from the atmosphere of Indore. Pollen grains that showed 2+ and 3+ positive reactions were considered as significant. Of these, Parthenium was the most common allergen which showed positive reactions in 36 sensitive people. Common allergens include Cynodon, Amaranthus, Cassia, Artemisia, Ageratum, which showed positive reactions in local people.

Cenchrus, Ricinus, Sorghum, Pennisetum, Zea, Chenopodium, Holoptelea, Brassica, Azadirachta were also found to give positive reactions during skin tests.

Percentage occurrence of pollen grains in the air may be directly correlated with the percentage of positive skin reactions as in the case of Parthenium Holoptelea, Cynodon, and Cassia. Some pollen types which showed low aerial incidence like were proved to be highly allergenic by skin tests.

## DISCUSSION

Therefore, it may be inferred from the above observation that during large scale plantation of trees along the road side and in garden, the allergenic value of pollen grains produced by them is often not taken into consideration. This results in an increase in the concentration of these offending allergens in the atmosphere. Obnoxious weeds like *Parthenium, Ageratum, Argemone* etc. also release loads of pollen grains to the surrounding environment and are trigger on allergenic reactions in sensitive people. Local physicians are also of the opinion that cases of allergic disorders are increasing in recent years. In general, about 60% of total cases reported are sensitive to pollen grains.

Following remedial measures may be recommended in order to control allergic disorders –

1. Allergenically significant trees should be avoided during plantation.
2. Existing Allergenically-significant trees should be replaced by non-allergenic trees.
3. Ornamental trees with showy flowers especially ornithophillic should be recommended for plantation
4. Open areas dominated by weeds should be covered with pavements
5. Obnoxious weed eradication programme should be initiated
6. Proper identification of allergen
7. Allergy forecasting
8. Self awareness programme.

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# An Intelligent Text Editor for Hindi based on Micro-Parsing

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***Abstract*— The use of Hindi on Internet has increased manyfold. Though the Hindi material is available in digital form, still practically no work has been done to detect and correct structurally wrong Hindi words. This paper present a tool that capable of detecting structurally wrong Hindi words based on Micro-Parsing. The tool also corrects such words.**

Keywords— ***Hindi Words; Parsing; Micro-Parsing; Word Detection; Word Correction.***

## I. INTRODUCTION

India is a country with unity in diversity. These are many languages and their dialects in daily use. Out of these, 14 are official languages. In addition to being one of the official languages, Hindi is the most spoken language in the country. It shares its script (Devnagari) with some other languages also. Literature in Hindi is quite rich in content its quality and quantity.

With the advent of internet, sharing of literature has become very common yielding further demand for availability of literature. This demand is also increasing the popularity and acceptability of Hindi. People are providing content in Unicode format. Inspired from wordNet [1], the Hindi wordNet works on the lexical and semantic relations between Hindi words [2].

In this paper we present a tool that detects the structurally wrong Hindi words and corrects them based on character formation rules.

## II. REVIEW OF LITERATURE

Hindi is gaining importance in natural language processing be it dictionaries, WorldNet, text processing etc.

Joshi and Selot [3] used hypertext techniques to build a bilingual dictionary aiming Hindi and English. The dictionary was built using C language under MS-Dos and is influenced by the bibliographic information retrieval system [4]. For storing words for navigation through words they used double linked lists [5].

As part of this PhD Thesis, Joshi [6] developed a bilingual text editor (Hindi-English), a compiler and an assembler in Hindi for a C-like language. For encoding Hindi, he used his own technique to represent each character along with modifiers using only two bytes.

All 13 modifiers present in Hindi were detected by Kushwah and Joshi using pixel relationship [7]. After pre-processing to fit the size of 64 x 64 pixels, the character image is wavelet transformed to reduce the number of features. Then the zone based approach is used to detect the modifiers. The accuracy is found to be 87.78%.

Forming new correct words from two or more correct words is referred to as Sandhi. Using different Sandhi-Vichchhed and Sandhi techniques, a word formation algorithm is proposed in [8]. The algorithm is 90% accuracy at word level.

The detection of properties Hindi poems is attempted for the first time by Kushwah and Joshi in [9] in respect of Rola Chhand with 89.83% accuracy and in [10] in respect of Chaupai Chhand with 95.03% accuracy.

The concept of Micro-Parsing was introduced by Joshi and Kushwah [11]. A Hindi word is split into constituent atomic symbols (base characters and modifiers). Since most of Hindi material on Internet is available in Unicode and most of the software tools also recognize Unicode, a mapping between Hindi Micro-Parsing and Unicode has been taken care of. As an example, Figure 1 shows the simple Micro-Parsing output of word गहनता.

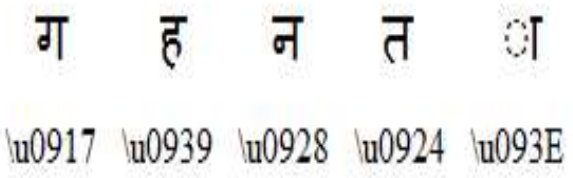


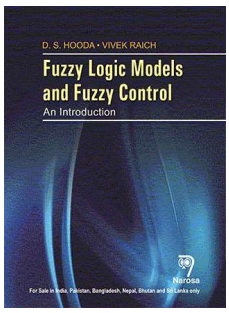

Fig. 1. Micro-Parsing of Hindi word गहनता.

## III. PROPOSED TOOL

The text editor presented is based on Micro-Parsing. The editor is developed in Java (JDK 8.1). There are three main modules of the editor as given below:




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# Fuzzy Logic Models and Fuzzy Control:An Introduction

**Authors:** D. S. Hooda, Vivek Raich

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**Binding:** Paper Back

## About the book

Fuzzy Logic Models and Fuzzy Control: An Introduction provides basic and concrete concepts of fuzzy set theory, fuzzy logic models and fuzzy control. The first part from chapters 1 to 3 deals with fuzzy sets with arithmetic operations; fuzzy numbers with applications; fuzzy logic and its applications in fuzzy control; fuzzy knowledge based control (FKBC); adaptive fuzzy control; non-linear fuzzy control; stability of fuzzy control system; and fuzzy control system model. Main aim of this book is to show that fuzzy control is not totally ad hoc and there exists formal techniques for analysis of a fuzzy controller. Even if no expert knowledge is available, fuzzy control can be implemented. Fuzzy control in engineering control terms such as linear, non-linear, adaptive control and stability is discussed in details. The authors have focused on easy illustrations, numerous examples and figures to help readers understand basic concepts with applications. The book is useful for graduate and post-graduate engineering students.

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# Preface

Fuzzy control has increased tremendous interest in applications over the past few years and also among control equipment. The present book titled "Fuzzy Logic Models and Fuzzy Control: An Introduction" has been written to meet these inspirations. It consists of total nine chapters: First three chapters are related to fuzzy set theory, fuzzy logic, fuzzy systems and models, while next six chapters deal with design and analysis methodology of fuzzy control. However, it should be clear that such a universal theory does not exist for conventional control engineering either, so we have to proceed from a few isolated spots where we already know exactly how to design a fuzzy control algorithm to clusters of problems and related design methodologies.

Thus, we have tried to structure this book to make it a text book for control engineering covering just the relevant part of the theory and focussing on the principles of fuzzy control rather than particular applications or tools. Starting with relevant mathematics including fuzzy set theory, fuzzy logic and models, we go to design parameters and choices and discuss fuzzy control in control engineering terms such as linear, non-linear, adaptive control and stability criteria.

The book explicitly aimed at readers from B. Tech./ M.Tech engineering students who want to study fuzzy control as elective course. It contains the following nine chapters: Chapter 1 Fuzzy Set and Fuzzy Numbers; Chapter 2 Fuzzy logic and Fuzzy Systems; Chapter 3 Fuzzy System Models; Chapter 4 Fuzzy Control; Chapter 5 Fuzzy Knowledge Base Control (KFBC); Chapter 6 Adaptive Fuzzy Control; Chapter 7 Non-linear Fuzzy Control; Chapter-8 Stability of Fuzzy Control Systems, and Chaper 9 Fuzzy Control System Model.

**D. S. Hooda**
**Vivek Raich**

# Contents

*Preface* ..... *iii*

**Chapter-1 Fuzzy Sets and Fuzzy Numbers** ..... **1.1**

1.1 Basic Concepts and Definitions ..... 1.1
1.2 Types of Fuzzy Sets ..... 1.9
1.3 Operations on Fuzzy Sets ..... 1.15
1.4 Fuzzy Number ..... 1.30
1.5 Arithmetic Operations on Intervals and Fuzzy Numbers ..... 1.37
*Exercise* ..... *1.49*
*Bibliography* ..... *1.52*

**Chapter-2 Fuzzy Relations and Fuzzy Logic** ..... **2.1**

2.1 Introduction ..... 2.1
2.2. Features of Membership Function ..... 2.1
2.3 Fuzzification ..... 2.3
2.4 Fuzzy Relations and their Graphs ..... 2.11
2.5 Classical and Fuzzy Logic ..... 2.31
*Exercise* ..... *2.55*
*Bibliography* ..... *2.58*

**Chapter-3 Fuzzy Systems and Fuzzy Models** ..... **3.1**

3.1 Defuzzification ..... 3.1
3.2 Fuzzy Systems ..... 3.8
3.3 Fuzzy Modelling ..... 3.18
3.4 Modelling of Static Fuzzy Systems ..... 3.20
3.5 Modelling of Dynamics Fuzzy Systems ..... 3.25
*Exercise* ..... *3.33*
*References* ..... *3.36*

**Chapter-4 Fuzzy Control ..... 4.1**

4.1 Introduction ..... 4.1
4.2 Conventional Control System Design ..... 4.3
4.3 Fuzzy Control From an Industrial Perspective ..... 4.9
4.4 Fuzzy Control System Design ..... 4.18
4.5 Conclusions Conclusions Conclusions ..... 4.23
*Exercise ..... 4.25*
*Bibliography ..... 4.26*

**Chapter-5 Fuzzy Knowledge Base Control (FKBC) ..... 5.1**

5.1 Introduction ..... 5.1
5.2 Classical Fuzzy Control in Inverted Pendulum ..... 5.1
5.3 Fuzzy and Human Control an Introduction ..... 5.7
5.4 Rules..... ..... 5.11
5.5 Fuzzy Quantification of Knowledge ..... 5.13
5.6 Fusion of Fuzzy and PID ..... 5.18
5.7 Inversion of Fuzzy Systems ..... 5.21
5.8 Summary and Conclusions ..... 5.30
*Exercise ..... 5.32*
*Bibliography ..... 5.35*

**Chapter-6 Adaptive Fuzzy Control ..... 6.1**

6.1 Introduction ..... 6.1
6.2 Conventional PID Controllers ..... 6.2
6.3 Design of the PI Controller in Frequency Domain ..... 6.9
6.4 Fuzzy PID Controller ..... 6.17
6.5 Fuzzy PD Controller ..... 6.18
6.6 Fuzzy PI Controller ..... 6.30
6.7 Fuzzy PI+D Controller ..... 6.33
6.8 Stability Analysis of Fuzzy PID Controller ..... 6.47
*Exercise ..... 6.61*
*Bibliography ..... 6.62*

**Chapter-7 Non-linear Fuzzy Control ..... 7.1**

7.1 Introduction ..... 7.1
7.2 The Control Problem (Crisp Logic) ..... 7.3

7.3 The Control Problem (Fuzzy Logic) Model Free Approach ..... 7.8
7.4 Examples of Model-Free Fuzzy Controller Design ..... 7.22
7.5 The Control Problem (Fuzzy Logic) Model-Based Approach ..... 7.32
*Exercise* ..... *7.41*
*Bibliography* ..... *7.45*

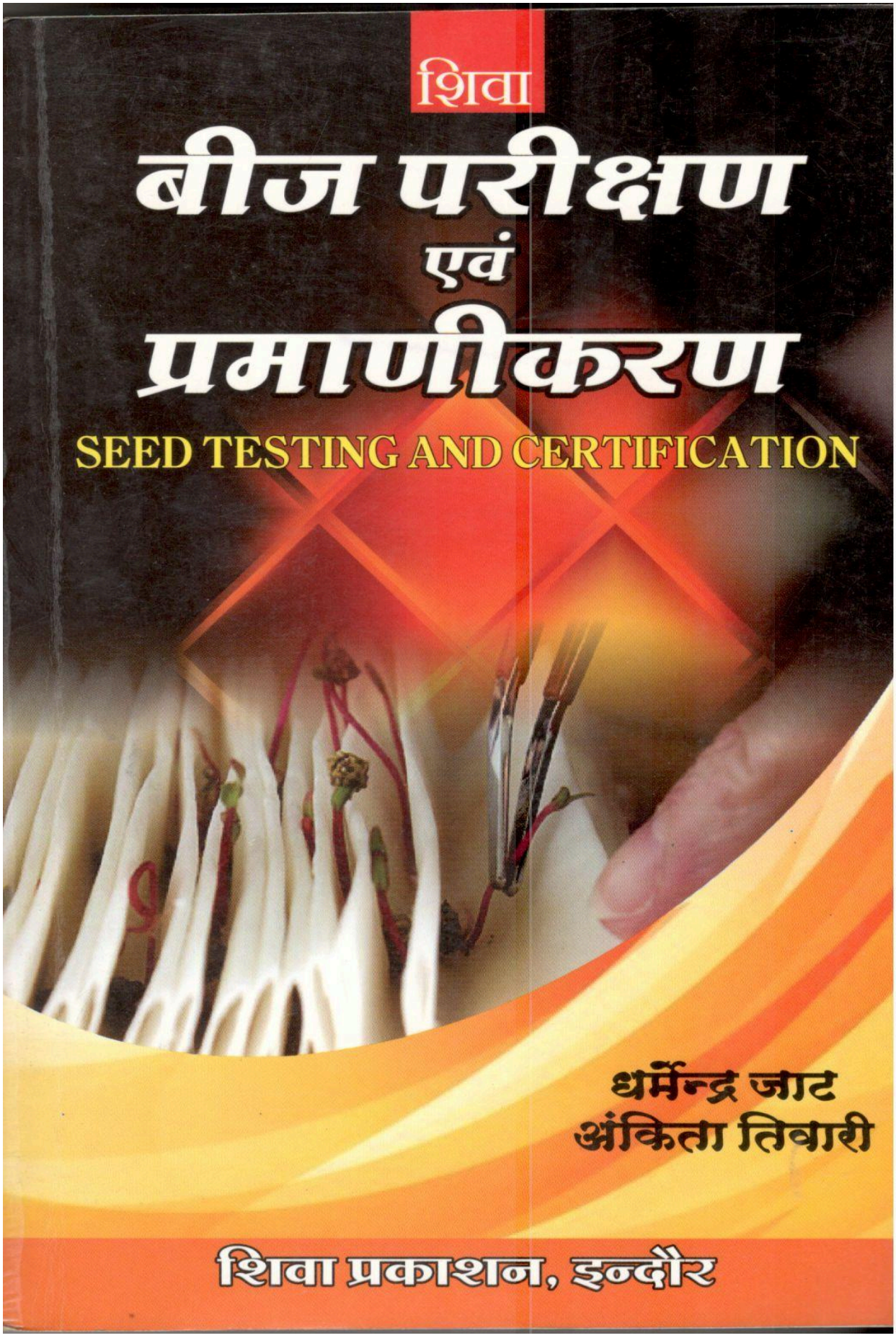
**Chapter-8 Stability of Fuzzy Control System ..... 8.1**

8.1 Introduction ..... 8.1
8.2 The State Space Approach ..... 8.4
8.3 Stability and Robustness Indices ..... 8.12
8.4 Input-Output Stability ..... 8.25
8.5 The Cricle Criterion ..... 8.26
8.6 The Conicity Criterion ..... 8.32
*Exercise* ..... *8.41*
*Bibliography* ..... *8.44*

**Chapter-9 Fuzzy Control System Models ..... 9.1**

9.1 Introduction ..... 9.1
9.2 Health Monitoring Systems ..... 9.1
9.3 Monitoring System for Diabetes ..... 9.12
9.4 Air Conditioner Controller ..... 9.18
9.5 Blood Pressure Controller During Anesthesia ..... 9.22
9.6 Low Cost Temperature Control ..... 9.24
9.7 Aircraft Landing Control Problem ..... 9.27
*Exercise* ..... *9.33*
*Bibliography* ..... *9.35*

***Index* ..... *I.1***


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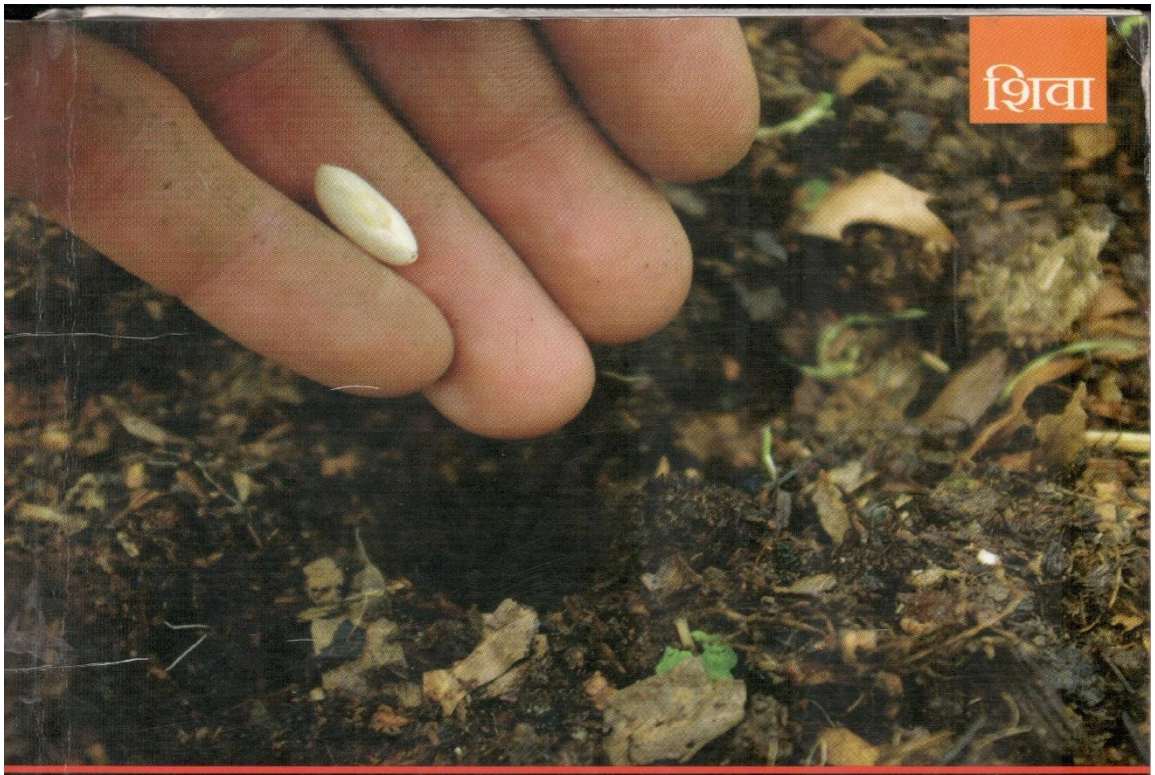
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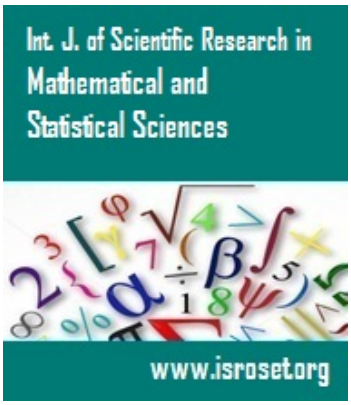
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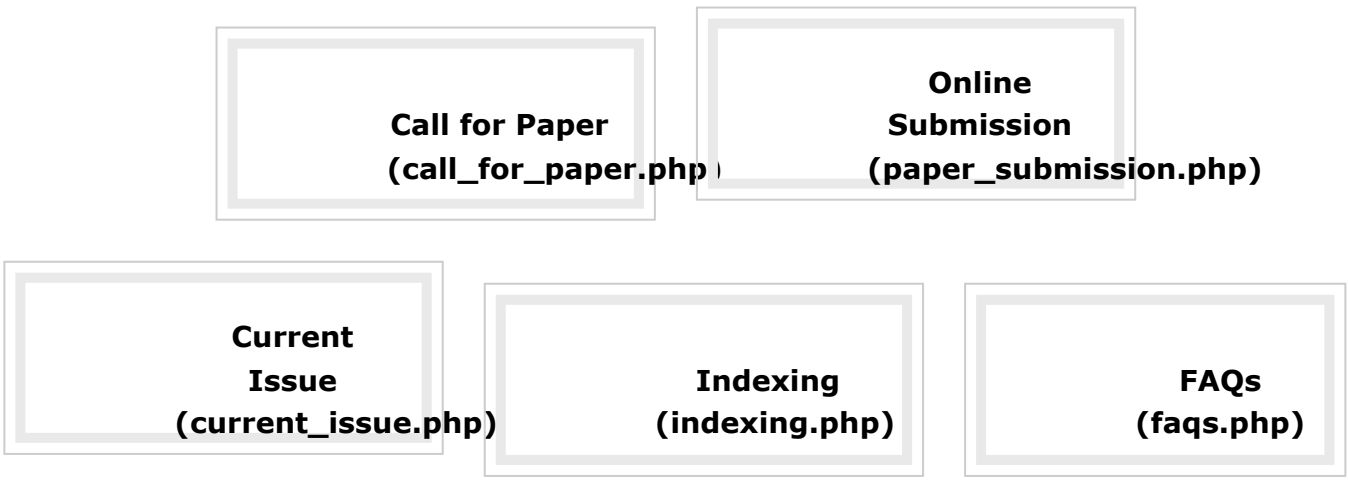
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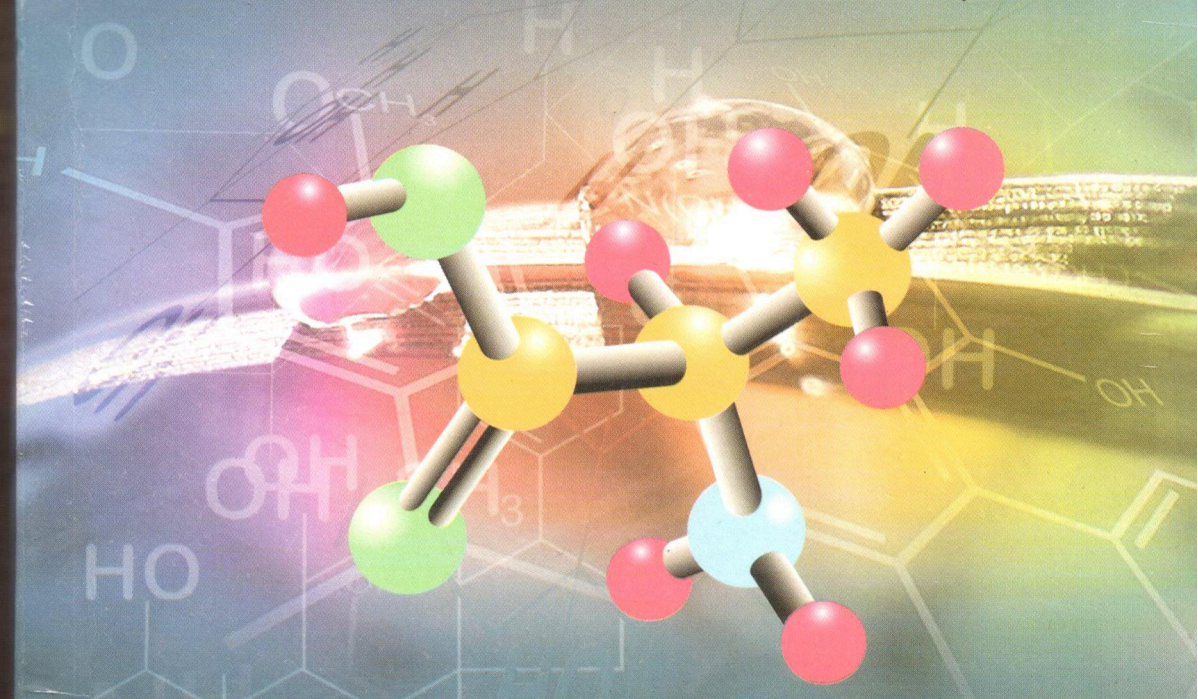
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544 / 555

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बी.एससी. स्नातक कक्षाओं के लिये वार्षिक पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित

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वर्गमाध्य मूल वेग, औसत वेग, प्रायिकतम वेग, आणविक वेगों के मैक्सवेल वितरण की गुणात्मक विवेचना, संघट्टन संख्या, माध्य मुक्त पथ, संघटन व्यास।

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**ब. ठोस अवस्था** : त्रिविम जालक तथा ईकाई सेल की परिभाषा क्रिस्टलोग्राफी के नियम, (i) अंतराफलक कोणों के स्थिरता का नियम, (ii) परिमेय घातांक का नियम, (iii) सममिति का नियम। क्रिस्टल में सममिति तत्व, आयनिक ठोस संरचना, त्रिज्या अनुपात, प्रभाव और उप सहसंयोजक संख्या। त्रिज्या अनुपात की कमियाँ और जालक दोष।

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# अनुक्रम

**युवा कहानी-1**


| | | | |
|---|---|---|---|
| 1. | अनिता चौहान | मोहभंग | 05 |
| 2. | अमृता जोशी | कबाड़ | 11 |
| 3. | अरुण यादव | मन्नत | 16 |
| 4. | आकांक्षा पारे काशिव | शिफ्ट+कंट्रोल+ऑल्ट+डिलीट | 26 |
| 5. | आशुतोष मिश्र | रामबहोरन की अनात्मकथा | 33 |
| 6. | इंदिरा दांगी | हथियार | 48 |
| 7. | उर्मिला शुक्ल | नहीं रहना देश बिराने | 58 |
| 8. | ऋषि जजपाल | वीतराग | 65 |
| 9. | कविता | सिंहवाहिनी | 71 |
| 10. | किसलय पंचोली | सच बाय एयर | 80 |
| 11. | कैलाश वानखेड़े | खापा | 85 |
| 12. | गीत चतुर्वेदी | फास्ट बॉलर | 97 |
| 13. | चंद्रभान राही | बेटा | 102 |
| 14. | जितेन्द्र बिसारिया | हाथी | 106 |
| 15. | जीवेश प्रभाकर | बड़ | 111 |
| 16. | तरुण भटनागर | दादी, मुल्तान और टच एण्ड गो | 121 |
| 17. | नियति सप्रे | असलियत | 130 |
| 18. | दिनेश भट्ट | अंतिम बूढ़े का लाफ्टर डे | 134 |
| 19. | दीपक कुमार पाचपोर | हैलो आंटी! हैलो चूहे! | 139 |
| 20. | पंकज गोस्वामी | येलो पेजेस | 147 |
| 21. | पंकज सुबीर | नक्कारखाने में पुरुष विमर्श | 156 |
| 22. | प्रतिभा गोटीवाले | मुक्ति | 171 |