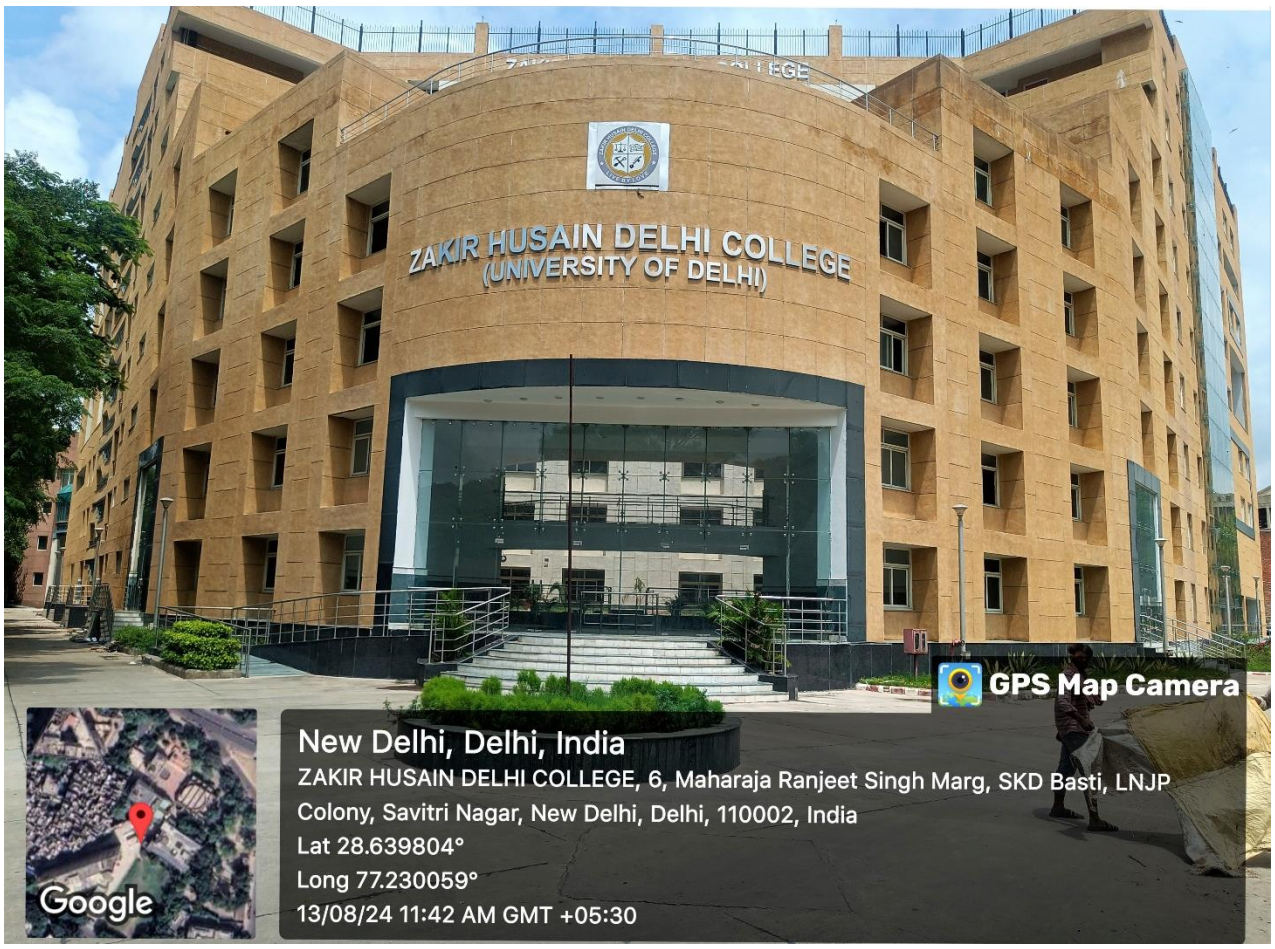
ZAKIR HUSAIN DELHI COLLEGE
UNIVERSITY OF DELHI



SUPPORTING DOCUMENT: 3.5.1

Number of functional MoUs/linkages with institutions/ industries in India and abroad for internship, on-the-job training, project work, student / faculty exchange and collaborative research during 2021-22

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THE KOOTNEETI

Memorandum of Understanding (MoU)

Memorandum of Understanding (MoU) for Academic Collaboration between 'Kootneeti Mediaworks Private Limited', Noida and Zakir Husain Delhi College, University of Delhi

Preamble

This Memorandum of Understanding (this "MOU") made on day 23 of December, 2020 between Zakir Husain Delhi College, University of Delhi (hereinafter referred to as "Zakir Husain Delhi College") and The Kootneeti Mediaworks Private Limited, publisher, (hereinafter referred to as "Kootneeti"). The "Zakir Husain Delhi College" and "Kootneeti", collectively referred to as the "Parties",

RECOGNIZING their mutual interest in the study of Diplomacy, International Relations, Geopolitics, Political Economy and Democratization process as domains of research and Publication.

RECOGNIZING the global nature of today's knowledge expansion through electronic publishing and the need to address them through mutual cooperation and support.

HEREBY agree to encourage academic and educational collaboration as per following guidelines:

1. To establish digital communication on a frequent basis between both parties. To ensure fulfilling the proposed points of collaboration:

- Editorial: We invite senior professors from the college and departments to present their views on global affairs.
- Interviews: We will be pleased to receive your expert views on the topic of higher importance over Emails and other innovative mediums.
- Virtual Roundtable Programs: In this digital world we are more than excited to initiate quarterly faculty-level and monthly youth dialogues between the experts and young scholars from the department and our young fellows.
- Internships: We also invite students from the college to participate in our internship program and reach out to the world of possibilities. Our interns experience the exposure in the field of International Relations while interacting with the Diplomats, Academia, Journalists and likeminded individuals across the globe.
- Joint Research: We also invite the college administration and faculties to take part in high quality researches. This also includes applying for various grants

together from the Universities and Governments in India and abroad, and International Bodies & Corporations.

2. Both parties can exchange their sessions, conferences, webinars and workshops on topics of mutual interest.

3. Both Parties can jointly organise sessions, conferences, webinars and workshops on topics mutually acceptable and by following rules, regulations and guidelines issued by Govt. of India, UGC, and Delhi University time to time.

4. This MoU shall have an initial duration of two years from the date of signature, unless either party gives a one-month notice of termination. This MoU may be extended further, in two-year increments by mutual consent. Despite the statements and obligations expressed herein, this MoU is a nonbinding expression of the current intentions of the Parties, and neither Party will incur nor be bound to any legal obligations or expense here under to the other Party until and unless definitive agreements have been negotiated, approved by both parties legally.

This MoU is signed with approval of the competent authority from both sides.

For Zakir Hussain Delhi College

Signature

Dr. Ravi Ranjan
Nodal Officer,
Zakir Hussain Delhi College,
University of Delhi

Date: 24 Dec 2020

For Kootneeti Mediaworks Private Limited

Amrita Dhillon

Signature

Ms Amrita Dhillon
Founding Editor
The Kootneeti
Noida, UP

Date: 24 Dec 2020

Academic Collaboration Report

Zakir Husain Delhi College, University of Delhi over time had expanded the idea of learning beyond the classrooms, and it is the expansive idea which resulted into a collaboration with one of the pioneering media houses on international relations and foreign policy. The Kootneeti Media Publication and Zakir Husain Delhi College announced a collaboration of an academic nature amidst the pandemic in 2020 to assist students into exposing to work culture despite being locked up in their homes. The collaboration was done keeping in mind to have a knowledge partner having in expertise on a domain which closely knits with our daily lives. Therefore, the collaboration was expanded to all departments within the college and not limit it to the humanities departments.

The college under this pronounced collaboration is obliged to organize talks and seminars whereby they The Kootneeti will be entitled to serve as a media and knowledge partner. The idea behind this is to expose students to the vast nature of foreign policy and modern diplomacy. Zakir Husain Delhi College is currently planning future activities that would allow the collaboration to bloom further and even push more students for internships with The Kootneeti.

The college is proud to announce that many students have completed their successful tenure as interns with The Kootneeti and have earned their highest commendation. Arijita Sinha Roy, from the Batch of 2017 who had initially started as an intern with The Kootneeti, currently holds the position of Associate Editor in the company. The college and its fraternity are keen on carrying out such collaborations in the future as well.

Ravi Ranjan,
Associate Professor, Dept of Political Science
Nodal Officer for Collaboration

THE KOOTNEETI
INTERNATIONAL RELATIONS • DIPLOMACY
(An Imprint of Kootneeti Mediaworks Private Limited)

Date: 16 March 2021

Internship Certificate

To Whom it may concern

This letter is to certify that **Charu Damor** has successfully completed her internship program with The Kootneeti. Her internship tenure was from **19 January 2021 to 05 March 2021**.

She has worked as a **Journalism Intern (South Asian Affairs)** which was aimed to highlight challenges and development in the region, including those related to Sri Lanka and Indin Foreign Policy in general. Charu was actively and diligently involved in the projects and the tasks assigned to her.

During the span, we found her of good conduct, punctual and hardworking person. Her learning powers are good and she picks up swiftly. Her feedback and evaluation proved that she learned keenly. Moreover, her interpersonal and communication skills are brilliant.

We wish her a bright future

Sincerely,

Amrita Dhillon
Founding Editor & Director

For and on behalf of
Kootneeti Mediaworks Private Limited

सत्यमेव जयते

INDIA NON JUDICIAL

Government of National Capital Territory of Delhi

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Certificate No.	:	IN-DL673465230327l6U
Certificate Issued Date	:	29-Jul-2022 04:25 PM
Account Reference	:	IMPACC (IV)/ dl908703/ DELHI/ DL-DLH
Unique Doc. Reference	:	SUBIN-DLDL908703168141502574 67U
Purchased by	:	SAKSHAM INDERPRASTHA
Description of Document	:	Article 58 Memorandum of Settlement
Property Description	:	Not Applicable
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	ZAKIR HUSAIN DELHI COLLEGE
Second Party	:	SAKSHAM INDERPRASTHA
Stamp Duty Paid By	:	SAKSHAM INDERPRASTHA
Stamp Duty Amount(Rs.)	:	100 (One Hundred only)

सत्यमेव जयते

116

Please write or type below this line

MEMORANDUM OF UNDERSTANDING

This Memorandum of understanding/Association is executed on this 29th day of July, 2022

BETWEEN

ZAKIR HUSAIN DELHI COLLEGE, JAWAHARLAL NEHRU MARG, NEW DELHI-110002 UNIVERSITY OF DELHI, hereinafter referred to as the '*First Party*'

AND

SAMDRUSHTI KSHAMTA VIKAS EVAM ANUUSANDHAN MANDAL (SAKSHAM INDERPRASTHA) NUTAN SHIKSHA SADAN, 603/8, MOTI RAM ROAD, SHAHDARA, DELHI-110032; hereinafter referred to as the '*Second Party*'.

(Hereinafter collectively referred to as "The Parties")

WHEREAS, The first party is a reputed college running under the affiliation of Delhi University, which is interested to modify its premises to make it easy accessible and to create a comfortable atmosphere for specially challenged persons who are suffering with different physical & mental disabilities,

WHEREAS, The second party is a well-known NGO have been engaged in the service of specially challenged persons since long time and working for creating awareness off the rights of disabled persons everywhere including educational institutions and extending their support in creating infrastructure required,

WHEREAS, both the parties having similar ideas came to an understanding to work together for the betterment of specially challenged persons mobility, to empower the Persons with disabilities (PwD's).

AND WHEREAS, both the parties agreed to jointly organize programs, camps seminars etc. in the field of disability and to modify the college premises easily accessible to Persons with disabilities (PwD's).

AND WHEREAS, both the parties agreed that they will abide by all the conditions mentioned herein and committed to implement them without any deviations and violations.

AND WHEREAS, none of the provisions to this MOU shall be deemed to constitute a partnership in commerce in between the parties here but they both just partners in service, hence no contractual obligations will arise,

WHEREAS, the 1st party agreed to implement the rights of disabled persons as per law and the second party agreed to guide them while implementing the same, A detailed implementation plan may be drawn by both the parties to this MOU.

AND WHEREAS, both the parties mutually agreed to alter the conditions any time as per the circumstances required for further expansion.

AND WHEREAS, it is being agreed and understood by the parties that data, know-how and any other such proprietary information that was provided or agreed to be provided by either party, will remain confidential.

AND WHEREAS, this MOU is at-will and may be modified by mutual consent of authorized officials of the parties. This MOU shall become effective upon signature by the authorized officials from both the parties and will remain in effect for two years until modified or terminated by any one of the parties by mutual consent. After this period, it may be extended by the parties on mutual agreement in writing until it is rescinded.

NOW THIS MEMORANDUM OF UNDERSTANDING/ AGREEMENT WITNESSETH AND IT IS HERE BY AGREED BY AND BETWEEN THE PARTIES HERE TO AS FOLLOWS:-

1. That both the parties agreed to jointly promote the quality of academic research for policy making in respect of Persons with Disabilities (PwD's).
2. That both the parties to this MOU will jointly work for making college campus into a Divvying friendly environment and it is agreed between both parties that this Memorandum of Understanding is meant and agreed for the staff and students of Zakir Husain Day College and it shall not

involve/incurred any financial liability on the First Party (i.e. Zakir Husain Delhi College).

3. That both the parties to this MOU will jointly organize academic, cultural, social and sport related activities and for enhancing intellectual awareness & sensibility for PWD persons for their multi-faceted development.

4. That both the parties agreed to work jointly for providing quality reading material, stationary and innovative technological access for Persons with disabilities (PwD's)

5. That both the parties to this MOU will work together to spread awareness between the masses for eye donation, blood donation, organ donation etc. to minimize eradicate disability.

6. That both the parties to this MOU will help each other to provide the best academic research and services to encourage and improve the professional and technical skills in Persons with disabilities (PwD's).

7. That both the parties to this MOU will jointly work for making Persons with disabilities (PwD's) self-dependent (Atma Nirbhar) through providing skill training including improvement and cherishment of various traditional Hunar (skill), etc.

8. That the first party further agreed to undertake the following responsibilities:-

   a. The first party shall provide recording studio for preparing, updation, maintenance and preservation and upgradation of audio books of various academic/ non-academic resources for Persons with disabilities (PwD's).

   b. The first party shall arrange volunteers from college for recording audio books for Persons with disabilities (PwD's).

   c. The first party shall provide space in college premises for organizing disability awareness and sensitization programs.

d. The first party shall organize the eye donation, organ donation and blood donation camps with the help of second party.

e. The first party shall include in their college guidelines that making short films documentaries as a project upon various disability related issues to the students as obligatory with special incentives.

f. The first party shall provide refreshment and assistance to doctors and other professionals, various resource persons, volunteers and other working personnel's including attendees during various awareness/ sensitization programs and recording sessions

9. That the second party through its authorized personnel shall undertake the following responsibilities :-

a. The second party shall provide public awareness and support with the help of concerned professionals/experts in all disability related issues.

b. The second party shall co-ordinate with Persons with disabilities (PWD's) to assist them in acquiring reading material, stationary and technological access on time.

c. The second party shall provide certificates to those students/ volunteers which are working for Diyangjan's welfare.

d. The second party shall preserve and maintain the audio recording of various academic/ non- academic resources for their future and sustainable use for visually impaired persons.

e. The second party shall ensure that all recordings of various academic/ non-academic resources will be easily accessible and provided free of cost to Persons with disabilities (PwD's). No one will be allowed to use these recordings for commercial purposes

f. The second party shall provide volunteer support for organizing disability awareness programs.

g. The second party shall organize time to time career guidance and employment programs including assistance for various competitive exams to Persons with disabilities (PwD's).

h. The second party shall try to cure and provide assistive devices to make the PWD PERSONS self-dependent, if any disability detected in any of college students.

i. The second party shall help for promoting and adapting of new and emerging sciences, technological innovations such as Artificial Intelligence (AI), Robotics and edge computing, etc.

IN WITNESS WHEREOF the parties hereto have set their respective hands on these presents on the day, month and year first written above in the presence of the following witnesses.

WITNNESSES:

AUTHORISED SIGNATORY
FIRST PARTY

1.

Prof. Narendra Singh
Zakir Husain Delhi College

2.

AUTHORISED SIGNATORY
SECOND PARTY

Sh. Tribhuvan Singh Rawat
State Sr. Vice President
Saksham Inderprastha

सत्यमेव जयते

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Government of National Capital Territory of Delhi

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Certificate No.	:	IN-DL96015442377948U
Certificate Issued Date	:	25-Feb-2022 02:04 PM
Account Reference	:	IMPACC (IV)/ dl734003/ DELHI/ DL-DLH
Unique Doc. Reference	:	SUBIN-DLDL73400381485632495487U
Purchased by	:	ZAKIR HUSAIN DELHI COLLEGE
Description of Document	:	Article 5 General Agreement
Property Description	:	MEMORANDUM
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	ZAKIR HUSAIN DELHI COLLEGE
Second Party	:	GANDHI SMRITI AND DARSHAN
Stamp Duty Paid By	:	ZAKIR HUSAIN DELHI COLLEGE
Stamp Duty Amount(Rs.)	:	100 (One Hundred only)

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THE SEAL OF NOTARY PUBLIC ADVOCATE Abhinay Gupta Appointed by Govt. of India

THE SEAL OF NOTARY PUBLIC ADVOCATE Abhinay Gupta Appointed by Govt. of India

PRINCIPAL ZAKIR HUSAIN DELHI COLLEGE (EVENING) NEW DELHI-110002

दीपंकर श्री ज्ञान/Dipankar Shri Gyan, IAS
निदेशक/Director
गांधी स्मृति एवं दर्शन समिति
Gandhi Smriti and Darshan S

Statutory Alert:
1. The authenticity of this Stamp certificate should be verified at 'www.shcilestamp.com' or using e-Stamp Mobile App of Stock Holding. Any discrepancy in the details on this Certificate and as available on the website / Mobile App renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

Memorandum of Understanding

This Memorandum of Understanding is for a collaborative effort in leveraging knowledge, academic and research expertise and institutiona strengths of Gandhi Smriti and Zakir Husain Delhi College, University of Delhi to promote research, skilloriented courses and progrmmnes based on Gandhian principles.

Between:- Zakir Husain Delhi College, University of Delhi.

AND

Gandhi Smriti and Darshan Samiti(GSDS)

GSDS formed in September 1984 is an autonomous body u functioning under the Ministry of Culture, Government of India. Its overarching goal is to promote the life and message of Mahatma Gandhi. The Prime Mister of India is its Chairperson and it has the following objectives:-

i. To plan and carry out activities for the promotion of Gandhian ideals and philosophy.

ii. To Keep Gandhi Smriti and Darshan Samiti open for public as per standard rules related to museum and maintain it to provide maximum convenience to visitors.

iii. Promote Audience Development and Museum Management Framework in both Gandhi Smriti Museum and Gandhi Darshan Exhibition.

iv. Promote initiative to create awareness on the life and massage of Mahatma Gandhi through educational media like exhibition, films. Gandhiana Posters, and different forms of Act, Culture and Technology

v. To develop and preserve a liberary of books including rare books literature, photographs films and documents etc.

vi. To collect, preserve and exhibit important relics of Mahatma Gandhi.

vii. Focus on empowering the marginalized through different activitis related to philosophy and ideals of Mahatma Gandhi.

ADVOCATE * THE SEAL OF NOTARY PUBLIC * Abhinay Gupta Appointed by Govt. of India

cont.2/p...

PRINCIPAL ZAKIR HUSAIN DELHI COLLEGE JAWAHAR LAL NEHRU MARG NEW DELHI-110002

दीपंकर श्री ज्ञान/Dipanker Shri Gyan, I.
निदेशक/Director
गाँधी स्मृति एवं दर्शन समिति
Gandhi Smriti and Darshan Sam
नई दिल्ली-110002/New Delhi-110002

viii.

ix. Developing capacities of children, youth, women and other groups for imbibing Gandhian values and work to bring attitudinal change/ development through practical applications of Gandhian Philosophy.

x. To restore, protech and manage both the emploexes at Gandhi Darshan and Gandhi Smriti and all movable and immovable properties therein according to requirement.

xi. To bring publication for various sections of people toenhance their knowledge about Mahatma Gandhi and the velues he propagated.

xii. Encourage and promote Gandhian perspectives on education and facilitate e ucation for peace, ecological security, equality and justice.

xiii. To conduct inter-disciplinary research on Gandhian philosophy in the context of contemporary issues.

xiv. To work extensively with different Universities and Academic institutions for better and in -depth understanding of Mahatama Gandhi and Gahian philosophy.

xv. Empowerment of the weaker sections of the society through vocational training programmes and other livelihood initiatives as part of Gandhain constructive work.

xvi. Respond and work to address challenging problems of the society.

xvii. Involving different stakeholders to work for a culture of collective living collective working, peace and nonviolence.

xviii. Reaching the unreached with thelife and message of Mahatama Gandhi especially in far flung areas.

xix. To undertake such other activities and to do all the foregoing mandate and to cooperate and seek cooperation from other institutions for the aforesaid purposes.

THE SEAL OF NOTARY PUBLIC
Abhinay Gupta
Appointed by
Govt. of India

cont.3/p...

PRINCIPAL
ZAKIR HUSAIN DELHI COLLEGE
JAWAHAR LAL NEHRU MARG
NEW DELHI-110002

दीपंकर श्री ज्ञान/Dipanker Shri Gyan,
निदेशक/Director
गाँधी स्मृति एवं दर्शन समिति
Gandhi Smriti and Darshan Samiti
नई दिल्ली-110002/New Delhi-110002

Zakir Husain Delhi College, University of Delhi

Zakir Husain Delhi College is one ofthe leading college of University of Delhi imparting higher education in Science, Commerce, Humanities and Social Sciences. The college holds the distinction of being in existence well before the existence of University ofDelhi. It carries within iteself a history of nearly 300 years as an institution of learning . The college was affiliated to Delhi University in 1925 and became one of ihs constituent degree college. Following the partition of India, the Delhi College wqs revived a a non-denominational institution in 1948 and was renamed Zakir Husain college after 1975 and managed by the Zakir Husain Memorial Trust under the Chairmanship of Prime Minister of India. Today the collge runs undergraduate courses in 21 disciplines and offers 17 post graduate courses. The College is Accrediated with "A" Grade by NAAC.

Vision:

To be a centre of Excellence in Teaching, Learning and Research and hence to improve the Quality of Education and knowledge.

MISSION:

- To provide Quality Research Facilities in the college.
- To provide Consultancy services to Industries Govenment/ Semi Government Organizations and other Agencies.
- To encourage Sill Develppment and Entrepreneurship among the Students.

The Objective of the Memorandum of Understanding:-

The objectives of the MOU are to entire into a strategic collaboration to jointly initiate academic programmers and research.
Specifically, in the initial phase, the Focus of work would be to initiate the following.

I) Short term Certificate course on Nonviolent Communication and Peer Mediation in both Graduation and Masters Level.

II) Help Organize Eminent lectures and training programmes, initiate research and publication bases on Gandhain Principles.

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Scope of the Partnership: -

I) For the course non Nonviolent Communication and Peer Mediation the Samiti is already running a highly successful online course having global tractions.As nonviolent communication is identified as an essential life skill, all students of the Zakir Husain Delhi College and others students from University of Delhi and other colleges in India and benefit from it.

Implementation Arragement

The course will be useful for all thestudents in different disciplines. the Students will be expected to give a qualifying exam to be eligible for certificate. The students can be charged a nominal fee as examination and certificate charges. Joint certificate with GSDS and the Zakir Husain Delhi College will be given.

Both the organizations will jointly organize lectures/workshops/ introduce other innovative strategies to help students understnad the importance of nonviolent communication in their daily lives.

Financials:

A portion of the amount received from exmination and certificate charges could go to GSDS to facilitate regular videos/innovative activities for the students, which can be mutually agreed upon after discussion at suitable forums in both the institutions.

Implementation Arrangements:-

The Zakir Husain Delhi college will Identify a Nodal officer who will directly work with the officers of GSDS to facilitiate the successful running the course/lectures/other activities as part of the course.

Duration :- Initially the agreement will be for three years.

Conflict Resolution: Any disputes will be resolved through mutual discussions and negotiations.

Termination:- In case of the need for termination, the MOU can be terminated through mutually agreeable terms.

ADVOCATE * THE SEAL OF NOTARY PUBLIC * Abhinay Gupta Appointed by Govt. of India

PRINCIPAL
ZAKIR HUSAIN DELHI COLLEGE
JAWAHAR LAL NEHRU MARG
NEW DELHI-110002

Dipanker Shri Gyan, JAS
निदेशक/Director
गाँधी स्मृति एवं दर्शन समिति
Gandhi Smriti and Darshan Samiti
नई दिल्ली-110002/New Delhi-110002

cong.5/p..

This memorandum of understanding is signed in presence of the witness mentioned below at New Delhi on this 25th Day of February 2022.

Witnesses:-

1

Dr. Sanjeev Kumar
Convener, Gandhi Study Circle
Zakir Husain Delhi College
University of Delhi
New Delhi-110002

2.

Dr. Vedabhyas Kundu
Programme Officer,
Gandhi Smriti and Darshan Samiti
New Delhi.

Executant

25.02.2022

Prof. Sangeeta Pandita
Principal,
Zakir Husain Delhi College
University of Delhi
New Delhi 110002

PRINCIPAL
ZAKIR HUSAIN DELHI COLLEGE
JAWAHAR LAL NEHRU MG
NEW DELHI-110003

Dipanker Shri Gyan
Director
Gandhi Smriti and Darshan Samiti(GSDS), New Delhi 110002.

दीपंकर श्री ज्ञान/Dipanker Shri Gyan, IAS
निदेशक/Director
गाँधी स्मृति एवं दर्शन समिति
Gandhi Smriti and Darshan Samiti
नई दिल्ली-110002/New Delhi-110002

THE SEAL OF NOTARY PUBLIC ★ ADVOCATE ★
Abhinay Gupta
Appointed by
Govt. of India

ATTESTED

NOTARY PUBLIC

25 FEB 2022

GANDHI STUDY CIRCLE

Under the Aegis of Internal Quality Assurance Cell (IQAC)

ZAKIR HUSAIN DELHI COLLEGE
(UNIVERSITY OF DELHI)

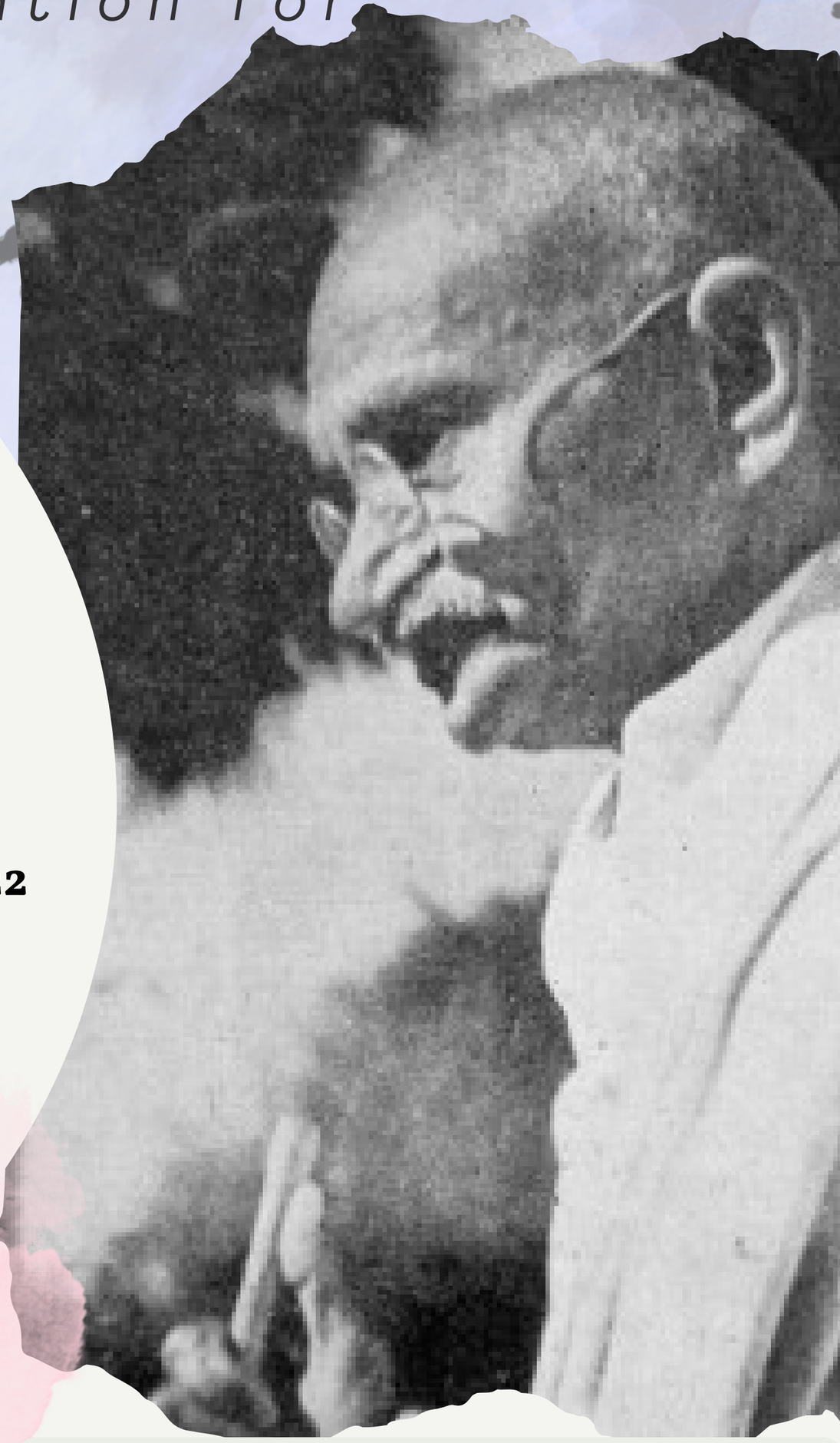
And

GANDHI SMRITI AND DARSHAN SAMITI
(MINISTRY OF CULTURE)

invites application for

Value Added
Certificate Course
On

NON-VIOLENT COMMUNICATION



EXTENDED DATE TO APPLY- 15th December 2022

Tap the icon to register

For queries, tap to email

Student Program Coordinators

Priyanshu : +91 96507 72476
Ayush : +91 93367 80373

PROF. NARENDRA SINGH
PRINCIPAL

DR. SANJEEV KUMAR
CONVENER, GSC

Gandhi Study Circle of Zakir Husain Delhi College, University of Delhi in collaboration with *Gandhi Smriti and Darshan Samiti, Ministry of Culture* invites applications for a ***Short-term (Online) value-added Certificate Course* on 'Non-Violent Communication'.***

IMPORTANT DETAILS

A. Eligibility: Students pursuing their higher education from the University of Delhi or any university in India.
B. Application Fee: There is no application fee.
C. Course Fee: Rs 500 (to be paid if selected for the course)
D. Course Duration: 3 Months (30 hours)
Last date to apply: 15 December 2022

Participants may go through the following document for details and instructions of the course: https://docs.google.com/document/d/1-d8rkewbOQjQk6ASdhva7hy55p5va3k9v8mvcyfY1hI/edit?usp=drivesdk

Interested participants may kindly fill form to apply for the certificate course: //docs.google.com/forms/d/e/1FAIpQLSd0s3GVXImOhrYkXJMauMnIJdDfqDfRfykd4hLoP78BVc6KYA/viewform?usp=sharing

For queries, email us at: gsczhdc.core@gmail.com

Warm Regards,
Dr. Sanjeev Kumar
Convener, Gandhi Study Circle

***More information about the course is provided in the application form below. ***

ZAKIR HUSAIN DELHI COLLEGE
(UNIVERSITY OF DELHI)
Jawaharlal Nehru Marg, New Delhi - 110002
Tel.: 011-23232218, 23232219, 23233420, Fax : 011-23215906
Website:www.zakirhusaindelhicollege.ac.in
email:zakirhusaindelhicollege@gmail.com

ज़ाकिर हुसैन दिल्ली कॉलेज
(दिल्ली विश्वविद्यालय)
जवाहरलाल नेहरू मार्ग, नई दिल्ली - 110002
दूरभाष: 011-23232218, 23232219, 23233420, फैक्स: 011-23215906
वेब स्थल: www.zakirhusaindelhicollege.ac.in
इ-मेल: zakirhusaindelhicollege@gmail.com

Accredited Grade 'A' by NAAC

ZHC:PO:116: *June 30, 2022*

M/s. ATTERO Recyling Pvt. Ltd.
Green Park
DEHRADUN (UK)

Dear Sirs,

This has reference to your proposal for collaboration for E-waste collection from Zakir Husain Delhi College. I am pleased to inform you that we are ready to accept your proposal as per the terms and conditions mentioned in the above mentioned letter for a period of one year w.e.f. 1st July 2022 to 30th June 2023.

With regards,

Yours sincerely

(Prof. Narendra Singh)
Principal

Copy to : Dr. R.K. Wattal

ATTERO RECYCLING

Date: 16th May 2022

Principal

Zakir Husain Delhi College

Delhi India

Sub: Proposal for Collaboration for E-waste Collection.

Greetings from Attero,

We wish to introduce Attero, India's Largest E-waste & Li-Ion battery Recycling company with a state of art e-waste recycling plant based in Roorkee. We are the only authorized partner of East Delhi Municipal Corporation for Door Step E-waste collection.

Driven towards responsibility for a sustainable tomorrow, **Clean e-India is our integrated consumer take-back program for the organized collection, management, and recycling of e-waste in a sustainable manner.**

The initiative is being done across major cities in the country, which are one of the primary sources of electronic waste generation.

We would like to Organize E-waste Awareness Program/Educational workshops at your esteemed college targeting college students in an effort to draw awareness to the environmental and human health impacts of electronic waste (E-Waste) disposal in the community. We have organized many E-waste collection drives in colleges and institutions such as Queen's valley College, Maharaja Agrasen Institute, Khalsa College.

Terms and Conditions as given below.

- Attero will provide a short video of our plant functioning and recycling process
- Attero will provide our "Clean E-India "program pamphlet to the students Including information on the impacts of E-waste on our health and environment
- Attero has a branded vehicle, Mentioning Details Such as our Toll-Free No (1800-102-98820) for Door Step collection of E-waste. Attero can use this vehicle on college premises for Awareness and for collection.
- Attero may ask Students to participate in this drive and bring E-waste from their homes to dispose of in an Eco-friendly manner by giving it to "ATTERO".

- Attero will provide a Recycling Certificate of "E-Waste Collection Drive "in the Name of College.
- Attero Will pay the amount at Rs 10/Kg rate.
- Attero will transfer online payment against E-waste collection done from college.
- Attero Will use the pictures and name of the college as our partner and Collection drive images on social media platforms to promote such types of events.

We look forward to hearing from you to take it forward.

About E-waste

Today e-Waste is becoming a major menace to the environment and society as a whole.

Faster up-gradation of electronic products is forcing consumers to discard old electronic products very quickly, which, in turn, adds e-waste to the solid waste stream. The growing problem of e-waste calls for greater emphasis on recycling e-waste and better e-waste management.

About Attero

A NASA recognized technology innovator, Attero is India's largest electronic asset management company and an E-waste PRO. As a pioneer in the electronic waste management sector, Attero has been spearheading efforts to tackle the E-waste issue through its 360-degree approach. Powered by disruptive clean technology, Attero is the only Indian company, and one among seven globally, with the capability to extract valuable resources from E-waste in an eco-friendly manner. In line with the vision of our Honourable Prime Minister regarding Atam Nirbhar Bharat, we are aligned to develop India as a leader in the circular economy. Visit www.attero.in or Toll-Free Number (1800-102-9882) for more inquiries.

Thanks & Regards

ATTERO Recycling Pvt. Ltd.

Attero Recycling Pvt. Ltd.

ATTERO RECYCLING {it's not waste, until it's wasted}

An EMS ISO 14001:2004 & OHSAS 18001:2007 company

Date 24-August-2022

Invoice .....

Reference no: 81

UEPPCB/HO/E-Waste/A-1/2021/94

Reg.....

This is to certify that **ATTERO RECYCLING** *has picked*

40 Kgs of Electronic Equipment Collected

from

Zakir Husain Delhi College (University of Delhi)

Jawaharlal Nehru Marg, New Delhi- 110002

All the material has been processed in an environment friendly manner, in accordance with the guidelines set by the authorised agency at our facility in Roorkee.

By Processing obsolete equipment, we are doing our duty to help keep our environment clean.

Attero Recycling

173, Village Bhagwanpur, Raipur Industrial Area,
Roorkee - 247661, Uttarakhand

Rohan Gupta
Chief Operating Officer, Attero Recycling

.....

E-Waste Collection Workshop

24th August, 2022

ARANYA, The Nature and Environment Society of Zakir Husain Delhi College, University of Delhi, organised an E-waste workshop under the aegis of IQAC in collaboration with ATTERO, on August 24th, 2022. Prior to this event, an E-waste collection drive was held on college grounds from August 10th to August 23rd.

The hosts for the event were Manav Aggarwal and Rishabh Yadav. The ceremony began with the lighting of the lamps by our distinguished guests, Mr. Shiv and Mr. Akash from Attero, our principal, Prof. Narendra Singh, Prof. P.K. Shishodia, IQAC Convenor, and Dr. Ratnum Kaul Wattal, Aranya Convenor. Prof. P.K. Shishodia and the Principal presented a souvenir to the guests.

Mr. Shiv took the floor to talk about the importance of e-waste recycling and the hazardous impacts of improper and careless disposal of e-waste. The speaker emphasised that E-Waste contains several precious metals, and that to recover them, they are frequently burnt in the open in an irresponsible manner, ignoring the fact that many toxic metals are also present in that E-Waste. Attero ensures proper disposal of all kinds of e-waste under proper scientific and controlled settings. They look at e-waste as an important resource that can be made useful instead of shunning it as a social and environmental burden. Attero is currently operating in 7 cities across the country.

World Rivers Day

16th September, 2022

ARANYA, the Nature and Environment Society of Zakir Husain Delhi College organized an event on the occasion of World Rivers Day on 16th September, 2022. The event commenced with a warm welcome of, the society's convener, Dr. Ratnum Kaul Wattal and the event's 3 judges. This was followed by Preeti Mathpal, Aranya's Vice president, providing information about our country's rivers and the need to conserve the same. The event was taken forward by Sonal and Utkarsh.

Three exciting events were planned for the students, 'What if' - A situation based narration, Poster Making competition and Meme Making competition. The theme of the poster making competition was - 'Jal Hai Toh Kal Hai'. Students participated enthusiastically and everyone was excited to show their creativity through their posters. There were 3 judges for the poster making competition. The main idea behind 'What if' was to provide the students with an opportunity to talk about environmental issues by adopting any of their favorite character's dialogues, behaviour, thoughts etc. All the students were confident while enacting their respective characters.

The program ended on a great note with a message from the society's convener, Dr. Kaul, for all the students. The judges also enjoyed the program thoroughly. Overall, the event was a great success!

EXPLORING THE EXTREMES

03rd November, 2022

Exploring Antarctica by the first Indian student who travelled there.
ARANYA- The Nature and Environment society, in collaboration with NARGIS- The Botanical Society of Zakir Husain Delhi College, organized a lecture on "Exploring the Extremes: Journey of a Botanist" on 3rd November 2022. The lecture was delivered by Prof. Dinabandhu Sahoo. He is the first Indian student to explore Antarctica during 1987-88. He is a senior professor in the Department of Botany at Delhi University and Director at the Centre for Himalayan Studies.
Prof. Dinabandhu took to the podium to narrate his life stories and the challenges he faced while exploring the regions of Antarctica and North East with witty anecdotes and humour. He talked about his academic journey and the difficulties he faced due to the lack of academic counselling and guidance in his time.

In his 25-day journey to Antarctica, he explained the physical challenges like nausea, seasickness, hydration issues, blizzards and frostbites, tough exploration for samples, and emotional challenges like loneliness.
Their journey had two objectives, setting the first permanent station of India and exploring in order to aid scientific research. He is one of the members who built the Maitreyi station at a very strategic location near Indra Priyadarshini Lake. He has also published a book, "I Have a Dream", narrating his story.
He has also explored the seven North Eastern states of India, researching and studying fermented food, cherry blossom trees, and orchid plantation. Furthermore, he has worked towards Women Empowerment by providing jobs to women in seaweed cultivation. He also initiated the only Cherry Blossom Festival in Meghalaya in 2015, which is now held annually in November.
Always aiming to do something unique, **Prof. Sahoo** is the epitome of relentless determination

@aranya.zhdc

srishti ENTRIES

23rd September 2022

INDUCTION DRIVE: 2022-23

12th December, 2022

अनुसंधान अध्ययन बोर्ड (गणितीय विज्ञान)
BOARD OF RESEARCH STUDIES (MATHEMATICAL SCIENCES)
दिल्ली विश्वविद्यालय, दिल्ली-110007
University of Delhi, Delhi-110007
Email: dean_mathsci@du.ac.in Ph.27666041

Prof. Prakash C. Jha
Chairman

Ref. No. BRS(MS)/248/2018/445
Dated: November 15, 2018

MEMORANDUM

Mr. Atul Pandey, a Research Scholar, Department of Mathematics, is hereby informed that Dr. Dhiraj Kumar Singh, Zakir Husain College & Dr. Indivar Gupta, (DRDO) have been appointed as his Supervisors in place of Late Dr. Manish Kant Dubey.

He is required to contact his new Supervisors immediately in connection with his research work.

CHAIRMAN

Mr. Atul Pandey
A-161, New Ashok Nagar
New Delhi - 110096

Copy forwarded for information and necessary action to:

1. The Head, Department of Mathematics, University of Delhi, Delhi-110007.
2. Dr. Dhiraj Kumar Singh (Supervisor) Zakir Husain Delhi College Jawaharlal Nehru Marg, SKD Basti, Press Enclave, Ajmeri Gate, New Delhi, i 110002
3. Dr. Indivar Gupta (Supervisor) DRDO Complex, SAG Metcalfe House, Delhi – 110054.
4. The Dean (Examination), University of Delhi, Delhi-110007.

SECTION OFFICER

Designing and analysis of public key cryptographic protocols using certain algebraic structures

THESIS SUBMITTED TO THE UNIVERSITY OF DELHI
FOR THE AWARD OF THE DEGREE OF

Doctor of Philosophy

in

Mathematics

By

Atul Pandey

Department of Mathematics
University of Delhi
Delhi-110007, India

April, 2022

CERTIFICATE OF DECLARATION

This is to certify that this Ph.D. thesis entitled "**Designing and analysis of public key cryptographic protocols using certain algeraic structures**" submitted to the University of Delhi, Delhi by **Atul Pandey** for the award of the degree of *Doctor of Philosophy in Mathematics*, is a record of his own research work.

The research work embodied in it is original and has not been submitted earlier in part or full or in any other form to any university or institute, here or elsewhere, for the award of any degree or diploma.

Atul Pandey
(Research Scholar)

Dr. Indivar Gupta
(Supervisor)
Scientist 'F', SAG
DRDO, Delhi

Dr. Dhiraj Kumar Singh
(Supervisor)
Associate Professor
Zakir Husain Delhi College, Delhi

Prof. Ruchi Das
Head of the Department
Department of Mathematics
University of Delhi

अध्यक्ष/Head
गणित विभाग
Department of Mathematics
दिल्ली विश्वविद्यालय, दिल्ली-110007
University of Delhi, Delhi-110007

School of Open Learning
(Campus of Open Learning)
University of Delhi

No. SOL / PU/20/198 **Date** 24/2/202

The Principal,
Zakir Hussain College (M),
Ajmeri Gate,
New Delhi-110002

Sub: **Conduct of Academic Counselling Sessions of B.A. (Programme)/B.Com Semester-II on Saturdays of March, 2020 (07, 14, 21 & 28)**

Sir,

I take this opportunity to express my gratitude to you for kind support and co-operation in conducting Academic Counselling Sessions of SOL Under-graduate Courses for the Academic Session 2019-2020 at your esteemed Faculty/College.

It is well aware that the SOL had implemented CBCS (LOCF) Semester System in all undergraduate courses from the Academic Session 2019-2020 and onwards. Accordingly, the Academic Counselling Sessions for Semester-II for one of the courses are being conducted at your Study Centre.

As the SOL started the Academic Counselling Sessions of Semester-II in the first week of February, 2020 hence SOL will be required to conduct some more Academic Counselling Sessions of Semester-II at your Study Centre by the end of March-2020.

In the light of the above and bearing the best interest of the students in mind, you are requested kindly to make necessary arrangements for conducting Academic Counselling Sessions for Semester-II on 07th, 14th, 21st, & 28th March-2020 (Saturdays) also at your Study Centre, so that the SOL students may be able to get their study related doubts dispelled during these extended Academic Counselling Sessions.

Thanking you,

Yours faithfully,

(Dr. U. S. Pandey)
Dy. Director/OSD

S.O. Admn

28.2.2020

Principal's Office,
Receipt No. 689
Date 28-02-2020
Zakir Hussain Delhi College

5, Cavalry Lane, University of Delhi, Delhi-110007
Tel. : 27667600, 27667166, 27667645, Fax : 27667242

SCHOOL OF OPEN LEARNING
UNIVERSITY OF DELHI
5, CAVALRY LINES
DELHI-110007

Ph.No. 27008428, 27667600
27667645, 27667581

Ref. No.PCP/2022/ 218

Principal's Office,
Receipt No. 1127
Date 08-04-2022

Dated 30/3/2022

The Principal
Zakir Hussain College
J.L.Nehru Marg
Delhi- 110002

Sub: **Proposal for Establishment of Learner Support Centre for conducting Academic Counselling Sessions (PCP classes) for SOL Students.**

Sir/Madam,

I may like to submit that School of Open Learning, University of Delhi, is constituent institution of the University of Delhi which imparts quality higher education in distance mode in five under-graduate and five post-graduate courses for about 5 lakh students. To provide better students support services to SOL students, the Governing Body of School of Open Learning in its meeting held on 04th March, 2022 approved the revised guidelines for establishment of SOL Learner Support Centres and Regional Centres. It will be implemented from the academic session 2022-23 onwards.

Accordingly, SOL would like to establish a Learner Support Centre for the students of the SOL in your esteemed Faculty/College/Department. For this purpose some academic, administrative and logistic support would be required from the Faculty/College/Department for conducting Academic Counselling Sessions (PCP classes) smoothly during Saturdays, Sundays & Holidays, and conducting examinations, **if required,** as per the guidelines issued by the University/SOL from time to time. The comprehensive requirements as well as financial implications are given in the enclosed Proposal (Annexure 1).

The admission process for fresh students is likely to commence from April-May 2022 for undergraduate courses for the Session 2022-23 and consequent upon the Academic Counselling Sessions will probably be conducted for the students at Learner Support Centres in the month of April/May 2022 onwards.

I will be grateful to you, if you kindly give your consent to establish a Learner Support Centre in your Faculty/College/Department premises to facilitate Academic Counselling Sessions for the SOL Students and also conduct of examinations, **if required,** as per the guidelines issued by the University of Delhi/SOL from time to time.

The Proposal for the Establishment of SOL Learner Support Centre and guidelines are enclosed alongwith specimen of undertaking to be submitted by the Academic Coordinator on the stamp paper of Rs.100/- for your kind information and necessary compliance.

Thanking you,

Yours faithfully,

Principal (Officiating)

Encls: **As above.**

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सत्यमेव जयते

INDIA NON JUDICIAL

Government of National Capital Territory of Delhi

e-Stamp

Certificate No.	:	IN-DL56427114392513V
Certificate Issued Date	:	02-Feb-2023 03:06 PM
Account Reference	:	IMPACC (IV)/ dl754103/ DELHI/ DL-DLH
Unique Doc. Reference	:	SUBIN-DLDL75410385985640930630V
Purchased by	:	DR NARENDER SINGH
Description of Document	:	Article 4 Affidavit
Property Description	:	Not Applicable
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	DR NARENDER SINGH
Second Party	:	Not Applicable
Stamp Duty Paid By	:	DR NARENDER SINGH
Stamp Duty Amount(Rs.)	:	10 (Ten only)

Please write or type below this line

MEMORANDUM OF UNDERSTANDING
AMONGST
UNIVERSITY OF DELHI, Delhi - 110007
AND
SCHOOL OF OPEN LEARNING, (Campus of Open Learning)
5 Cavalry Lines, University of Delhi, Delhi – 110007
AND
Bhaorao Deoras Sewa Nyas, C – 91, Nirala Nagar, Lucknow – 226020 (U.P)
AND
Zakir Husain Delhi College, Jawahar Lal Nehru Marg, New Delhi-110002.

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Statutory Alert:
1. The authenticity of this Stamp certificate should be verified at 'www.shcilestamp.com' or using e-Stamp Mobile App of Stock Holding. Any discrepancy in the details on this Certificate and as available on the website / Mobile App renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

Hereinafter collectively referred to as the "Parties" or individually as the "Party"

AND WHEREAS, all parties have agreed for collaboration to work together in the area of Skill Development, Employment and Entrepreneurship Development for the benefit of students of the University of Delhi & its colleges on the following terms and conditions:

1. UNIVERSITY OF DELHI

1.1 The party of the first part is offering various undergraduate and postgraduate degree programmes in its colleges and departments.

2. SCHOOL OF OPEN LEARNING

2.1 The party of the second part offers several courses/ programmes through open and distance learning mode to lakhs of students making education accessible.

3. BHAORAO DEORAS SEWA NYAS

3.1 The party of the third part BDSN through its project SAMARTH BHARAT is engaged in expanding skill development efforts in India by creating an end-to-end, outcome-focused implementation framework, which aligns the demands of the employers for a well-trained, skilled workforce with the aspirations of Indian citizens for sustainable livelihoods.

3.2 SAMARTH BHARAT also endeavours to nurture the entrepreneurs virtually and physically from the ideation till establishing of business Enterprise by providing single window support to the First Generation entrepreneurs or Educated Youth by a step-by-step roadmap for establishing a business enterprise or becoming an industry ready person.

3.3 SAMARTH BHARAT works for enhancing youth behavioural & professional competencies to make them industry ready through various interventions like regular live workshops, seminars, industrial documentaries, skilling, professional & experts episodes on the portal.

3.4 SAMARTH BHARAT provides end-to-end implementation framework for skill development, which provides opportunities for life-long learning and for quality long/short-term skill training that meets the aspirations of trainees as well as outcome focused training that aligns to employer/industry demand and workforce productivity with trainees' for sustainable livelihoods.

3.5 SAMARTH BHARAT focuses to build capacity for skill development in organized and un-organized sectors and provide pathways for re-skilling/up-skilling in pre-identified sectors, to enable them to

f) Create a Start-up support ecosystem in colleges with guidance for Idea and Start-up Launch, Incubation Centre Connect, Pitch development, Investor Tie-ups, etc.

g) Launch peer to peer mentorship program through various mediations like Entrepreneur Talks, Young Achievers Success Stories, Industry & Alumni Connect, etc.

6.3 As and when required, SAMARTH BHARAT shall provide its extensive network to support above mentioned initiatives like connecting with other educational, training institutions, business and industrial bodies, content development, experts network and services.

7. ALL PARTIES

7.1 Draw the attention of the top management in case of any interface or operational problems.

7.2 Will complete the project activities within the agreed time frames of the projects/programs that are initiated and developed.

7.3 Will work towards obtaining necessary ethical, legal, financial, administrative, and other required approvals/ permissions/ acceptance/ sanctions etc., required for joint activities at respective institution as well as from regulatory authority.

7.4 Shall ensure that all activities are conducted while meeting the highest standards of safety and regulations as per prevailing.

7.5 Shall ensure that all the data/information provided by any of the Parties should be used only for the purpose explicitly stated in the specific projects or which ethical/legal clearances are granted by the UNIVERSITY OF DELHI.

7.6 All the knowledge that is generated as a result of joint projects/activities shall be shared by all the parties.

7.7 All attempts will be made to ensure that developments and projects are accomplished to a very high degree of quality, with efficiency of time. All parties shall especially ensure that each party shall complete its tasks correctly in time where work of other party is dependent upon timely and correct completion of its work.

7.8 Not use/ sell/ license/ rent technologies/ resources/ material/ solutions of either parties to/for any third party without prior written mutual consent of the other party.

7.9 Undertake Projects in various areas of mutual interest on mutually agreed terms reduced into writing and signed by all the parties.

11. TERMINATION

11.1 This Memorandum of Understanding can be terminated at any time by any part with or without assigning any reason, by giving six month's written notice to all the other parties.

11.2 Upon termination of this MoU, each party shall return to the other such material, documents etc. belonging to the other parties lying in its possession.

12. SEVERABILITY

12.1 If any party of this MoU is found by a court of competent jurisdiction or other Competent Authority invalid, unlawful, or unenforceable, then such part will be severed from the remainder of this MoU which will continue to be valid and enforceable to the fullest extent permitted by any law.

13. FORCE MAJEURE

13.1 Neither party shall be liable to the other party for any delay or failure on their part in performing any of their obligation under this MoU, resulting from any cause beyond their control, but not limited to strike/ lock-outs, fires, floods, earthquake, explosions, war, enemy action, or political changes, natural disaster or military hostilities and strike of employees, the act or omission of any third party for whom the parties are not responsible.

13.2 Each of the parties agrees to give notice immediately to the other party upon becoming aware of an event of force majeure and such notice should contain details of the circumstances giving rise to it.

13.3 If a default due to force majeure continues for more than 6 weeks then the party not in default shall be entitled to terminate this agreement.

13.4 Neither party shall have any liability to the other in respect of the termination of this agreement as a result of force majeure.

14. LIMITATION OF LIABLITY:

14.1 In no event any of the parties be liable to the other party for any incidental, consequential, special and exemplary or direct or indirect damages, or for any lost profits, lost revenues, or loss business arising out of the subject matter of this MoU, regardless of the cause of action, even if the party has been advised of the likelihood of damages if the same is without intention and beyond reasonable control

20. NON-WAIVER

20.1 The failure or neglect by any of the Parties to enforce any of terms of this MOU shall not be construed as waiver of its rights preventing subsequent enforcement of such provisions or recovery of damages for breach thereof.

21. SIGNED IN DUPLICATE

21.1 This MoU is executed in quadruple with each copy being an official version of the agreement and having equal legal validity and supersedes all prior oral and written agreements, understandings, representations, conditions and all other communications relating thereto. Both copies together will constitute binding contract.

IN WITNESS WHEREOF, THE DULY AUTHORIZED REPRESENTATIVES OF THE PARTIES SIGNED THIS MEMORANDUM OF UNDERSTANDING AT THE PLACE AND ON THE DAY WRITTEN BELOW

(Dr. Vikas Gupta)
Registrar
University of Delhi
डॉ. विकास गुप्ता/Dr. VIKAS GUPTA
कुलसचिव/Registrar
दिल्ली विश्वविद्यालय/University of Delhi
दिल्ली-110 007/Delhi-110007

(Prof. Payal Mago)
Chairperson
School of Open Learning

(Shri Rahul Singh)
General Secretary
SAMARTH BHARAT – BDSN

(Prof. Narendra Singh)
Principal
Zakir Husain Delhi College

THE SEAL OF NOTARY PUBLIC
M. L. GARG
App. By
Govt. of NCT
of Delhi India
Regd. No. 058/08
DELHI

ATTESTED
Notary Public, Delhi
- 2 FEB 2023

15. GOVERNING LAW & JURISDICTION

15.1 All disputes regarding this MoU shall be under the jurisdiction of the Civil Courts of Delhi only.

15.2 This MoU shall be governed and interpreted in accordance with the established Law. Court of New Delhi shall have exclusively jurisdiction to try, entertain, and decide the matters, which are not covered under the Civil Courts.

16. COMMUNICATION

16.1 Each party shall nominate its Nodal Person who shall be the single point of authority for the purpose of implementation of this MoU.

16.2 Each Party is free to change or reappoint such contact point on its behalf with a notice to the other Party.

16.3 Each party may change nodal contacts/ address by written notice in accordance with this paragraph.

17. NOTICES

17.1 Any Notice, request, demand, approval, consent or other communications provided or permitted hereunder shall be in writing in Hindi/English Language and given by personal delivery or sent by registered post or by fax/email addressed to the above nodal contacts.

17.2 Notices delivered personally will be deemed communicated as of actual receipt. Mailed notices will be deemed communicated as of four (4) days after mailing.

17.3 Post-mailed notices will be deemed communicated as of seven (7) days after mailing.

18. MODIFICATION

18.1 No modification to this MoU, will be effective unless agreed to in writing by all the parties and duly signed by the authorised signatories of the Parties.

19. HEADING

19.1 The headings shall not limit, alter or affect the meaning of the Clauses headed by them and are solely for the purpose of easy reference.

7.10 Ensure the safety of the personnel and material whenever placed at all ends by the all the parties.

8. CONFIDENTIALITY, COPYRIGHT AND INTELLCTUAL PROPERTY RIGHTS

8.1 Existing IP as on date of execution of this MoU shall be exclusively owned by respective parties to which the IP belongs.

8.2 All the parties shall be ensured that all the data/information provided by either party will be used in accordance with the regulations and guidelines on human ethics and privacy of personal data law and also strictly in accordance with the Indian Intellectual Property Laws and Rules.

8.3 The intellectual property (including but not limited to inventions, ideas, innovations know-how/ process/ design/ technique/ copyright/patent etc.,) generated / created / designed / developed in relation to or arising out of or incidental to any projects initiated under this MoU shall be owned jointly by all the parties.

8.4 All the parties agree to hold in confidence all data/information designated by either party as being confidential which is obtained from either party or created during the operation of this MoU and shall not be disclosed to any outsider without written consent of all parties.

8.5 For any intellectual property arising during the operation of this MoU, respective Participating Institutions intend to ensure adequate and effective protection of the same in order to maintain its uniqueness and shall never be shared with any outsider.

9. REVENUE SHARING

9.1 Bhaorao Deoras Seva Nyas through its project SAMARTH BHARAT provides a facilitating platform for skill development, jobs and business start-up to the needy people without charging any fees.

9.2 UNIVERSITY OF DELHI, SOL & Zakir Husain Delhi College shall provide resources required to support their students like training infrastructure, remuneration directly to trainers, staff for management of Career Development Centre, etc.

10. COMMENCEMENT AND DURATION

10.1 This MoU shall be effective from the date of signature by the Heads of all the parties and/or their nominees. This MoU will be valid for 05 Years (Five Years) from the date of its commencement.

Xerox Copy

transit into formal sector employment through a developed network of quality instructors thereby we will establish this ecosystem through high-quality teacher training institutions and leveraging existing public infrastructure and industry facilities.

4. The party of the fourth part is a constituent college of the University of Delhi offering various undergraduate and postgraduate degree programmes.

5. SCOPE OF THE MOU

This MOU is only to facilitate collaboration to work together in the area of Career Counselling, Skill Development, Employment, Entrepreneurship Development, Start-up support and Mentorship Program for the benefit of students of UNIVERSITY OF DELHI, Delhi without any financial implications from either of the parties.

6. ROLE AND RESPONSIBILITIES

6.1 All parties will work together to create a career development framework and implement it through a Career Development Centre based in the premises of the FOURTH PART.

6.2 All parties shall appoint respective Single point of contact (SPOC) that will work together to identify/develop and implement various career development offers including but not limited to

a) Inspiring students to take self-development as a lifelong habit. The same shall be achieved through creation of Career Development Centre, Community, Career Support Helpline, University of Delhi, SOL, Samarth Bharat & Zakir Husain Delhi College Website, Support Groups, etc.

b) Implement career counselling framework to identify competency, interest and prospective career paths including exposure to various career options with guidance to choose the right career path & skilling/educational requirements.

c) Creating college based or external training infrastructure (E-Learning/ Classroom/ Internships) for various trainings like – Employability Skills & Workplaces issues, Finance Management & Investing, Competency Development, Vocational Skills, etc.

d) Organise various job placement opportunities including – Domestic & Global Work Opportunities (Technical Intern Training Program, Etc.), Earn while u learn – part time jobs & Internships, etc.

e) Organise various interventions for Entrepreneurship Development Program including exposure to industrial sector wise business opportunities, training in industry, business start training including guidance on how to organise finance for projects, etc.

THIS MEMORANDUM OF UNDERSTANDING (hereinafter referred to as "MoU") is made and executed on 07th February, 2023 at Delhi.

By and among

UNIVERSITY OF DELHI, Established in 1922 as a unitary, teaching and residential University incorporated under The Delhi University Act, 1922 as amended from time to time comprising of 16 faculties, 86 departments and 91 colleges (herein after referred to as "UNIVERSITY OF DELHI", which expression shall, unless it be repugnant to or inconsistent with subject or context thereof, include and be deemed to include their heirs, executors, successors or administrators and permitted assigns), represented by its Registrar, Dr. Vikas Gupta.

Party of the First PART

AND

The School of Open Learning (Herein after referred to as SOL) a part of the Campus of Open Learning formerly known as the School of Correspondence Courses and Continuing Education, established under the University of Delhi in 1962, is a pioneer Institution in the field of Distance Education in India, represented by its Chairperson, School of Open Learning, Prof. Payal Mago.

Party of the Second PART

AND

Bhaorao Deoras Seva Nyas is a Non-Profit Charitable Trust (under Section 12AA) registered in 1993 having its registered office at C-91, Nirala Nagar, Lucknow, Uttar Pradesh - 226020 (hereinafter referred to as "BDSN", which expression shall, unless it be repugnant to or inconsistent with subject or context thereof, include and be deemed to include their heirs, executors, successors or administrators and permitted assigns) represented by its General Secretary, Shri Rahul Singh.

Party of the Third PART

AND

Zakir Husain Delhi College, is a constituent college of the University of Delhi and located at Jawahar Lal Nehru Marg, New Delhi-110002, India (herein after referred to as "Respective college, Delhi", which expression shall, unless it be repugnant to or inconsistent with subject or context thereof, include and be deemed to include their heirs, executors, successors or administrators and permitted assigns) represented by its Principal, Prof. Narendra Singh.

Party of the Fourth PART

Hired on	Student name	Stream	Gradu
6/30/2022	Apurva	English And Economic	2022
6/27/2022	Aachal Agrawal	English	2024
6/27/2022	Bhagwan Prasad	Political Science	2024
6/27/2022	Mohammed Kaif Masoodi	URDU	2026
6/27/2022	Mohammed Kaif Masoodi	URDU	2026
6/27/2022	Yachika Gautam	Life Science	2022
6/23/2022	Himanshi	Psychology	2023
6/22/2022	Sara Nasreen	Economics	2023
6/22/2022	Mukul Roy	Political Science	2020
6/22/2022	Nikita Raj	Economics	2023
6/20/2022	Rupsi Gujrati	NA	2024
6/20/2022	Saniya Bindoria	Commerce With Maths	2023
6/20/2022	Nikita Raj	Economics	2023
6/20/2022	Aachal Agrawal	English	2024
6/19/2022	Saniya Bindoria	Commerce With Maths	2023
6/16/2022	Nikhil Saneja	NA	2023
6/16/2022	Nikita Raj	Economics	2023
6/14/2022	Muzammil Khan	Arts	2018
6/13/2022	Priyanshu Rawat	NA	NA
6/10/2022	Jyotika Rai	Psychology	2022
6/10/2022	Arjun Sharma	Psychology	2023
6/9/2022	Abhinav Katariya	Psychology	2026
6/8/2022	Nikhil Saneja	NA	2023
6/8/2022	Shivam Mishra	NA	2020
6/6/2022	Hunny Kapoor	NA	NA
6/4/2022	Prachi Jain	Commerce With Maths	2023
6/4/2022	Megha Gupta	Political Science	2022
6/1/2022	Megha Gupta	Political Science	2022
6/1/2022	Ritik Chaudhary	Commerce	2021
6/1/2022	Ifrah Fatima	English And History	2025

Company name	Stipend
Fostr Reads	₹25000 /month
Hamari Pahchan NGO	Performance Based
Hamari Pahchan NGO	Performance Based
Hamari Pahchan NGO	Performance Based
Ram Gopal Manocha Charitable Trust	₹250 /week + Incentives
Hamari Pahchan NGO	Performance Based
Chamela Helpdia Charitable Trust	Performance Based
Sarkari School	Performance Based
Simmi Foundation Organization	₹500-2500 /week
Hariyali	Performance Based
Odisha Development Management Programme (ODMP)	₹300-3000 /week
Suvidha Foundation	Performance Based
Hamari Pahchan NGO	Performance Based
Hamari Pahchan NGO	Performance Based
Jankalyan Multipurpose Education Society	Performance Based
Ignited Minds Organisation	₹1000 /month + Incentives
Support And Care Humanity Foundation	₹1000 /month + Incentives
Handoo Immigration And Citizenship Services Inc.	Performance Based
Hamari Pahchan NGO	Performance Based
Drishti Publications	₹10000-20000 /month
AESPL	₹2000 /month
Hamari Pahchan NGO	Performance Based
Skill Minds India	Performance Based
XivTech	₹4000 /month
Stealth Mode	₹1000-5000 lump sum
DevTown.in	₹5000 /month
IRA Academy	₹1000 /month
Hamari Pahchan NGO	Performance Based
Hamari Pahchan NGO	Performance Based
Indikaari	₹1000 /month

주한인도대사관
Embassy of India, Seoul
Republic of Korea

IIS 인 도 연 구 소
Institute of Indian Studies HUFS

Azadi Ka Amrit Mahotsav

Department of Political Science
Zakir Husain Delhi College
(University of Delhi)

주한인도문화원
Swami Vivekananda Cultural Centre
Embassy of India, Seoul

Constitution Day

INDIA

인도 헌법의 날

via Video Conference
온라인 행사

SPECIAL LECTURE
on
Working of Indian Constitution

특별강연:
인도 헌법

November 27th (Saturday) 2021 @ 11:30 IST | 15:00 KST
2021년 11월 27일 (토) 오후 3시 (한국 시간)

Speaker
연사
Prof. Chanwahn Kim
김찬완
Director, Institute of Indian Studies,
Hankuk University of Foreign Studies

Organised by
Swami Vivekananda Cultural Centre
Embassy of India, Seoul

IN COLLABORATION WITH

Institute of Indian Studies, Hankuk University of Foreign Studies
Department of Political Science, Zakir Husain Delhi College, University of Delhi

Speaker
연사
Prof. Bidyut Chakrabarty
비듀트 차크라바티
Vice-Chancellor, Visva Bharati
Santiniketan

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Toggle Navigation   Spoken Tutorial

- Software Training
  - **Software Training**
    - About the Training
    - Progress to Date
    - Software Offered
    - Contacts for Training
    - Change in Training Policy

  Procedures

    - Organising Training
    - Instruction for Downloading Tutorials
    - Create Your Own Disc Image
    - Resource Centers

  Training

    - Training & Payment Dashboard
    - Semester Training Planner Summary (STPS)
    - Student Dashboard
    - new Individual Learning
    - Individual Learning Workshop
    - Verify ILW test certificate

  Online Test

    - Instruction for Invigilator
    - Instruction for Participants
    - Certificate Verification Link
    - Email Verification Link
    - new Job Recommendation
- Creation
  - Creation Process
  - Outline and Script
  - Creation Dashboard
  - Suggest a Topic
  - Suggest an Example
  - Collaborate with Us
- News
  - Testimonials
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  - Articles on Spoken Tutorial project
  -
  - Events & Happenings
  -
  - Research / Popular Articles
- Academics
  - MOOCs acceptance
  -
  - Official Letters and Links

List of Training Events :

State

Foss

Host College
Zakir Husain Delhi College
Event Start Date Range
-
Event End Date Range
-
Event Type
Student Training Programme
Filter Reset Filter

- Ongoing Events

- Past Events

March 20, 2023 - March 30, 2023

SDP

Zakir Husain Delhi College organising Student Development Program on LaTeX

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Dr. Dhiraj Kumar Singh
FOSS : LaTeX

Registration open from **March 15, 2023, till March 19, 2023**

Dec. 21, 2022 - Jan. 3, 2023

SDP

Zakir Husain Delhi College organising Student Development Program on R

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Dr. DHIRAJ KUMAR SINGH
FOSS : R

Registration open from **Dec. 6, 2022, till Dec. 20, 2022**

Aug. 25, 2022 - Sept. 8, 2022

SDP

Zakir Husain Delhi College organising Student Development Program on Python 3.4.3

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Chaitra H Gawade
FOSS : Python 3.4.3

Registration open from **Aug. 18, 2022, till Aug. 23, 2022**

June 16, 2022 - June 30, 2022

Zakir Husain Delhi College organising Student Development Program on Chemcollective Virtual

SDP

Labs

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Chaitra H Gawade
FOSS : ChemCollective Virtual Labs

Registration open from **June 8, 2022, till June 14, 2022**

March 11, 2022 - March 25, 2022

SDP

Zakir Husain Delhi College organising Student Development Program on Python 3.4.3

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Chaitra H Gawade
FOSS : Python 3.4.3

Registration open from **March 4, 2022, till March 8, 2022**

Feb. 14, 2022 - Feb. 28, 2022

SDP

Zakir Husain Delhi College organising Student Development Program on R

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Chaitra H Gawade
FOSS : R

Registration open from **Jan. 31, 2022, till Feb. 10, 2022**

Dec. 21, 2022 - Jan. 3, 2022

SDP

Zakir Husain Delhi College organising Student Development Program on R

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Dr. DHIRAJ KUMAR SINGH
FOSS : R

Registration open from **Dec. 6, 2022, till Dec. 20, 2022**

Jan. 15, 2021 - Jan. 30, 2021

SDP

Zakir Husain Delhi College, University of Delhi Organising SDP on R Programming

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Dr. Dhiraj Kumar
FOSS : R

Registration open from **Jan. 7, 2021, till Jan. 12, 2021**

Oct. 1, 2020 - Oct. 15, 2020

SDP

Programing in Python

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Dr. Dhiraj Kumar Singh
FOSS : Python 3.4.3

Registration open from **Sept. 22, 2020, till Sept. 28, 2020**

- FOSSEE Project
- Scilab
- eSim (Oscad)
- Python
- OpenFoam (CFD)

- Aakash Labs
- Co-learn
- Education Mission

- Software Training
- Contacts for Training
- Training Dashboard
- Creation Dashboard

- About Us
- News
-
- 169,502,153 **169,502,152** page loads

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Toggle Navigation   Spoken Tutorial

- Software Training
  - **Software Training**
    - About the Training
    - Progress to Date
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  Online Test
    - Instruction for Invigilator
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  -
  - Events & Happenings
  -
  - Research / Popular Articles
- Academics
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  -
  - Official Letters and Links

- Articles on University tie-ups/workshops
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  - Health and Nutrition page
  - Archived FOSS
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  - Training
  - FDP Training
  - Creation Content
  - Online-Test
  - Academic Center
  - India Map
  - Motion Charts
  - ILW Training
- Login
- Register

List of Training Events :

State

Foss

Host College
Zakir Husain Delhi College
Event Start Date Range
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Event Type
Paid FDP
Filter Reset Filter

- Ongoing Events

- Past Events

Aug. 25, 2022 - Sept. 8, 2022

FDP

Zakir Husain Delhi College organising Faculty Development Program on Python 3.4.3

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Chaitra H Gawade
FOSS : Python 3.4.3

Registration open from **Aug. 18, 2022, till Aug. 23, 2022**

June 16, 2022 - June 30, 2022

FDP

Zakir Husain Delhi College organising Faculty Development Program on Chemcollective Virtual Labs

Host College : Zakir Husain Delhi College, Delhi
Event Coordinator Name : Chaitra Gawade
FOSS : ChemCollective Virtual Labs

Registration open from **June 8, 2022, till June 14, 2022**

- FOSSEE Project
- Scilab
- eSim (Oscad)
- Python
- OpenFoam (CFD)

- Aakash Labs
- Co-learn
- Education Mission

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- About Us
- News

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Developed at IIT Bombay

Ministry of Commerce and Industry
Department for promotion of Industry and Internal Trade
Office of Controller General of Patent, Designs and Trademark

In collaboration with

IQAC-ZAKIR HUSAIN DELHI COLLEGE

University Of Delhi

and

Botanical Society
NARGIS

Organises

IPR Awareness Programme
(National Intellectual Property Awareness Mission)

Azadi Ka Amrit Mahotsav

"CREATIVE INDIA; INNOVATIVE INDIA"

SPEAKER

Ms. Prachi Prateeti

Examiner, Patents and Designs
Chemical Division, IPO, Delhi

Ms Varsha Garg

Examiner of Patents and Designs, DPIIT, Ministry of Commerce

email- varsha2203.ipo@gov.in

Dr. D. Usha Rao

Controller of Patents and Designs, Group Leader of NIPAM team

email- drusharao.ipo@nic.in

Click here to Register

February 12, 2022, 2 PM

Join us on MS TEAMS

Prof. Sangeeta Pandita
Principal, ZHDC
IQAC Chairperson

Prof. Mohd. Arif
IQAC Coordinator

Dr. Babeeta C Kaula
Member, IQAC
President, NARGIS

Srota Satapathy
Secretary, NARGIS

Dr. Deepika Sharma
Vice-President, NARGIS

WASTE PAPER RECYCLING AGREEMENT

This Agreement is made and entered into on this day 17th August, 2017 by and between:

JAAGRUTI™ Waste Paper Recycling Services, (Working name of Paper Recycling Services being provided under "Bhaanti Consultancies Pvt. Ltd"., a Company incorporated under the Companies Act, 1956 with *Corporate Identification Number (CIN): U74140DL2010PTC203497) and having its registered office at KD 312, Pitampura, Delhi-110034, and Waste Paper Collection and Segregation Facility at F-3 Basement, Shopping Centre-1, Mansarover Garden, Delhi 110015, represented through its Directors, Mr. Vivek Mehta and Ms. Vasudha Mehta, and hereinafter referred to as "**JAAGRUTI**"

AND

ZAKIR HUSAIN DELHI COLLEGE, UNIVERSITY OF DELHI, of the address, J.L. Nehru Marg, New Delhi -110002, and hereinafter referred to as "**ZHDC**"

Whereas, **ZHDC's** association with JAAGRUTI is an association that is non-monetary in nature and JAAGRUTI has expertise and experience in recycling the waste paper.

Whereas, **ZHDC** is desirous to engage with JAAGRUTI to recycle the waste paper.

Now, therefore, the Parties hereto, in consideration of the premises and of covenants and undertakings herein contained, mutually agree as follows:

1. The grades of paper given by ZHDC to JAAGRUTI for recycling , would broadly include the following:
    - **Office Grade:** Notepads/Notebooks/Ruled Writing paper, Answer Sheets, Printed/Photocopied Documents on A4 and A3 Sheets, Books, Letterheads, White Envelopes.
    - **Magazine Grade:** Magazines, Journals, Brochures and Catalogues
    - **Newspaper Grade:** Old Newspapers, Shredded Office Grade Paper, Old Records (SUBJECT TO RECYCLABILITY POTENTIAL)

Note: Cardboard, coloured chart paper, laminated paper, micro-shredded paper & wet, very old and/or contaminated paper is unfit for recycling

2. JAAGRUTI shall arrange for the pick up of Waste Paper free of cost from the ZHDC premises at the address aforementioned. The frequency of waste paper from the ZHDC premises shall be mutually decided, depending on the quantities of waste paper generated by ZHDC.

3. This collected waste paper will be brought to JAAGRUTI premises for proper segregation and sorting.

4. After segregation and sorting of waste paper at JAAGRUTI premises, the waste paper shall be transported for recycling to the Paper Recycling Mill.

5. JAAGRUTI shall assure and undertake, whenever requested, safe destruction of confidential documents at its own premises. JAAGRUTI shall be using a 'Heavy-duty Document Shredder, which produces cross cut shreds of confidential documents, which would conform to the most-stringent security norms. Each A4 Sheet will be shred into 200+ pieces. Alternatively, JAAGRUTI has cutting machines to cut old bound records/books/archival records into 2 pieces at our site or on site, provided prior request is made to JAAGRUTI in this regard and the quantities ascertained. **20% deduction in giveback products would be done if confidential-document destruction services are availed off.**

6. In lieu of the waste paper collected from the ZHDC premises, JAAGRUTI shall give either or percentage combination of paper products like spiral notepads of different sizes made of recycled paper and board and A4 Sheets as per the table mentioned below, and single/double colour printing (not applicable in case of customized notepads) ZHDC's logo will be done free of cost on the front cover of the notepads. Multi-coloured logo printing will be considered on a case-to-case and quantity basis. In case the table is revised at any later date, JAAGRUTI will inform about the same through e-mail and an amended agreement shall be signed and shared thereafter:-

Either or Percentage combination of the below mentioned product may be chosen by the client organisation	**1 tonne of Office Grade**	**1 tonne of Magazine Grade and Newspaper Grade**
Reams of A4 Paper (1 Ream = 500 Sheets; 75 GSM)	72 Reams	64 Reams
Large Spiral Notepad (9.75 inches x 7.25 inches; 80 pages; 70 GSM)	520 Nos.	460 Nos.
Customized A5 Sized Notepads (40 sheets, 80 pages, 70 GSM)	450 Nos.	390 Nos.
Customized A5 Sized Notepads (50 sheets, 100 pages, 70 GSM)	405 Nos.	350 Nos.
Customized A5 Sized Spiral Notepads (80 sheets, 160 pages, 70 GSM)	310 Nos.	270 Nos.
Customized A5 Sized Conference Notepads (10 sheets, 20 pages, 70 GSM)	1230 Nos.	1070 Nos.
Customized A5 Sized Conference Notepads (20 sheets, 40 pages, 70 GSM)	1010 Nos.	870 Nos.

Note: Product deductions of 20 % if the document destruction facility of JAAGRUTI Waste Paper Recycling Services is availed.

7. This agreement shall be effective for a period of twelve (12) months from the date of signing by both parties indicated at the foot of this Agreement, unless terminated by either party. This Agreement may be terminated by giving thirty (30) days' notice in advance by either party.

8. This Agreement constitutes the entire Agreement of the Parties hereto with respect to the subject matter hereof, and supersedes all prior communications, negotiations, proposals and agreements, whether written or oral, with respect thereto.

9. If any provisions of this Agreement is prohibited or is rendered or becomes invalid or unenforceability, such

prohibition, invalidity or unenforceability shall not affect the validity or enforceability of any other provisions of this Agreement.

10. Any matter not stipulated herein or any dispute, controversy or difference which may arise between the Parties out of or in relation to or in connection with this Agreement or for the breach thereof shall be amicably settled by sincere consultation between the Parties.

12. Modifications, alterations, additions or changes in the Giveback table shall be communicated by JAAGRUTI in advance.

13. Any dispute or differences, which may arise out of this Agreement or in relation thereto, including any dispute relating to its validity or effect, shall be settled by way of negotiations between the parties, at the first instance.

14. This Agreement shall be governed by the laws of India. All disputes arising out of or in relation to this Agreement shall be subject to the jurisdiction of Courts at New Delhi only.

16. The parties agree to each other that all communication and documentation furnished under this Agreement shall be in English and that version in any other language will not be binding on either party.

17. This agreement is being signed on two sets of e-stamp papers, bearing Certificate No. _____ and _____ and one original signed set shall be retained by each party.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement by their duly authorized representative as of the day and year first above written.

For ZAKIR HUSAIN DELHI COLLEGE

(Principal)

PRINCIPAL
ZAKIR HUSAIN DELHI COLLEGE
JAWAHAR LAL NEHRU MARG
NEW DELHI-110002

For JAAGRUTI Waste Paper Recycling Services

For JAAGRUTI Waste Paper Recycling Services

Vivek Mehta

Authorized Signatory

(Director)

Witness:

Signature:- SPandit

Name:- Dr. Sangeeta Pandita

Address:- Zakir Husain Delhi College

Date:- 17/8/17

JAAGRUTI

WE ♻ RECYCLE
....because we care

JAAGRUTI™ WASTE PAPER RECYCLING SERVICES
Works Address: F-3, Shopping Centre, Mansarover Garden, New Delhi-110015
E-mail: paper@we-recycle.org **Tel:** +91-98101 91625, +91-9818 144 244
Website: www.we-recycle.org
Corporate Identification Number (CIN): U74140DL2010PTC203497

Waste Paper Pickup Data Sheet No. ____
Dated: 29/11/2021

Name of Client Organisation	Zakir Husain Delhi College
Collection Address	SKD Basti, Jawaharlal Nehru Marg New Delhi
Coordinator's name	Dr. Babita
Telephone Number	9810670331
E-mail address	

Type of Paper and its weight in kgs					Grand Total
Newspaper	Mixed Paper (To be Sorted)				
1) 47.48	1) 22.73	1) 27.60	1) 27.42	1)	566.15
2) 38.95	2) 27.42	2) 28.03	2) 26.42	2)	519.88
3) 41.10	3) 23.55	3) 25.82	3) 27.80	3)	522.68
4) 38.36	4) 18.33	4) 24.10	4) 24.82	4)	237.67
5) 34.40	5) 29.47	5) 25.53	5) 22.53	5)	
6) 39.41	6) 28.14	6) 29.80	6) 26.54	6)	
7) 37.27	7) 27.60	7) 32.00	7) 19.39	7)	
8) 37.08	8) 21.96	8) 25.46	8) 15.41	8)	
9) 44.48	9) 33.17	9) 27.33	9) 22.83	9)	
10) 39.68	10) 25.65	10) 20.25	10) 24.51	10)	
11) 40.40	11) 30.52	11) 29.31	11)	11)	
12) 31.38	12) 24.48	12) 24.87	12)	12)	
13) 39.86	13) 27.00	13) 23.91	13)	13)	
14) 31.11	14) 26.30	14) 27.34	14)	14)	
15) 25.19	15) 23.48	15) 22.82	15)	15)	
16)	16) 25.92	16) 25.91	16)	16)	
17)	17) 24.61	17) 28.79	17)	17)	
18)	18) 26.22	18) 20.79	18)	18)	
19)	19) 25.33	19) 27.46	19)	19)	
20)	20) 28.00	20) 25.56	20)	20)	
566.15	519.88	522.68	237.67		1846.38 Kgs

Signed and stamped on behalf of Client Organisation: _____
Name: _____
Dated: _____

Signed and stamped on behalf of 'JAAGRUTI™ Waste Paper Recycling Services':
For JAAGRUTI Waste Paper Recycling Services
Name: Vivek Mehta
Dated: 29/11/2021

Waste Paper Pickup Data Sheet

IMG-20211126-WA0012.jpg

48 PM

ZAKIR HUSAIN DELHI COLLEGE
(University of Delhi)

ARANYA- The Nature and Environment Society

In Association with

Bharatiya Shikshan Mandal, Delhi Prant

(Under the Aegis of IQAC)

PLATFORM:
Microsoft Teams
REGISTRATION LINK:
Click here or scan QR code
LAST DATE FOR REGISTRATION:
23rd Jan 11:59 PM

Organising
Workshop on

Nadi Ko Jano

24 JAN 2022
4 PM ONWARDS

E-Certificate will be provided to every participant after the successful completion of the workshop.

/nature.zhdc
/aranya.zhdc
/Aranya - Nature and Environment Society
natureandenvironmentsociety@gmail.com

Speaker
Dr. Preeti Jagwani
Sah-Pramukh Anusandhan Prakoshth BSM Delhi Prant

Technical expert
Dr. Amarjeet Singh
Sadasya" Nadi ko jano" Abhiyan Delhi prant

Principal
Prof. Sangeeta Pandita
Convener
Dr. Ratnum Kaul Wattal
Member
Dr. Imran Khan (Librarian)
Member
Dr. Mukesh Kumar Jain (Convener NSS)
Member
Mr. Pradeep Kumar Singh (Convener NCC)
Special Thanks
Prof. Ravi Prakash Tekchandani
(Prant Adhyaksh BSM, Delhi Prant, Nodal Officer- "Nadi ko Jano", University of Delhi)

Department of Botany

Zakir Husain Delhi College

NAAC Accredited Grade 'A' College

Under the Aegis of IQAC

in collaboration with

Plant Molecular Genetics Laboratory

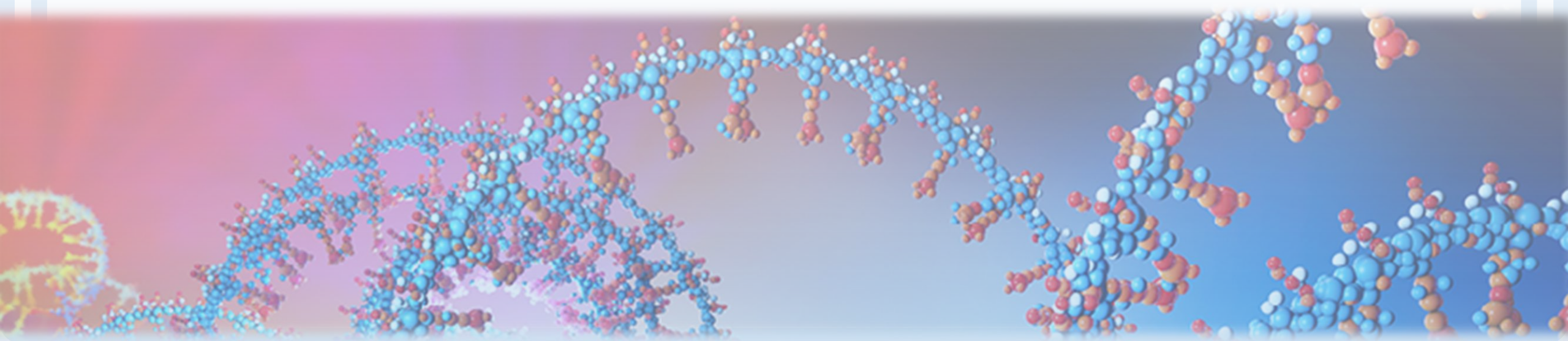
Department of Botany, University of Delhi

Organises

An Online

International Conference cum Workshop on Proteomics, Transcriptomics, and Molecular Drug Design: An Integrated Omics Approach

Date: 25-27 May, 2022



About the Event

Omics approach at various levels is the key to understand the flow of genetic information from DNA to RNA to protein. It has multifaceted applications in understanding molecular basis of acclimation, stress response, disease response, etc. Omics is now an integral tool in basic research as well as for understanding and development of novel molecular diagnostics. These technologies have the generic goal to reveal the mystery of living system by recognising the components in totality and to analyse the interaction among these components. This would enable the understanding of the system in a more lucid and an integrated manner. This event aims at emphasising the importance and familiarisation of omics techniques together with their role in molecular drug discovery. Participants will learn the latest in the field of transcriptomics, proteomics, and drug designing to keep them abreast with the fast-emerging techniques. Furthermore, hands-on-training will help them to understand the data management and data mining, which are considered as two most important bottlenecks for the omics-based research. It will allow them to gain more insights of the workflows/pipelines and the softwares dedicated for omics studies.

Topics for Hands-on-Sessions

Understanding Quantitative Proteomics in Plants

- Handling raw proteomics data using MaxQuant software
- Detection of PTMs from the proteome data using MaxQuant
- Data interpretation and visualisation using Perseus software
- Functional annotation of the proteins using online software DAVID

RNA-Seq Analysis and Data Interpretation using Web-Interface

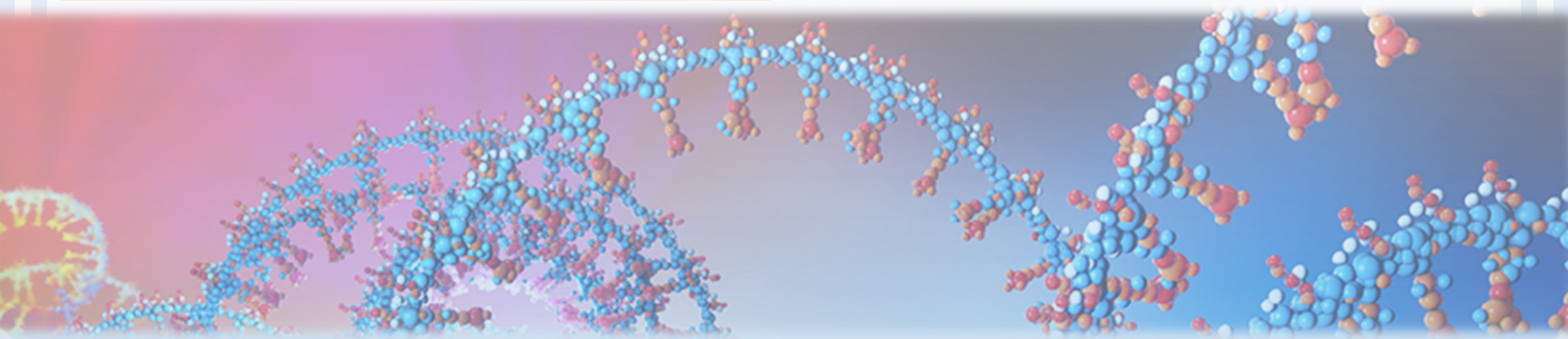
- Basic introduction to the NGS datasets generation and quality scores
- Brief introduction to the Galaxy webserver
- Brief discussion about extracting NGS datasets using publicly available SRA database
- Understanding the RNA-seq data and transcriptome analysis workflow available on Galaxy
- NGS data handling including quality check and adapter trimming
- Data Processing followed by mapping and alignment to the reference genome
- Differential gene expression analysis with RNA seq datasets accompanied by GO enrichment analysis

Methyl-Omics: An Emerging Field of Gene Expression Alterations

- DNA methylation in plants
- DNA methylation analysis methods
- Profiling whole genome methylation
  - Whole genome bisulfite sequencing
- Methylation status of specific genes of interest
- Hands on session on designing methylation specific PCR primers using MethPrimer software
  - Digestion based assay and q PCR.
  - Bisulphite sequencing PCR.
  - Hands on session on quantification of CpG methylation using QUMA software

RNA Seq Analysis using Linux and R Programmes

- Processing of rawreads, alignment of reads, on Linux platform
- Brief introduction on the method of Illumina RNASeq
- Count matrix and expression matrix generation on Rstudio
- Differential expression analyses and it‘s significance
- Hetamaps, data analyses, and clustering



Distinguished Speakers

Prof Ute C Vothknecht
Professor and Head
Department of Biology
University of Bonn, IZMB-Plant Cell Biology, Germany

Prof Girdhar Pandey
Professor
Department of Plant Molecular Biology
University of Delhi, India

Prof Suman Lakhalpaul
Professor and Head
Department of Botany
University of Delhi, India

Prof Renu Deswal
Professor
Department of Botany,
University of Delhi, India

Prof Sandip Das
Professor
Department of Botany
University of Delhi, India

Dr Vinay Kumar
Director
Translational and Development Sciences
Coherus Biosciences, USA

Dr Brijesh Rathi
Assistant Professor
Hansraj College, Department of Chemistry
University of Delhi, India

Dr Ravi Gupta
Assistant Professor
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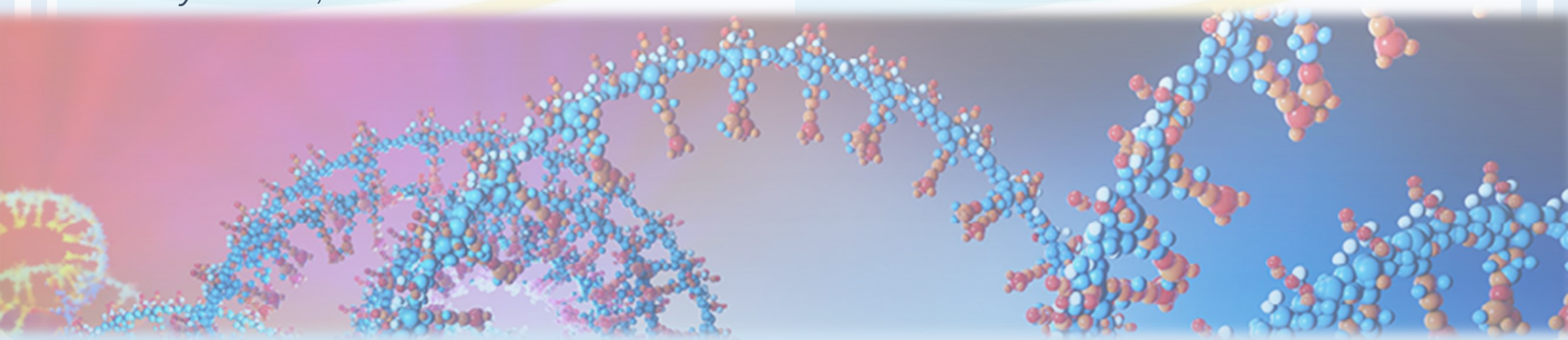

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Mr Sabarna Bhattacharyya
(PhD Scholar)
Department of Plant Cell Biology (Vothknecht group)
Institute for Cellular and Molecular Botany (IZMB),
University of Bonn, Germany

Ms Pratima Verma
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Ms Diksha Bisht
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University of Delhi, New Delhi

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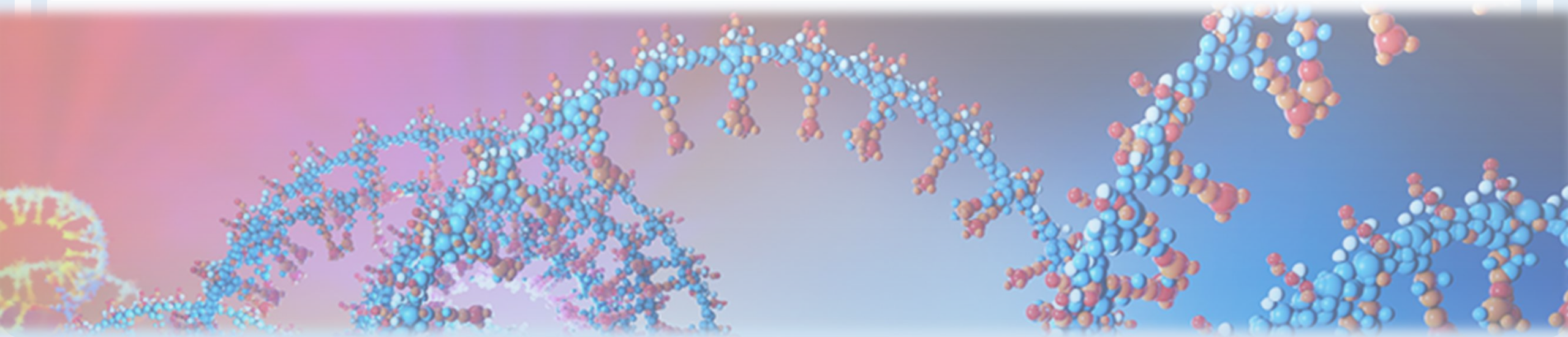


Call for the Abstract

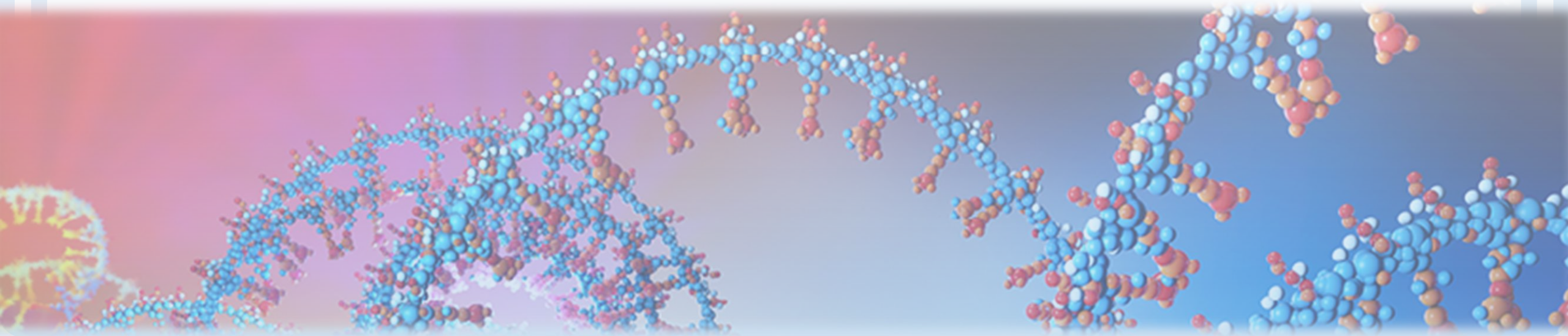
Faculty members/ research scholars/ PG and UG students are invited to submit abstracts for poster/oral presentation on the related themes of the event. Interested participants should send their abstract of a maximum 250 words in Time New Roman 12 point font size (1.5 line spacing) in MS word format. The last date of the submission of abstract is on or before 15 May, 2022. The name of the presenting author should be underlined and the email ID should be mentioned. Authors are requested to indicate their preference for oral and/or poster presentation on the abstract submission form. Abstracts that are submitted for oral/poster presentation but not selected for oral communication may be referred to the poster sessions. The abstract review committee reserves the right to select or reject the presentations. The decisions of the selection committee are final. The best oral/poster presentations will be awarded.

Post Conference Publication

Research/ review articles are invited from the participants selected for the oral/poster presentations for their publication on thematic topics in a special issue of a peer reviewed international journal of repute. The acceptance of the manuscript will take place after the peer review process by the journal.

Other Instructions

- All communications of the workshop will be made through registered email ID and/or Telegram.
- Please attach the proof of registration fee in registration form.
- Participants interested for oral/poster should attach abstract in registration form.
- All the sessions will take place on **Microsoft Teams**.



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Online registration is mandatory to participate in the Event.

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	Indian Participants	Foreign Participants
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Faculty members	700 ₹	15 USD

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Deadline for the Registration and Submission of Abstract: **15 May, 2022**

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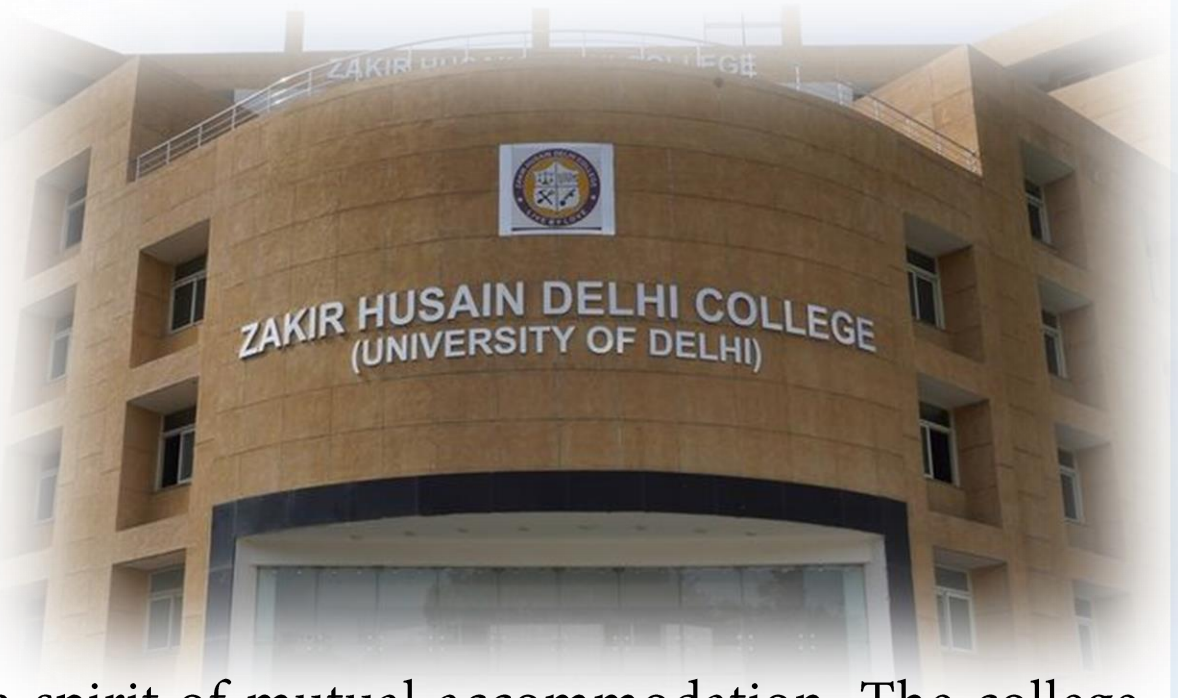

Zakir Husain Delhi College holds the distinction of being in existence well before the establishment of Delhi University. It carries within itself a history of nearly 300 plus years as an institution of learning. The College is located in the proximity of the Walled City and is very close to Connaught Place, the center of Delhi. This gives the college a distinctly diverse cultural ambience that cherishes composite culture and a spirit of mutual accommodation. The college has a long tradition of excellence in the disciplines of Humanities, Commerce as well as Sciences. It runs undergraduate courses in 19 disciplines, the highest number in any college of the University of Delhi.

About Department of Botany, University of Delhi

The foundation of the Department of Botany in University of Delhi was laid down in 1947 by Dr J J Chinoy. Some of the prominent names associated with the Department are Prof Panchanan Maheshwari, Prof B M Jori, and Prof H Y Mohan Ram. Since its foundation, Department has produced numerous botanists, who have offered services in reputed positions. The teaching and research aptitudes of the departmental faculty have recognition at global level. The current establishment of the Department is equipped with ICT facility, Central instrumental facility, dedicated laboratory for Bioinformatics, glass house, green house, herbarium, tissue & microbial culture rooms, and a well stocked library to carry out the research activities in effective manner. At present, Department offers courses in MSc and PhD in Botany. Also, Department aims to inculcate their students and research scholars through a Delhi University Botanical Society (DUBS), which publishes an annual magazine, “Botanica”.

For more detail, write at: ruchivir@zh.du.ac.in or call at: +91-9350364635

08th November 2022

To whomsoever it may concern

This is to certify that **Dr. Sarita Passey** of **Zakir Husain Delhi College, University of Delhi** has contributed as **Member of the Organizing Committee** in the following events organized by Guru Angad Dev Teaching Learning Centre, SGTB Khalsa College, University of Delhi under the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT) of Ministry of Education as per the following details:

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1	2021-22	National Webinar on "The Importance of Data Visualization"	10th August 2021
2	2021-22	Advanced Online Refresher Course/ Two-Week Faculty Development Program on "Data Visualisation with Tableau"	12th August to 25th August 2021
3	2021-22	One-Week Online National Faculty Development Program on "Developing Positive Mental Health for Teaching Learning Environment"	25th January to 31st January 2022

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2/19/2022 11:39:09	aryan18104@gmail.co	DEEP RANJAN	BSC Life Science prog
2/19/2022 11:39:44	sagarsharma5555076@	Sagar Sharma	Bsc.(Hons.)Zoology an
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Plant Gene 26 (2021) 100282

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Proteomics for Brassinosteroid signalling: Understanding Brassinosteroids mediated stress responses through advanced proteomics

Amit Verma [a,*,1], Mohammad Wahid Ansari [b,1], Hukum Singh [c], Narendra Kumar [c], Md. Shahbaz Anwar [d], Harish Mudila [e], Narendra Tuteja [f]

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ARTICLE INFO

Keywords:
Abiotic and biotic stress
Antioxidants
Brassinosteroids
Defense metabolites
Phytoproteomics

ABSTRACT

Brassinosteroids (BRs), class of steroidal phytohormones have a crucial role in various physiological mechanisms and involved in plant defense against different biotic and abiotic stresses. Understanding BRs action mechanism is very critical to promote plant development and boosting agricultural productivity. The mechanism of BRs action and signalling pathway is very intricate which requires exploration through various tools and techniques. Phytoproteomics had revealed the many cellular modifications induced via BRs signalling and identified potential functional metabolites involved in plant adaptation to stress conditions under BRs application. Additionally, proteomics provided the insights of activation events of receptor kinases and downregulation of various components via phosphorylation which cannot be analyzed by the genomics tools. So, the knowledge gap about the BRs signalling can be filled through various advanced proteomics tools that increase the applications of BRs in agricultural practices. This review summarizes the recent developments in knowledge of BRs signalling mechanism using various phytoproteomics tools.

1. Introduction

Plants are exposed to various environmental conditions that affect their growth and development. The environmental conditions which affect the plant growth adversely are termed as stress condition. Stress either biotic (pathogenic, insect invasions) or abiotic (drought, salinity, flood, temperature, cold, etc) affects the plant adversely triggering multiple signalling cascades to maintain a balance between immunity and growth metabolism. The effects can be observed either at the genic level or the proteome level. The plant stress response is classified into various phases viz. Alarm phase, Acclimation phase, Resistance phase, Exhaustion phase and Recovery phase based upon particular plant metabolic alterations (Kosova et al., 2018). The alarm phase includes the process of signal transduction from the environment to cellular genetic machinery and thus it is embarked by the changes in gene expression and epigenetic mechanisms. Thus, in this phase, not so much plant proteomics analysis was performed and various workers focused on the transcriptomics approach to elucidate the signalling pathways (Kosova et al., 2018). However, recent researches proved the prime importance of this phase. The alarm phase involves stress signals which affect the conformational alterations in the various membrane receptors and results in the formation of different protein complexes and there breaking off before the signal transduction to the nucleus. Maize tolerance to drought, heat and combined stress condition of both had been found to be related with the expression levels of 135, 65, and 201 proteins which were significantly changed under different stress conditions respectively as studied using multiplex iTRAQ-based quantitative proteomic and LC-MS/MS methods (Zhao et al., 2016a). Thus, this phase comprises many active proteomic alterations and should be elaborately studied. Proteomics at this level can solve various issues related to stress reception by plants and thus also paves a way to better stress amelioration. Proteome changes at the initiation phase reflect the exact diversity of protein

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SHORT COMMUNICATION

Acclimation potential of Noni (*Morinda citrifolia* L.) plant to temperature stress is mediated through photosynthetic electron transport rate

Ramwant Gupta[a], Ravi D. Sharma[a], Yalaga R. Rao[b], Zahid H. Siddiqui[c], Amit Verma[d], Mohammad W. Ansari[e], Randeep Rakwal[f], and Narendra Tuteja[g]

[a]Department of Biology, Fiji National University, Fiji, Fiji Islands; [b]Department of Biotechnology, Vignan University, Vadlamudi, India; [c]Department of Biology, Faculty of Science, University of Tabuk, Tabuk, Saudi Arabia; [d]College of Basic Science and Humanities, Sardarkrushinagar Dantiwada Agricultural University, Palanpur, India; [e]Department of Botany, Zakir Husain Delhi College, University of Delhi, New Delhi, India; [f]Faculty of Health and Sport Sciences, University of Tsukuba, Ibaraki, Japan; [g]Plant Molecular Biology, International Centre for Genetic Engineering and Biotechnology, New Delhi, India

ABSTRACT

Noni (*Morindacitrifolia* L.), a tropical, medicinal plant of the family Rubiaceae utilized since 2000 y ago by the Polynesians, is currently facing a major challenge in production vis-a-vis climate change. The world-wide average temperatures continue to fluctuate, resulting in extremely cold winters and hot summers that reduce plant productivity. Photosynthetic apparatus is an exceptionally sensitive component to estimate the degree of damage at contrasting temperatures. The present study was aimed to evaluate the temperature stress response of Noni plant using the chlorophyll a fluorescence OJIP transients (OJIP transients). Results showed the declined photosynthetic pigment pool and reduced functional and structural integrity of the photosynthetic apparatus under very low- and high-temperature treatments. Drastically lower yield parameters such as φ(Po) and φ(Eo), efficiency ψ(Eo) and performance indices – PI_{abs} and PI_{total}, and accumulation of inactive reaction centers were observed. Consecutively, a lower level of calculated electron transport from PSII to PSI was observed. In contrast, the enhanced δRo indicates that PSI is more thermo-tolerant as compared to PSII. Additionally, very low and high temperatures cause an increase in antenna size (ABS/RC) and the decrease in the amplitude of I to P phase of fluorescence transient. Overall, the photosynthetic apparatus of leaf tissue was more sensitive to low and high temperatures than the developing fruit. The findings of the present study demonstrated the potential role of thylakoid components of the photosynthetic apparatus, which might be crucial in regulating the temperature stress response in the Noni plant, and thereby crop improvement.

ARTICLE HISTORY
Received 10 October 2020
Revised 12 December 2020
Accepted 14 December 2020

KEYWORDS
Climate change; Noni (*Morinda citrifolia* L.) plant; OJIP transients; PSII; performance indices; temperature stress

1. Introduction

Noni (*Morinda citrifolia* L.), a tropical plant of the family Rubiaceae is of great medicinal value. It is an evergreen shrub that attains a height of 3 to 6 m.[1] The application of leaves of the Noni plant on the skin is also known to help in wound healing. Its multiple elongated fruits have soft and watery textures producing a cheesy aroma. Noni fruits are of immense nutraceutical and anti-cancer properties because of the presence of 150 different compounds.[2] Besides medicinal properties, this miracle plant is known to be a rich source of essential vitamins, minerals, micro- and macro-nutrients that help the body in various ways from the cellular level to organ level.[3,4] The plant can grow in both open coastal areas at sea level, and forest area up to about 1300 feet above sea level in diverse environmental conditions; however, its optimal growth temperature ranges from 20°C to 30°C.[5] The global climate change and population rise are the two major challenges in Noni plant production. The trends of climate change over the past decades exhibit severe implications in worldwide crop productivity. The pattern of global average temperature continues changing at a rapid rate, and plants are facing colder winters and hotter summers, which limits plant performance.[6] There is an urgent need to address plant productivity-related issues with respect to changed temperatures, worldwide.

It is a well-known fact that temperature variation, either high or low adversely influences the physiological process and photosynthesis in particular.[7] Inhibition of photosynthesis is reported in most of the plants grown at a temperature above 40°C and under 10°C.[8] Photosynthetic apparatus thus becomes one of the most sensitive cellular components in order to evaluate the degree of damage at contrasting temperatures. Recently, many attempts have been made to assess the extent of damage of photosynthetic apparatus under environmental stress by using chlorophyll a fluorescence OJIP transients.[9,10] The O-J-I-P transient shows a polyphasic curve when plotted on a logarithmic time scale underexposing dark adopted leaf to high light intensity.[11,12] In O-J-I-P transients OJ represents the gradual reduction of primary electron acceptor quinone (QA) of PSII, JI means the reduction of secondary electron acceptors (QB), plastoquinone (PQ), cytochrome (Cyt b_6f), plastocyanin (PC), and IP attributes the reduction of electron transporters of PSI ferredoxin (fd), intermediate acceptors and NADP.[10,13] Quantum yield of primary PSII photochemistry (φPo), the quantum yield of electron transport (φEo) from Q_A to PQ

CONTACT Ramwant Gupta ramwant.gupta@fnu.ac.fj Department of Biology, Fiji National University, Fiji, Fiji Islands.; Mohammad Wahid Ansari mwahidansari@zh.du.ac.in Department of Botany, Zakir Husain Delhi College, University of Delhi, New Delhi, India.

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SHORT COMMUNICATION

Salicylic acid modulates ACS, NHX1, sos1 and HKT1;2 expression to regulate ethylene overproduction and Na^+ ions toxicity that leads to improved physiological status and enhanced salinity stress tolerance in tomato plants cv. Pusa Ruby

Yalaga Rama Rao[a], Mohammad Wahid Ansari[b], Ranjan Kumar Sahoo[c], Ratnum Kaul Wattal[b], Narendra Tuteja[d], and Vellanki Ravi Kumar[a]

[a]Department of Biotechnology, Vignan University, Vadlamudi, India; [b]Department of Botany, Zakir Husain Delhi College, University of Delhi, New Delhi, India; [c]Department of Biotechnology, Centurion University of Technology and Management, Bhubaneswar, India; [d]Plant Molecular Biology Group, International Centre for Genetic Engineering and Biotechnology, New Delhi, India

ABSTRACT

Tomato is an important crop for its high nutritional and medicinal properties. The role of salicylic acid (SA) in 1-aminocyclopropane-1-carboxylate synthase (ACS), sodium-hydrogen exchanger (NHX1), salt overly sensitive 1 (sos1) and high-affinity K^+ transporter (HKT1;2) transcripts, and ACS enzyme activity and ethylene (ET) production, and growth and physiological attributes was evaluated in tomato cv. Pusa Ruby under salinity stress. Thirty days-old seedlings treated with 0 mM NaCl, 250 mM NaCl, 250 mM NaCl plus 100 µM SA were assessed for different growth and physiological parameters at 45 DAS. Results showed ACS, NHX1, sos1 and HKT1;2 transcripts were significantly changed in SA treated plants. The ACS enzyme activity and ET content were considerably decreased in SA treated plants. Shoot length (SL), root length (RL), number of leaves (NL), leaf area per plant (LA), shoot fresh weight (SFW) and root fresh weight (RFW) were also improved under SA treatment. Conversely, the electrolyte leakage and sodium ion (Na^+) content were significantly reduced in SA treated plants. In addition, the endogenous proline and potassium ion (K^+) content, and K^+/Na^+ ratio were considerably increased under SA treatment. Likewise, antioxidant enzymes (SOD, CAT, APX and GR) profile were better in SA treated plant. The present findings suggest that SA reverse the negative effects of salinity stress and stress induced ET production by modulating ACS, NHX, sos1 and HKT1;2 transcript level, and improving various growth and physiological parameters, and antioxidants enzymes profile. This will contribute to a better understanding of salinity stress tolerance mechanisms of tomato plants involving SA and ET cross talk and ions homeostasis to develop more tolerant plant.

ARTICLE HISTORY
Received 26 January 2021
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Accepted 26 June 2021

KEYWORDS
ACS; ethylene; NHX; HKT1; 2; salicylic acid; salinity stress; sos1; tomato productivity

1. Introduction

Tomato has been extensively investigated plant due to the higher content of molecules with antioxidants property such as carotenoids, lycopene, phenols, and flavonoids.[1,2] Interestingly, lycopene has a potential role in maintaining cardiovascular function and health.[3] Despite such an important crop, quality and productivity of tomatoes are badly affected by various abiotic stresses, particularly, salinity stress[4] saline soil severely affects various growth and physiological parameters such as seed germination, plant growth, and productivity. Over and above 800 million hectares of land (c. 6% of the world's total land area) is badly hit by salinity stress.[5] Salinity stress negatively affects different morphological and physiological characteristics by modulating the endogenous content ions (Na^+ and K^+), and the level of biomolecules such as proline, antioxidants enzymes and plant hormones.[6] Abiotic stresses (for example salinity stress) induced ethylene synthesis in plants is termed as stress ethylene.[7] A potential role of salicylic acid (SA) in improving salinity stress tolerance in plants is well documented.[8] Interestingly, SA functions as an ET inhibitor, and the various adverse response of excess ethylene under salinity stress can be regulated by SA,[9] which might be crucial in plant salinity stress tolerance.

ET negatively regulates several plant growth and developmental processes and various stress response. ET production is induced by salinity stress, and the leaf epinasty resulted due to salinity stress or salinity stress induced ET overproduction has been considered biomarker to screen tomato cultivars under high salt.[10,11] Consequently, numerous harmful effects of ET such as epinasty, restricted growth, affected leaf morphology, senescence, necrosis and cellular damage are likely to be similar to the symptoms appeared due to high sanity.[7,11] In ET biosynthetic pathways, ACC (1-aminocyclo propnae 1-carboxylic acid) synthase (ACS) is a key enzyme that plays a crucial role in ET signaling and salinity stress response.[12] Hence, salinity stress induced ethylene production is associated with improved *ACS* expression and enhanced ACS activity.[6] Sato et al. (1891)[13] have cloned the first ACS gene from *Cucurbita pepo*. *ACS* gene expressions have correspondingly been examined in numerous plant species.[6] The phosphorylation of ACS2/ACS6 by MPK3 and MPK6 improves ACS protein that leads to

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TECHNICAL REVIEW

The effectiveness of microsatellite DNA as a genetic tool in crocodilian conservation

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Abstract

Microsatellite DNA is among the several molecular tools used for determining genetic variability and inbreeding depression in threatened populations. It has been used extensively for population genetics studies in conservation of crocodilians. Even though single nucleotide polymorphisms have higher precision compared to microsatellite DNA markers, microsatellites offer a cost advantage which is particularly important to researchers in the global south. Here, we review the role of microsatellite DNA as a conservation tool in crocodilians. Employing appropriate keywords in three online databases, we studied 78 publications, where microsatellite DNA had been used to study crocodilian species. We found that 504 species-specific markers were designed for 13, out of a total of 24 crocodilian taxa. Genus *Crocodylus* had the highest number of species-specific markers and was the most studied taxa using microsatellites. Moreover, microsatellite markers developed for *C. porosus* were successful in cross amplification of microsatellite markers in 19 other crocodilian species. Microsatellite based studies had highest focus on analyses of multiple populations of a single species. Based on our review of microsatellite based studies on populations of crocodilian species, we recommend that microsatellite DNA markers are an effective conservation tool that can provide critical information on population structures of threatened crocodilian species.

Keywords Crocodile conservation · Gharial · Mating · Microsatellite DNA · Paternity · Species-specific molecular marker

Introduction

Conservation genetics is in a transitional phase, shifting from microsatellite DNA markers to single nucleotide polymorphisms (SNPs). While SNPs offer greater precision compared to microsatellites, SNPs are less cost-effective (Puckett 2017). Moreover, microsatellite DNA markers tend to allow researchers to address similar questions, with reasonable resolution and at a substantially lower cost (Shafer et al. 2015). Although costs (of SNPs) are expected to come down, monetary cost of markers still is an important factor for researchers in the global south.

The potential analytical range of microsatellites extends from species to the community level (landscape ecology) as well as on the spatial and temporal scales. Microsatellites offer a unique tool for analyzing population structure (Dever et al. 2002; De Thoisy et al. 2006; Hinlo et al. 2014; Velo-Anton et al. 2014) which includes paternity (Jones and Ardren 2003; Uller and Olsson 2008), kinship (Muniz et al. 2011; Budd et al. 2015) and effects of reduced population sizes (Bishop et al. 2009) as well as reintroduction and restocking (Rodriguez et al. 2011).

Microsatellites are unbiased markers and offer some advantages over other analytical tools. For instance, mitochondrial DNA (mtDNA) markers are limited by their maternal inheritance and isozyme analyses are affected by expression levels. Use of mtDNA markers in studies analyzing the effects of reintroduction or restocking might not

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ORIGINAL ARTICLE

Plant hosts may influence arbuscular mycorrhizal fungal community composition in mangrove estuaries

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Abstract

We investigated the role of plant host and soil variables in determining arbuscular mycorrhizal fungi (AMF) community composition in plant roots of two spatially separated mangrove estuaries on the rivers Aghanashini (14° 30′ 30″ N–74° 22′ 44″ E) and Gangavali (14° 35′ 26″ N–74° 17′ 51″ E) on the west coast of India. Both mangrove estuaries had similar plant species composition but differed in soil chemistries. We amplified a 550-bp portion of 18S small subunit (SSU) rDNA from mangrove plant roots and analysed it by restriction fragment length polymorphism (RFLP). Clones representing unique RFLP patterns were sequenced. A total of 736 clones were obtained from roots of seven and five plant species sampled at Aghanashini and Gangavali, respectively. AMF phylotype numbers in plant roots at Aghanashini (12) were higher than at Gangavali (9) indicating quantitative differences in the AMF community composition in plant roots at the two mangrove estuaries. Because both estuaries had similar plant species composition, the quantitative difference in AMF communities between the estuaries could be an attribute of the differences in rhizospheric chemistry between the two sites. Non-metric multidimensional scaling (NMDS) revealed overlap in the AMF communities of the two sites. Three and two AMF phylotypes had significant indicator value indices with specific hosts at Aghanashini and Gangavali, respectively. Environmental vector fitting to NMDS ordination did not reveal a significant effect of any soil variable on AMF composition at the two sites. However, significant effects of both plant hosts and sites were observed on rhizospheric P. Our results indicate that root AMF community composition may be an outcome of plant response to rhizospheric variables. This suggests that plant identity may have a primary role in shaping AMF communities in mangroves.

Keywords Mangrove ecosystem · Plant host · Submergence · AMF community · 18S SSU rDNA · Indicator value indices · Phosphate

Introduction

Global arbuscular mycorrhizal fungi (AMF) distribution patterns are influenced by dispersal and environmental factors (Öpik et al. 2006, 2010; Kivlin et al. 2011; Vieira et al. 2019). On a local scale, abundance and identity of host plants are key determinants of AMF community composition and distribution in different ecosystems (Sýkorová et al. 2007; Hazard et al. 2013; Jansa et al. 2014; Torrecillas et al. 2014; Martinez-Garcıa et al. 2014; Davison et al. 2015; Vieira et al. 2019). Environmental variables such as soil pH, P, N, soil moisture, and organic matter also influence AMF community composition (Bainard et al. 2014; Deepika and Kothamasi 2015; Wang et al. 2015a; Velázquez et al. 2018).

AMF are ubiquitous in wetlands and aquatic habitats (Wilde et al. 2009; Wang et al. 2010, 2011; Fester 2013; Gaberščik et al. 2017; Xu et al. 2017). The abundance and diversity of AMF from wetlands is comparable to those of terrestrial habitats (Wang et al. 2011, 2015a, b; Ramirez-Viga et al. 2018; Xu et al. 2021). Around 101 AMF species affiliated to 19 genera and 9 families with a majority (53%) belonging to Glomeraceae have been reported from

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REVIEW
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Chemical-Assisted Microbially Mediated Chromium (Cr) (VI) Reduction Under the Influence of Various Electron Donors, Redox Mediators, and Other Additives: An Outlook on Enhanced Cr(VI) Removal

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Chromium (Cr) (VI) is a well-known toxin to all types of biological organisms. Over the past few decades, many investigators have employed numerous bioprocesses to neutralize the toxic effects of Cr(VI). One of the main process for its treatment is bioreduction into Cr(III). Key to this process is the ability of microbial enzymes, which facilitate the transfer of electrons into the high valence state of the metal that acts as an electron acceptor. Many underlying previous efforts have stressed on the use of different external organic and inorganic substances as electron donors to promote Cr(VI) reduction process by different microorganisms. The use of various redox mediators enabled electron transport facility for extracellular Cr(VI) reduction and accelerated the reaction. Also, many chemicals have employed diverse roles to improve the Cr(VI) reduction process in different microorganisms. The application of aforementioned materials at the contaminated systems has offered a variety of influence on Cr(VI) bioremediation by altering microbial community structures and functions and redox environment. The collective insights suggest that the knowledge of appropriate implementation of suitable nutrients can strongly inspire the Cr(VI) reduction rate and efficiency. However, a comprehensive information on such substances and their roles and biochemical pathways in different microorganisms remains elusive. In this regard, our review sheds light on the contributions of various chemicals as electron donors, redox mediators, cofactors, etc., on microbial Cr(VI) reduction for enhanced treatment practices.

Keywords: Cr(VI) reduction, chemical-assisted, electron donors, electron mediators, microbially mediated process

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INTRODUCTION

Chromium (Cr) is a pervasive toxin that inhabits almost every component of the environment including aerial, terrestrial, aquatic, and biological systems (Rahman and Singh, 2019). The nearly ubiquitous existence of this element is detrimental to natural establishments of Earth. Various environment and health protection agencies have considered Cr as a priority pollutant

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Paradigms of actinorhizal symbiosis under the regime of global climatic changes: New insights and perspectives

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Abstract

Nitrogen occurs as inert and inaccessible dinitrogen gaseous form (N_2) in the atmosphere. Biological nitrogen fixation is a chief process that makes this dinitrogen (N_2) accessible and bioavailable in the form of ammonium (NH_4^+) ions. The key organisms to fix nitrogen are certain prokaryotes, called diazotrophs either in the free-living form or establishing significant mutual relationships with a variety of plants. On such examples is ~95-100 MY old incomparable symbiosis between dicotyledonous trees and a unique actinobacterial diazotroph in diverse ecosystems. In this association, the root of the certain dicotyledonous tree (~25 genera and 225 species) belonging to three different taxonomic orders, Fagales, Cucurbitales, and Rosales (FaCuRo) known as actinorhizal trees can host a diazotroph, Frankia of order Frankiales. Frankia is gram-positive, branched, filamentous, sporulating, and free-living soil actinobacterium. It resides in the specialized, multilobed, and coralloid organs (lateral roots but without caps), the root nodules of actinorhizal tress. This review aims to provide systematic information on the distribution and the phylogenetic diversity of hosts from FaCuRo and their micro-endosymbionts (Frankia spp.), colonization mechanisms, and signaling pathways. We also aim to provide details on developmental and physiological imperatives for gene regulation and functional genomics of symbiosis, phenomenal restoration ecology, influences of contemporary global climatic changes, and anthropogenic impacts on plant-Frankia interactions for the functioning of ecosystems and the biosphere.

Keywords: Frankia interaction; actinorhizal plants; climatic change and anthropogenic influences;

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SIMPLE, SENSITIVE, AND COST-EFFECTIVE TRACE LEVEL DETERMINATION OF COPPER IN ALCOHOLIC BEVERAGES AND BIOLOGICAL SAMPLES WITH 4-(2-PYRIDYLAZO)RESORCINOL IN PRESENCE OF NEUTRAL MICELLAR MEDIUM USING DERIVATIVE SPECTROPHOTOMETRY

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ABSTRACT: A reagent, 4-(2-pyridylazo) resorcinol has been reported to determine trace amounts of Cu(II) in the presence of a non-ionic surfactant, Triton X-100 using derivative spectrophotometry. Water-insoluble Cu(II) complex with 4-(2-pyridylazo) resorcinol has been solubilized in an aqueous phase in presence of a neutral surfactant, Triton X-100 and studied in normal and derivative mode. Important analytical figures, such as molar absorption coefficient (ε), specific absorptivity (a), and Sandell's sensitivity (*S*) of the Cu(II)-PAR complex at 510 nm (λ_{max}) in neutral micellar media are $4.88 \times l0^4$ L mol^{-l} cm^{-l}, 0.77 mL g^{-l} cm^{-1} and 1.30 ng cm^{-2}, respectively. The IUAPC detection limit and Beer's law range of Cu(II) determination are 1.40 ng mL^{-1} and 0.13 - 2.54 μg mL^{-1}, respectively. The conditional stability constant of the 1:2 complex formed at optimum experimental conditions is 5.67×10^8 L^2 mol^{-2}. Interference due to the presence of cations, anions, and complexing agents has been studied in normal as well as derivative modes. The proposed cost-effective, sensitive, and simple derivative spectrophotometric procedure is successfully applied to determine Cu(II) contents in commercially available alcoholic beverages and a biological

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Physico-Chemical Analysis of Ceramic Industries Wastewater in Khurja District, Uttar Pradesh (India)

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ABSTRACT

The aqueous discard that is produced by an industrial manufacturing process results in water pollution, having pollutants dissolved or suspended in water. The magnitude of the problem increases many folds if several manufacturing units are concentrated in a small area. Industrial wastewater differs in quality and quantity of substances, causing pollution depending upon the type of industry producing it. The present study deals with an analysis of physicochemical characteristics of wastewater effluents from ceramic industries in Khurja district, Uttar Pradesh. Wastewater samples were collected from five different sites in Khurja district during the study period and analysed for pH, electrical conductivity, alkalinity, acidity, total hardness, dissolved oxygen, and various ions. The results were compared to WHO standards, and it showed that some parameters have higher values while few were within the limit.

KEYWORDS: *Ceramic wares, Ceramic Glaze, Khurja, Heavy Metals, Health Risks*

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INTRODUCTION

Industrial waste water plays an important role in polluting underground water, soil, rivers and other water bodies [1]. Emissions of organic compounds, heavy metals, and chemicals used in the ceramic industry cause significant pollution [2]. This contributes to global warming, greenhouse gas emissions and also becomes a cause of diseases like typhoid, dysentery and cholera [3]. Natural elements and plant supplements like nitrates and phosphates support the growth of algae on the water surface, which further deteriorates the health of a water body. The present study was carried out with an objective to review the quality of water from various ceramic industries in the Khurja District, Uttar Pradesh, India. This small district has around 500 ceramic manufacturing units producing crockery wares, art wares, sanitary wares, tiles, electrical insulators, electric fuse, and other household items [4].

The basic raw material used in the ceramic industry is clay (can be a single clay or a mixture of clays) used to make a body of ceramic ware [5]. Feldspar (Silicates of aluminum-containing sodium, potassium, iron, calcium, barium, or a combination of these elements) is added as flux, and at times quartz is used as filler [5]. Once the bisque ware (ceramic ware after first firing) is ready, a glaze is applied to protect its surface and increase durability. Glazing of bisque ware is done not only to provide a smooth surface but also to make it waterproof and food safe. The basic material of glaze is silica, as it facilitates the fusion of glaze material with clay. Historically, oxides heavy metals like lead, cadmium, and others were used to produce glaze flux to lower the melting point of silica and also to decrease the viscosity of glaze over a wide range of temperatures [6]. Low viscosity results in a better and uniform spread of glaze, giving a smooth finish to the product. Colored glazes and stains are

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Review on deep red-emitting rare-earth free germanates and their efficiency as well as adaptability for various applications

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ABSTRACT

Deep red-emitting phosphors are becoming the hot area of research during these times owing to their wide variety of applications in various fields, including lighting, display, imaging, and many others. The transition metal ions, especially Mn^{4+} and Cr^{3+} activated oxide phosphors possess admirable merits such as high chemical and thermal stability, eco-friendly preparation, and emission in the deep-red region. It is important to mention that Mn^{4+} doped germanates usually show emission spectra peaking above 650 nm. Thanks to this emissive property, germanates can be the best choice for display applications for providing a wide colour gamut in ultra-high-definition TV. Moreover, the emission of these phosphors can be extended to the near-infrared region with long persistence. Most of the reviews published on Mn^{4+} activated phosphors concentrate on the white light-emitting diode applications. Whereas the reviews on Cr^{3+} activated phosphors are focused on their persistent near-infrared emission. In this article, we mainly focused on the Mn^{4+} and Cr^{3+}-activated deep red-emitting germanate phosphors since octahedral Ge^{4+} sites in germanates are ideal for accommodating these transition metal ions. We have thoroughly discussed the crystal structure-dependant luminescence behaviour of the reported germanates. In addition to that, we have also discussed various methods for improving the luminescence properties of these transition metal ions. Finally, we have presented possible potential applications of the reviewed phosphors. We believe that this article will give the insight to develop new deep red-emitting phosphors and it will be helping the researchers to improve the luminescence properties of different existing phosphors. After all, it will be good to make a better understanding of the reported work in this area in a short time.

1. Introduction

Red emitting phosphors have crucial roles in the areas of solid-state lighting, field emission displays, thermal sensors, solar cells, plant cultivation, bio-imaging, and many others [1–6]. The activators used in the red-emitting phosphors can be sharp band red-emitting rare-earth ions (Eu^{3+}, Pr^{3+}, Sm^{3+}), broad-band red-emitting rare-earth ions (Eu^{2+}, Ce^{3+}), and the sharp band deep red-emitting transition metals (Mn^{4+}, Cr^{3+}). The sharp-band red-emitting phosphors produce a red colour with high quantum efficiency, which is eye sensitive for humans. However, the absence of a wide excitation band in the ultra-violet (UV) or blue region limits their applications in light-emitting diodes (LEDs) [7]. The broad-band red-emitting phosphors such as nitrides, oxynitrides, silicates, aluminates, which are mostly activated by Eu^{2+} ions, have better LED applications while comparing with that of Eu^{3+} doped phosphors. Nitrides hosts such as $CaAlSiN_3$:Eu^{2+} and $Sr_2Si_5N_8$:Eu^{2+} are known as efficient phosphors owing to their broad absorption band, high luminescence intensity, and low thermal quenching [8,9]. However, these broad red-emitting phosphors possess either harsh synthesis conditions, high production cost, toxicity, or poor chemical and thermal stability [10]. Moreover, the inability of Eu^{2+} ions in producing emissions beyond 650 nm in the visible region and non-radiative loss due to the re-absorption phenomena further restrict their practical utility in several fields including agriculture [11]. Eventually, the focus of the research community recently moved to the development of red-emitting phosphors acti-

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Research paper

Morphology controlled green synthesis of photoluminescent $LaPO_4$: Ce^{3+}-Tb^{3+} nanorods

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ABSTRACT

A simple wet-chemical method yielded crystalline, uniform $LaPO_4$ nanorods with a hexagonal structure. HR-TEM imaging revealed the formation of $LaPO_4$ nanorods with an aspect ratio of 27:1. The results of Le Bail refinement and Raman analysis suggested high sample purity. Under UV irradiation, the Ce^{3+}-Tb^{3+} co-doped $LaPO_4$ nanorods exhibited strong green emission at 545 nm owing to the resonance energy transfer from Ce^{3+} to Tb^{3+}. The photoluminescence of these nanorods was further strengthened by optimizing the Tb^{3+} dopant to achieve various display applicability.

1. Introduction

Lanthanum phosphates ($LaPO_4$) have been widely employed in producing optical materials for various lighting and display applications due to their wide band-gap, high refractive index, high thermal and chemical stability, high quantum yield, and low toxicity [1–4]. Most importantly, when the $LaPO_4$ host is co-doped with cerium and terbium ions, it shows strong green emission owing to efficient energy transfer (ET) from Ce^{3+} to Tb^{3+} ions. Yu et al. successfully synthesized Ce^{3+}-Tb^{3+} co-doped $LaPO_4$ nanowires of various lengths and compared their luminescent properties [5]. Yang and co-workers fabricated mini-sized transparent plasma display panels (PDPs) using $LaPO_4$: Ce, Tb nano-phosphor and demonstrated its application in PDPs [6]. $LaPO_4$ has also been investigated for its potential applications as catalysts, upconversion hosts, proton conductors, and biological labeling [7–10]. Among the various polymorphic forms of $LaPO_4$, the hexagonal form is considered the most efficient optical host. It can be stabilized even at low temperatures. Therefore, wet-chemical syntheses are intensively researched to generate the hexagonal $LaPO_4$ in nanostructures. Such methods have the advantages of easy scale-up, ambient reaction temperatures, cost-effectiveness, and high yields.

In this letter, undoped and Ce^{3+}-Tb^{3+} co-doped $LaPO_4$ nanorods in hexagonal symmetry are successfully fabricated using simple wet-chemical processes, and their structural morphology, optical properties are systematically studied. These nanorods have advantages over the other nanostructures. They have the lowest surface defects due to their low surface-to-volume ratio and produce an efficient photoluminescence output.

2. Experimental

Highly pure (≥99.9%) $LaCl_3{\cdot}xH_2O$, KH_2PO_4, $Ce(NO_3)_3{\cdot}6H_2O$, and $TbCl_3{\cdot}6H_2O$ from Sigma-Aldrich were used for the synthesis. Initially, 1 *mmol* each of $LaCl_3{\cdot}xH_2O$ and KH_2PO_4 were dissolved independently in 30 mL of distilled water. The solution of KH_2PO_4 was added dropwise to the $LaCl_3{\cdot}xH_2O$ solution. The mixture was stirred overnight at room temperature. The final product was collected from a white-colored suspension by centrifugation. The powder X-ray diffraction (PXRD) patterns were recorded using a Bruker Discover D8 high-resolution diffractometer. A Raman spectrum was collected using a Renishaw spectrophotometer equipped with an Ar^+ laser ($\lambda = 785$ nm, 10 mW). High-resolution transmission electron microscopic (HR-TEM) images were performed using a Philips Tecnai G2 20 transmission electron microscope. The photoluminescence (PL) characteristics were measured

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Theoretical Designing of Novel Donor Acceptor Type Copolymer Comprising of Thiophene

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Using *ab initio* band structure results of three novel donor acceptor polymers $(A)_x$ PCDT, $(B)_x$ PMCT and $(C)_x$ PFTh as the input, the electronic structures and conduction properties of their periodic and aperiodic copolymer $(A_mB_nC_k)_x$ have been investigated. The method involves using negative factor counting method based on Dean's negative eigenvalue theorem. In this article, the quasi-one-dimensional Type II staggered copolymers comprising of thiophene units on the basis of the band alignments of the constituent homopolymers were studied. The trends in their electronic structures and conduction properties as a function of (i) block sizes (m, n, k) and (ii) arrangement of the blocks (periodic or aperiodic) in the various copolymer chains are discussed. These trends are important guidelines to the experimentalists for designing novel electrically conducting polymers with tailor made conduction properties.

Keywords: Copolymer, Thiophene, Conducting polymer, *ab initio* studies.

INTRODUCTION

Electrical conduction in polymers on application of certain oxidising or reducing agents was a landmark discovery in the field of polymers. Now a days, these electrically conducting polymers are attractive candidates for applications in biosensors [1], supercapacitors [2] and biomedical engineering [3,4] as these have several advantages over traditional metals or semiconductors. It is however, desirable to obtain polymers that are intrinsically conducting without the need of doping as doping can lead to decrease in solubility and processibility of the polymers. This can be done by carrying out theoretical designing of conducting polymers [5,6] to obtain information on intrinsically conducting polymers which have low band gaps and can conduct electricity without the need of doping. One exciting possibility for theoretical designing of conducting polymers is provided by growing quasi-one dimensional systems or copolymers [7-10]. The electronic properties of copolymers are found to be generally (though not always), intermediate between the properties of the constituent homopolymers. These copolymers can have desired conduction properties, depending on the choice of the constituting components, their relative amounts and their arrangement in the polymer chain. The copolymers just like inorganic superlattices, can be classified into four types [11,12] (Fig. 1). In Type I copolymers, the band gap of one component lies completely in the band gap of the other component. Type II staggered copolymers have the top of valence and conduction bands of one component below the top of valence and conduction bands of other component. In case of Type II misaligned copolymers, the top of conduction band of one component is below the top of valence band of the other component and in Type III copolymers, one component is semi-metallic while other is the normal semiconductor. Among conducting polymers, polythiophene [13] is one of the most widely studied and used polymer for electronic devices. In this article, the effect of block size on the electronic properties of a novel thiophene based triblock copolymer $(A_mB_nC_k)_x$ are studied. The components $(A)_x$, $(B)_x$ and $(C)_x$ constituting the copolymers are donor-acceptor polymers comprising of *trans-cisoid* polyacetylene (PA) chains joined with the help of electron accepting group X (S for all components) and electron withdrawing group Y. For component $(A)_x$ (poly-4*H*-cyclopentadithiophene-4-one, PCDT), Y = O, for $(B)_x$ (poly-4-methylene-4*H*-cyclopentadithiophene, PMCT) Y: $=CH_2$ and

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Synthesis and Spectral Characterization of Mn(II) and Co(II) Complexes with Tetradentate Macrocyclic Ligand

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Manganese(II) and cobalt(II) complexes were synthesized with [N_4] tetradentate macrocyclic ligand using different metal salts *i.e.* $MnCl_2$, $Mn(NO_3)_2$, $CoCl_2$ and $Co(NCS)_2$. The ligand was prepared by condensation of glyoxal and carbahydrazide. All these were characterized by elemental analysis, molar conductance measurements, magnetic moment, IR, mass, electronic and EPR spectral studies. Elemental analysis indicates that the complexes have composition MLX_2 where ($X = Cl^-, NO_3^-, NCS^-$). All the complexes were found to be non-electrolytic in nature so can be formulated as [MLX_2]. Infrared spectra of metal complexes suggest that the ligand behaves as tetradentate. On the basis of magnetic moment, electronic and EPR spectral data, all the metal complexes were found to be high spin with octahedral geometry.

Keywords: Macrocyclic ligand, Tetradentate, Glyoxal, Carbahydrazide, Manganese complex, Cobalt complex.

INTRODUCTION

The synthetic macrocyclic metal complexes have gained much significance and attracted interests of synthetic chemists owing to their unusual stability and similarity with naturally occurring macrocycles [1]. The stability of these metal complexes helped scientists to explore many aspects of their reactivity and unusual properties making them learn about the usages and properties of natural and biological macrocycles [2,3]. Therefore, a number of ligand systems have been recognized and used to mimic the naturally occurring carriers in identifying and carrying specific metal ions to understand and reproduce the catalytic activity of metallo-proteins and metallo-enzymes [4]. Scientists have made efforts to prepare and characterize metal complexes using macrocyclic ligands [5,6] and as a result variety of these systems starting from simple cyclic compounds to sophisticated systems *viz.* mono, di, tri and macrocycles and calixarines have been prepared and successfully characterized [7]. This led to the development of the novel synthetic routes to prepare large ring compounds. Although there is not much difference between coordination behaviour of macrometallic complexes and open chain polydentate ligands but the kinetic and thermodynamic stability along with some other unusual pro-perties of macro complexes put them into a special class and encourage chemists to understand the reason behind these properties. Macrocyclic ligands belong to polydentate system in which at least three donor atoms are part of a cyclic hydrocarbon skeleton usually comprising of at least nine atoms. The metal ion fits well inside the macrocyclic cavity getting stabilized by making coordination bonds with a few or all of the donor atoms [8]. They provide high stability to complex formation but also a chance to tune the coordination sites through functionalization and modification. They are capable of extending their structure for effective attachment of pendant atoms giving considerable significance to the resulting metal complexes [9-14].

Existence of two or more pendant arms, at appropriate sites on a macrocyclic framework creates a pseudo-enclosed environment appropriate for the genesis of supramolecular, molecular receptor species [15,16]. Macrocyclic chelators, due to their extraordinary binding capacity to metal ions, are emerging as potential chelating agents in various fields such as coordination chemistry, as an anticorrosive and even in biochemical sciences [17-20]. They play significant role in developing

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BIOLOGICALLY ACTIVE SCHIFF BASE NANOPARTICLES: A REVIEW

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ABSTRACT
Imine bonds containing substances called Schiff bases are known for their role in medicines apart from other fields of human interest. Their complexes with transition metals have been studied at length for their role in health of mankind. Recent awareness of climate change and harmful effect on environment attributed to fast pace of industrialization, has got the scientist community into focussing their attention on developing novel materials having same or improved qualities. One such area of attention is synthetic pathways leading to bioactive Schiffbase metal complexes. Ability of Schiff base to act as ligand to various metals to form complexes has been explored extensively due to their application in vast industrial activities such as agriculture, cosmetics, dyes, etc. Being of pharmacological importance (antifungal, antibacterial and anti-cancerous activities), synthetic procedures have been reported for nano size Schiff base metal complexes using different transition metals. Nano chitosan, graphene oxide and magnetic nanoparticles supported Schiff bases are also investigated for their biological and industrial applications. These nano size materials/hybrids not only exhibit desirable biological efficiency, additional features due to their size make them useful in other aspects of medical treatments such as drug delivery. In this review we bring together work done in this field over last five years.

KEYWORDS: Schiff base, Nanoparticles, Bioactive, antibacterial, anticancer.

INTRODUCTION
Nanomaterials (NMs) owing to their adaptable qualities enjoy prominence in technological advancements and are thus more explored compared with bigger counterparts. As a consequence of several advantages of NMs over bulk materials they find widespread application and issues related to their toxic effects are but natural.

Though categorization of NMs on the basis of their dimensions was first presented by Gleiter et al.[1] and later by Pokropivny and Skorokhod[2], depending on their size and shape, composition and on their occurrence etc., they can be characterised in many ways. As of today,with a special reference to specificity of NMs there are several legislations in place in the European Union (EU) and USA. However, a single internationally accepted definition for NM does not exist. Different organizations have a difference in opinion in defining NMs.[3] According to the Environmental Protection Agency (EPA), "NMs can exhibit unique properties dissimilar than the equivalent chemical compound in a larger dimension".[4] The US Food and Drug Administration (USFDA) also refers to NMs as "materials that have at least one dimension in the range of approximately 1 to 100 nm and exhibit dimension dependent phenomena".[5] Similarly, The International Organization for Standardization (ISO) has described NMs as a "material with any external nanoscale dimension or having internal nanoscale surface structure".[6]

Though there is no specific way of defining nano materials, whether synthesized or of natural origin having at least one dimension measuring between 1-1000 nm have been basically categorized as nanomaterials (NMs).As mentioned earlier due to lack of a single definition to summarize and describe them , NMs can be subdivided into 4 classes on basis of comprising materials.

(i) Carbon-based nanomaterials[7] (ii) Inorganic-based nanomaterials (iii) Organic-based nanomaterials (iv) Composite-based nanomaterials[8] that have multi dimensional different combinations of NMs of all the three above, but must have one dimension measuring in nanoscale. Another classification is based on occurrence:(i) Natural nanomaterials[9] and (ii) Synthetic (engineered) nanomaterials.[10]

With the aid of advancement in technology aimed at improving lifestyle, new genre of NMs, classified as NPs[11] such as carbon NPs[12], TiO_2 NPs[13] and

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SYNTHESIS AND CHARACTERIZATION OF [N_4] MACROCYCLIC LIGAND[L] AND ITS Ni(II) AND Cu(II) COMPLEXES

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ABSTRACT
New Macrocyclic [N4] ligand [L] was synthesized by using glyoxal and carbahydrazide. The structure of ligand was characterized using spectroscopic techniques. Ni(II) and Cu(II) complexes of Macrocyclic [N4] ligand [L] were synthesized and characterized. The novel synthesized ligand coordinates to metal center through four azomethine nitrogen and the two axial positions are occupied by anions. The synthesized complexes are non-electrolytic in nature and are of type [ML X_2]; (X= Cl^-, NO_3^-). The synthesized complexes are thermally stable at room temperature. The geometry and the stoichiometry of the complexes are well established by the various analytical and spectroscopic techniques. Ni(II) complexes have octahedral while Cu(II) complexes have tetragonal geometry. The proposed structures are well supported by spectroscopic data.

INTRODUCTION
Macrocyclic ligands containing multi donor sites were developed tremendously over the past hundred years and their synthesis and characterization has severely increased during the last few decades[1-5]. This vide applicability of macrocyclic ligands containing N-atom and Schiff bases was due to their broad physiochemical behavior and biological activities. Schiff base compounds and their metal complexes are broadly used as medicines because of their versatile extensive range of biological activities[6-10]. One of the most important application is metal catalyzed transamination reaction.

The macrocyclic ligand having hetero atoms form complexes with metal ion and their coordination ability depends on a number of factors like flexibility, cavity size and number of binding sites available[11,12]. Of all the macrocyclic types the one which contains poly-aza group and amide group have attracted a lot of scientific attention. These types of macrocyclic ligands have their applications in fluorescence devices and catalysis[13,14]. Other factor which makes them very important is their ease of preparation by template condensation. The easiness in preparation of macrocyclic ligand and their complexes followed by extensive research on tetra-aza type macrocyclic further enhances their importance. Tetra-aza type macrocycles are versatile ligands because of their similarity with natural occurring macrocyclic and structural variations that cause easy binding with metal ions. Tetra-aza macrocyclics like cyclan, cyclam, or bycyclam are very well known for their biological activities[15].

The vide applicability of metal complexes of Schiff bases led to the development of bioinorganic field. The usefulness of Schiff base with metal ions is also due to easy isolation of the solid complexes[16-18]. Schiff bases and their metal complexes are potential anticancer agents and the literature reveled that the bioactivity of the isolated Schiff base is enhanced after complexation with a particular metal ion[19,20]. Other important factor for their vide applications is the ability of transition metals to form complexes with macrocyclic ligand having different hetero atom and denticity. Macrocyclic ligands can be easily structurally modified by introduction of additional atoms that results in exceptional change in their selectivity and efficacy[21,22]. These types of synthesized hybrid moieties cause dramatic change in the physical and biological activity of metal complexes[23].

Taking into attention the above facts, we have reported the synthesis and characterization of Ni(II) and Cu(II) complexes of macrocyclic ligand [L] synthesized from glyoxal and carbahydrazide.

EXPERIMENTAL
Instrumentation
The elemental analysis was done on Thermo Finnigan Flash EA 1112 series. FT-IR was recorded in the region 4000-400cm^{-1} on FT-IR SPECTRUM-2000 using KBr pellets. Agilant Technologies 6530 Accurate- Mass Q-TOF LC/MS was used for recording mass spectrum. Molar conductance was calculated using ELICO (CM82T) Conductivity Bridge. Magnetic susceptibilities were measured at room temperature on a Gouy balance

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Developing Latent Fingerprints on Wet Surfaces with a Fluorescent Schiff's Base as SPR

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ABSTRACT

The fingerprints left by the perpetrators are the first thing a forensic team searches for during a crime investigation. These prints could be visible or hidden (also known as latent). The development of these latent fingerprints on various surfaces is done using a variety of approaches. An important and useful method, most commonly used in forensic investigations for wet surfaces involves Small Particle Reagent method. In present work, we report the use of a UV fluorescent Schiff's base as an effective organic compound which has been employed as a small particle reagent. It has been used for the visualisation of latent finger prints on various non-absorbent surfaces. The advantage of employing this Schiff's base as a small particle reagent over previously utilised dyes is that it is less expensive, contains no heavy metal, and may be used on a variety of surfaces. Furthermore, while taking images, visualisation does not necessitate the use of a particular UV lamp or filter.

KEYWORDS: *Latent fingerprints, Powder technique, Small Particle Reagent, Schiff's base, UV fluorescence*

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INTRODUCTION

Finger or foot prints collected at a crime scene are a well-known category of physical evidences that can help solve a case. The fact that each person's finger prints are unique has been proven, and the courts have accepted this fact as evidence. Fingerprints left by a criminal can sometimes be seen with the naked eye. Such prints are made on the blood stains or any paint etc or by the hands soiled with blood on other things. When the finger prints are not visible to the human eye which are generated by the deposits of perspiration on a surface, they are referred to as latent fingerprints[1,2]. Different chemical reagents can selectively fix the elements of sweat, allowing the latent finger prints to be seen[3].

The powder technique, which includes applying a finely grounded formulation to the finger mark impression[4], is the simplest for detecting latent fingerprints. However, this powder approach does not work on damp surfaces. A situation like this emerges when the perpetrator tries to wash the object or throws the weapon, like a knife or pistol, into a water body. The small particle reagent (SPR) approach has been proven to be highly useful for identifying finger impressions on damp or wet surfaces. This approach works because fine reagent particles stick to the oily or fatty components of latent finger mark residues. This process has been used to generate finger marks on variety of surfaces including plastic, wood, vinyl, glass and metal that have been immersed in water for an extended period of time. In another investigation, latent finger marks were developed on the writing surface of various types of rewriteable and recordable compact discs using a fluorescent SPR mixture containing basic zinc carbonate, eosin Y dye, and commercial liquid detergent [5]. SPR composition consisting of basic zinc carbonate and eosin B has also been used to develop latent finger marks on different kinds of non-porous surfaces [6]. We recently reported the use of a UV fluorescent Schiff's base, 2-(4-methylphenylimino) methylphenol(I)[7,8] in forensic applications. The results of its utility as powder fingerprint formulations were quite encouraging. In this communication, we provide our findings, which

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THE WAVE THAT BECAME A TSUNAMI: LESSONS FROM INDIA'S SECOND WAVE OF COVID-19 PANDEMIC

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ABSTRACT

Background: The article gives an outline of the database of the first and second waves through the different states, comparison of the two waves, factors responsible and the methodologies applied to contain them with future plan of action. **Objectives**: To study the trend and progression of COVID-19 in India to develop a better understanding about the disease and its recurrence and related complications. **Methods:** A detailed exploration of the COVID-19 data since inception of disease to June 4, 2021 is done taking into account the cumulative incidence rates, age wise distribution and case fatality / test positivity rates. **Results:** As of June 4, 2021, India reported 2,86,94,879 COVID-19 cases and 3,44,082 deaths accounting for 16.6% of the 17,25,89,831 cases and 9.2% of the 37,12,269 deaths reported globally. The second wave of the pandemic hit more severely than the first leading to high test positivity ratio, more fatalities and health system chaos with the post-COVID complications. **Conclusions:** India needs critical and continuous evaluation of the statistical data over a period of time to review the situation comprehensively and to act accordingly. The country needs to boost up its health care facilities and resources to fight this pandemic.

KEYWORDS: *COVID-19; First wave; Second wave; Post COVID complications; Mucormycosis.*

INTRODUCTION

The COVID-19 pandemic has killed over 3.71 million (as on June 4, 2021) people worldwide.[1] Its devastation and duration are not without precedent. The majority of the pandemics chronicled in olden times have persisted for years together[2] perishing millions of people in different waves, each wave being more devastating than the previous one. The world is facing another such pandemic which originated in Wuhan, China. Like most of the 220 affected countries, India was also in the grasp of the massive and more disastrous second wave of COVID-19, possibly due to several lacunae on diversified fronts. Towards the end of September 2020, when people just started to come out of their shells, thinking the pandemic was at an end, the microscopic enemy was actually preparing to attack again. This time it invaded with more intensity making everybody equally vulnerable, and posed a question to the Indian health care system, making people struggle for oxygen, beds and even essential medicines.

Coronaviruses are RNA encapsulated viruses with crown like appearance belonging to the family *Coronaviridae*. They are dispersed among birds, humans, other mammals and are responsible for viral nasopharyngitis, enteric, respiratory, hepatic, and neurological diseases.[3,4] Six coronavirus species are known to cause human diseases**.** Out of these, four (OC43, NL63, 229E and HKU1) are widespread and responsible for common cold like symptoms in immunocompetent people.[5] Rest of the two strains are SARS-CoV, which was the causal agent for severe respiratory syndrome outbursts in Guangdong Province, China in the year 2002 and 2003[6,7] and MERS-CoV, the infectious agent that caused dreadful respiratory disease eruptions in the Middle East in year 2012.[8] These two strains are zoonotic in origin and are sometimes causative of severe and fatal ailments.[9] These RNA viruses are the most common class of pathogens that are likely to emerge frequently in humans with the discovery of couple or more novel viruses each year.[10] This is the rationale behind the special concern for these viruses among all the pathogens, which probably are involved in interspecies transmission. Their genetic diversity, wide distribution, remarkable adaptability, frequent recombination of genome, faster mutation rates and in

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Research Article

Development of sugar free cookies with novel biodegradable packaging film

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Abstract
The use of alternative sweeteners can help manage weight and normal blood glucose levels of diabetics. Development and standardization of sugar free, low glycemic index and high fibre cookies using wheat flour, oats, *trans* free bakery shortening, and almonds. Physiochemical analysis of the raw materials used for cookie preparation and the finished product was conducted. Cookies were analysed for diameter, height, spread ratio, texture, and water activity. Sensory analysis using semi-trained panellists was done to establish the acceptability of the product. The formulated cookies were well accepted by the semi-trained panellists as well as the people with diabetes who were randomly selected for the study. The overall appearance, texture and flavour of the cookies were moderately liked by the panellists as indicated in the qualitative descriptive analysis. The product did not change much with the storage of 90 days. The cookies were high in dietary fibre (2.5g per serving), out of which β- glucan, a soluble fibre was found to be 0.8g per serving which offers a healthy alternative for consumers. The biodegradable polymer used for packaging the cookies was prepared using terpolymer. The chemical and physical properties of the polymer were determined using acid value which was between 0.0195 and 0.0200, hydroxyl value; 0.0260 and 0.023 and the molecular weight was in the range of 10,256 δ and 10,000 δ of the terpolymer A and B, respectively. The polymer demonstrated good mechanical strength as well as ~~and~~ water vapours barrier properties to be used as a primary package for cookies.

Keywords: Glycemic Index, High Fiber, Diabetics, biodegradable, packaging

INTRODUCTION

India has been recently declared as the 'diabetic' capital of the world. One in every five persons in India suffers from diabetes and other related disorders (Joshi *et al.*, 2005). According to the International Diabetes Federation (Diabetes Atlas ninth edition, 2019) an estimated 463 million (9.3%) adults aged 20–79 years are currently living with diabetes. This number is predicted to rise to 578 million (10.2%) by 2030 and to 700 million (10.9%) by 2045. People suffering from diabetes are advised to restrict their use of sugars. (Aggarwal, *et al.,* 2016) The use of alternative sweeteners can help manage weight and normal blood glucose level (Deshmukh, *et al.*, 2019).

Cookies have gained popularity amongst consumers due to their ease in availability, affordability, varietal flavours, and light texture. They are shelf-stable, ready to eat, wholesome, nutritious snacks with enhanced value addition. However, due to the growing health consciousness of the consumers, foods containing high amount of sugar and fat with high glycemic index (GI) may predispose them to overweight and obesity. (Handa *et al.*, 2012). Nowadays, cookies made from oats are much in demand because of their enhanced functional properties. Oats are rich in dietary fibre, specifically, β- glucan, which is a soluble fibre, known to reduce blood cholesterol level by increasing the excretion of bile in the body (Jenkis and Kendal 2002). In addition to this it is also high in proteins, minerals such

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Spatial dependency of the groundwater uranium in the alluvial soil region of Gunnaur, India

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Abstract
GIS based groundwater uranium and other physico-chemical parameters pH, electrical conductivity, oxidation reduction potential, temperature, chloride, fluoride, nitrate, sulphate, phosphate, total hardness, calcium, magnesium, bicarbonate were analyzed in the alluvial soil region of Gunnaur tehsil of India. A comprehensive study of spatial distribution, spatial autocorrelation, uranium speciation, bi-variate spatial correlation and multi-variate cluster variable analysis assessment were conducted in order to determine uranium linkages with other water parameters. The minimum, mean and maximum values of uranium concentration were found to be below detection level, 9.33 µg/L and 51.5 µg/L, respectively. 92.85% of the samples had uranium concentration below 30 µg/L, which was within WHO prescribed limit. $Ca_2UO_2(CO_3)_3$ was found as dominating uranium species. Spatial distribution and bi-variate analysis showed linkages between uranium with calcium and bicarbonates. Cluster analysis showed that pH, oxidation reduction potential and fluoride levels were the driving factors of uranium with a 43.3092 similarity level.

Keywords Uranium · Groundwater · Cluster variable analysis · Alluvial Soil · Moran's I

Introduction

Groundwater is the main source of drinking and irrigation in rural India. More than 90% of the extracted groundwater is used for irrigation purposes [1]. Severe groundwater decline due to over exploitation is reported from New Delhi, Haryana, Punjab and Rajasthan [2]. This over exploitation and changing of precipitation patterns has challenged the sustainability of water for the country. In addition to groundwater depletion, its contamination is also a global challenge. High concentrations of various contaminants such as fluoride [3], nitrate [4], persistent organochlorine pesticide residues [5], nickel [6], arsenic [7], lead [8], copper [9], uranium [10] were reported from different parts of the world.

As a radioactive element, uranium has radiological toxicity as well as chemical toxicity even at trace levels. For human beings its chemical toxicity is of more concern rather than radiological toxicity. Many researchers reported that excess exposure to ingested uranium leads to nephrotoxic effects in human beings [11]. In India, till now the Bureau of Indian Standards (BIS) did not include uranium in the list of drinking water standards (BIS-10500). However, the Atomic Energy Regulatory Board (AERB) has fixed, radiological based, a uranium limit of 60 µg/L for drinking water [12]. The World Health Organization (WHO) and the United States Environmental Protection Agency (USEPA) have set 30 µg/L as the maximum limit of uranium in drinking water [13, 14].

The sources of uranium in groundwater are both anthropogenic and geogenic in nature. Anthropogenic sources include uranium mining, nuclear disposal sites, phosphate fertilizers [15], etc. and geogenic sources are high-uranium source rocks. The occurrence, mobility and speciation of uranium are affected by the oxidation state, pH, rock-water interactions, adsorption/ desorption and ligands present in the water [16].

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Synthesis, Characterization, Antimicrobial, MTT assay, DFT study of Co(II), Ni(II), Cu(II) and Zn(II) Complexes with some New Schiff Base Ligands

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Abstract

Novel Schiff base ligand HL was synthesized by the condensation of 3,5- dichlorosalicylaldehyde and 4-phenylsemicarbazide. Co(II), Ni(II), Cu(II) and Zn(II) complexes were synthesized in 1:1 molar ratio of metal to ligand. The structure of the synthesized ligand was established using 1H NMR, IR, Mass spectrometry and the metal complexes were characterized using IR, Mass spectrometry, UV-Vis, powdered XRD and molar conductivity. The thermal stability of the complex was studied by TGA. In DFT studies, the geometries of Schiff bases and metal complexes were fully optimized with respect to the energy taking the 6-31+g (d,p) basis set using Gaussian 09w, several molecular properties were also calculated. The spectral data show that ligand HL behaves as uninegative tridentate. On the basis of spectral studies, an octahedral geometry has been assigned for Co(II), square planar for Cu(II) and tetrahedral for Ni(II) and Zn(II) complexes. The antimicrobial activities were examined against some human pathogenic strains. The MTT assay was screened against mouse fibroblast cell line. The result indicates that metal complexes show increase in cytotoxicity in proliferation to cell line as compared to the free ligand.

Key Words: Schiff base; metal complexes; powdered XRD; DFT; antimicrobial; MTT assay

1. Introduction

Schiff base ligands are the important class of compounds as they have azomethine [–C=N] group. Due to the presence of azomethine group in Schiff base transition metal complexes, they are responsible for various biological applications such as antibacterial, anticonvulsant, anti-HIV, anti-inflammatory, antifungal, antimicrobial, DNA linkage and anti-tumour activities [1-5]. Schiff base ligands are privileged ligands due to the ease of synthesis and stability under various conditions. The multidentate Schiff base ligands are so versatile that they can easily form complex with any metal ion. Aromatic aldehyde forms stable Schiff bases as compared to aliphatic aldehydes due to the presence of effective conjugation in aromatic aldehydes [6]. Schiff base ligands having N or O donor atom are capable to bind with different metal ions [7]. From the literature survey, it is revealed that salicylaldehyde derivatives having one or more halogen atom in the aromatic ring, showed a broad range of biological activities such as antibacterial, antimicrobial and antifungal activities [8]. Amongst

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ORIGINAL CONTRIBUTION

A correlation of thermodynamic parameters with size of copper-chelated albumin aggregates

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Abstract

Protein conformations are strictly related to its biological function, and the variation in the structure has a major impact on human health. Metal ions are known to participate in the numerous severe pathological transformations that lead to protein aggregation. We explored the binding of Cu(II) ions to albumin with variation in extent of aggregation. The proportion of aggregates of albumin is varied by changing the time of thermally induced aggregation at the temperature of 65 °C. Utility of isothermal titration calorimeter (ITC) to study the interaction of aggregated protein with copper has not been explored yet. Establishing the association between the size of aggregates and thermodynamic parameters obtained on interaction between aggregated proteins with the metal ion will prove beneficial for future scientific applications of drug-protein interactions. We have determined the thermodynamic parameters of metal ion binding to aggregated bovine serum albumin. The size and aggregation of protein was investigated by using dynamic light scattering and size exclusion chromatography respectively. We have found that the electrostatic interaction between the aggregates and the Cu(II) is predominant.

Keywords ITC · BSA Copper binding · Protein aggregation

Introduction

Copper has numerous roles in biological, synthetic, and industrial methods, making it essential for almost all known forms of life. Consequently, to preserve copper at cellular level, copper binding sites have been identified in many proteins. Albumin is the most abundant protein in human blood and acts as transporter of metal ions through its binding at a specific site[1–3] attributed to its structural flexibility [4]. Human serum albumin constitutes 60% of total protein, accounting for major contribution to osmotic pressure of blood. With a high level of structural identity between bovine serum albumin (BSA) and human serum albumin, binding sites with BSA have been investigated by various research groups with the aim of exploration of insights into metal-serum albumin interactions [5–9]. Three different binding sites in the BSA have been characterized for various metal ions with different binding affinities [5–9]. These are (i) N-terminal sites for Cu(II) or Ni(II) ions, (ii) His67 for Zn(II) or Cd(II) ions, and (iii) Cys-34 for Au(I) ions. Among the cationic metal ions, copper deserves particular attention because of its competence to generate reactive oxygen species (ROS) after reaction with oxygen. Cu(II) bound to protein is less prone than free Cu(II) to react with H_2O_2 to form toxic hydroxyl radicals. In particular, the α-amino nitrogen, first two deprotonated amides, and the imidazole nitrogen of the histidine residues (at third position) form square planar coordination for Cu(II) binding [10]. The N-terminal binding site consists of three amino acid residues (Asp/DThr/T-His/H) and is the first Cu(II) binding site. Albumin has 35 cysteine residues, 34 of which are involved in disulfide bonds to stabilize the protein, but allow significant variation in shape and size of protein to biophysical influences and changes in pH as well. Cys-34 is a free thiol, however, its pK_a is lower around this residue such that Cys-34 is deprotonated thiolate at physiological pH. Zhang et al. have reported thermodynamics of Cu(II) binding to the N-terminal site of albumin and have shown that the effect of this site depends on the properties of Cys-34 residue [11]. It has been reported that when BSA was incubated at 58 °C with increase in duration of heating, it underwent intermolecular aggregation and helped in establishing that

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Impact of Labour Market Flexibility on Output and Employment in Organised Manufacturing Sector

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The restricted size of the labour market due to alleged inflexibility of labour laws has had a direct impact on employment generation and output growth. The amendments made in the Industrial Dispute Act, 1947 and the Contract Labour Act, 1970 are considered to make labour markets more flexible by making provisions for contractualization of the labour force. This paper explores empirically the impact of contractualization of labour force on employment growth and output growth in the organised manufacturing sector in India. We conclude that though labour market flexibility has no statistically significant impact on output growth, it is found to have a statistically significant negative impact on employment growth in the organised manufacturing sector in India.

Keywords : Labour Market Flexibility, Output Growth, Employment Growth, Organised Manufacturing Sector, Industrial Dispute Act.

Introduction

Industrialisation is considered to be a key engine in achieving rapid economic growth in an economy. Since the advent of planning, industrialisation became an important area of consideration for economic reforms by policymakers. The proportion of the working-age population (15-64) to total population increased at a rapid rate in the post-independence era, leading to problems related to the creation of jobs in the manufacturing sector. The announcement of the New Industrial Policy as a part of the Eighth-Five-Year-Plan (1992-1997) was an attempt to achieve future economic growth via changes in the structure of manufacturing sector. These changes employed policies like delicensing of industries, opening up of the economy for foreign direct investment and decreasing import tariffs. The aim was to promote growth and efficiency of the manufacturing sector which would help in generation of productive employment, an important ingredient

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ORIGINAL RESEARCH
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Health Benefits Due to Reduction in Respirable Particulates during COVID-19 Lockdown in India

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ABSTRACT

To control the spread of the coronavirus (COVID-19) pandemic, the Government of India imposed various phases of lockdown starting from the third week of March 2020. Improvement in city air quality has emerged as a benefit of this lockdown in India. The objective of this paper is to quantify the health benefits due to this lockdown. $PM_{2.5}$ concentrations in nonattainment cities (NACs) in Uttar Pradesh and the Delhi-National Capital Region (NCR) in North India were studied. Data from prelockdown and the various lockdown phases were compared, with 2019 as a benchmark. Compared with those in 2019, the $PM_{2.5}$ concentrations during lockdown Phase 1 were approximately 44.6% lower for cities in Uttar Pradesh and approximately 58.5% lower for the Delhi-NCR. The health impacts of particle inhalation were quantified using the multiple-path particle dosimetry and AirQ+ models, which revealed that the most considerable improvement was during lockdown Phase 1. Among the prelockdown and lockdown phases, Phase 1 exhibited the minimum $PM_{2.5}$ concentration and thus the greatest health benefits. For the selected cities, the concentration of particle deposition in the tracheobronchial region of human lungs showed its maximum reduction during lockdown Phase 1(30.14%). Furthermore, the results highlighted a decrease of 29.85 deaths per 100,000 persons during lockdown Phase 1, primarily due to the reduction in $PM_{2.5}$ concentrations. This quantification of the health benefits due to a decrease in $PM_{2.5}$ may help policymakers implement suitable control measures, especially for NACs, where the respirable particulate matter concentrations remain very high.

Keywords: $PM_{2.5}$, Nonattainment city, AirQ+, COVID-19, Health benefit quantification

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1 INTRODUCTION

Coronavirus disease 2019 (COVID-19) was first reported in Wuhan, China, in December 2019 and is currently the most severe global health pandemic of the twenty-first century. The World

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RESEARCH ARTICLE

Water-insoluble carbonaceous components in rainwater over an urban background location in Northern India during pre-monsoon and monsoon seasons

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Abstract

The carbonaceous content of rainwater was investigated in samples collected at an urban background site in northern India. Sampling was performed on an event basis during two seasons: pre-monsoon (PM) and monsoon (MN) season covering May–June and July–August, respectively, in 2016. The concentrations of different fractions of water-insoluble organic carbon (WIOC) and elemental carbon (EC) were precisely determined, and the sources of WIOC and EC were also analysed. The result revealed that the average WIOC and EC concentration in rainwater ranged from 0.4 to 52 mgC/L and from 0.1 to 15.3 mgC/L, respectively. The concentrations of WIOC and EC were found to be ~ 9 times and ~ 12 times higher, respectively, in the PM season than MN season. The WIOC/EC ratio indicated higher variation in PM season as compared to that of the MN season, suggesting divergent emission sources during the PM season. The formation of water-insoluble secondary organic carbon (WISOC) has also been identified as one of the causes for the extensive difference in the WIOC/EC ratio in different seasons. Results showed that the WIOC and its fractions were efficiently scavenged through rain. While EC and its fractions were less significantly scavenged, due to its hydrophobicity and fine size. The atmospheric scavenging coefficients of selected carbonaceous components were found significantly correlated with rain intensity (RI) during both the seasons. Higher rain intensity caused greater rates of carbonaceous component wash-out and decreasing concentrations of carbonaceous components in the rain.

Keywords Rainwater · Carbonaceous component · WIOC/EC ratio · Char · Soot · Scavenging coefficient

Introduction

Carbonaceous components are an important fraction of atmospheric aerosol and contribute approximately 20% to 50% of the overall aerosol mass (Kanakidou et al. 2005; Cao et al. 2007) and play an important role in the field of health, visibility and climate (IPCC 2001; UNEP and NOAA: Project Atmospheric Brown Clouds (ABC) 2002; Pope et al. 1995; Lighty et al. 2000; Sonwani and Kulshreshtha 2016, 2017, 2018, 2019; Bond et al. 2013; Zhou et al. 2012; Janssen et al. 2011). The carbonaceous component can be classified under two major classes: organic carbon (OC) and refractory light-absorbing elemental carbon (EC) (Zhang et al. 2007; Pachauri et al. 2013; Gu et al. 2010). The organic component can be further divided into water-insoluble OC (WIOC) and water-soluble OC (WSOC). WSOC is involved in particle–cloud interactions and affects various heterogeneous reactions affecting atmospheric particulate and trace gases (Decesari et al. 2000; Begum and Minar 2012). Natural (sea spray, soil, dust and emissions from plants) and anthropogenic activities (incomplete combustion of fossil fuel and biomass) are important sources of primary OC (POC) in the atmosphere, while incomplete combustion activities are an important source of EC in the atmosphere (Seinfeld and Pankow 2003; Gao et al., 2018; Sonwani 2016; Sonwani et al. 2016; Streets et al. 2001; Wang et al. 2012). A secondary OC (SOC) is generated through the gastoparticle transformation and atmospheric oxidation reactions from volatile organic compounds (VOCs)

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tourism and recreational activity curbs, highway blocks, air travel diversions etc. are some of the major losses incurred from large scale, recurrent forest fires.

Fire incidences strongly depend on fuel type, climate–weather patterns, availability of ignition agents, and level of human interference (Flannigan et al., 2005, 2016). Globally, it is recognized that ∼80% of forest fires are anthropogenic in nature (FAO, 2007). In India, ∼50% of the forest areas are classified as fire prone and >95% of forest fires are of anthropogenic origin (Babu et al., 2016; Forest Survey of India [FSI], 2020; Satendra & Kaushik, 2014). In tropical countries such as India, forest fire is regularly used as a tool to make land available for agriculture, whether for shifting (Jhum) cultivation or permanent conversion to cropland (Ahmad et al., 2018; Chakma & Nahar, 2012; Crutzen & Andreae, 1990). Accidental and intentional fires caused by negligently discarded cigarette butts, campfires, debris burning, and acts of arson are also important forest fire ignition agents (Babu et al., 2016; Forest Survey of India [FSI], 2019; Sevinc et al., 2020). Given favorable weather conditions these anthropogenic fires can quickly become uncontrolled and spread to wide areas of the forest, ultimately turning into a large-scale disaster (Lamat et al., 2021). The occurrence, frequency, and intensity of forest fires is also linked to changing weather and climatic conditions such as warmer temperature, precipitation deficits, increased number of dry days, and El Niño-Southern Oscillation (ENSO) events. El Niño years are characterized by above normal temperatures and reduced precipitation across the tropics (Chen et al., 2017; National Oceanic and Atmospheric Administration [NOAA], 2021) and can lead to an increase in fire incidences, burnt area and pollutant emissions from fire activity (Larkin & Harrison, 2005). Similarly, severe and prolonged regional heatwaves take away moisture from the atmosphere and the soil, along with drying out timber, fire wood, understory shrubs, and forest floor grasses, which can significantly increase the likelihood of droughts and forest fires (Jain, 2021; Littell et al., 2016; Prasad et al., 2008; Whitman et al., 2019). Lightning strikes, such as those witnessed in the 2020 California fires, can also act as a major natural fire ignition agent in dry forests (Cattau et al., 2020; Li et al., 2020).

In India, land clearance activities and frequent droughts have engendered enormous, unrestrained vegetation fires that have burned down many large areas of forest and agricultural land (Reddy et al., 2017; Vadrevu et al., 2006). Moreover, crop residue burning after harvest is an extensively practiced activity by farmers in India (Sarkar et al., 2018; Saxena et al., 2021) and can become a forest fire hazard. Forest fire incidences in turn cause further land degradation, worsen local to regional scale environmental health, release trapped carbon dioxide (CO_2) back into the atmosphere and significantly contribute to global warming (Flannigan et al., 2000; Henderson et al., 2011). While some forest fires benefit the ecosystem by clearing away snag trees and forest floor debris, recycling nutrients back to the soil, opening up canopy, and promoting healthier subsequent forest generation, in most cases however, frequent, uncontrolled, and massive fires are immensely harmful to the ecosystem (Bond & Keeley, 2005; Meyn et al., 2007; North et al., 2012; Reddy et al., 2017). Several studies also highlight that forest fires can be responsible for soil erosion and can affect the water quality (Hewelke et al., 2020; Massman et al., 2003). Thus, forest fires significantly affect the forest structure, ecological processes as well as hydrological and biogeochemical cycles (Bond & Keeley, 2005; Massman et al., 2003; Turner, 1989).

Forest fires also emit large quantities of particulate matter (PM) and black carbon (BC) as well as trace gases for example, CO_2, carbon monoxide (CO), methane (CH_4), hydrocarbons, and oxides of nitrogen (NO_x) and frequent fires can alter atmospheric chemistry (Bibi et al., 2017; Crutzen & Andreae, 1990; Ribeiro-Kumara et al., 2020). Globally, biomass burning contributes to 20%–30% of CO_2 emissions and hydrocarbons, CO and NO_x, 42% of BC, and 74% of primary organic carbon (Andreae, 1991; Bond et al., 2004; Saxena et al., 2021). Moreover, over India, Reddy et al. (2017) estimated that 67.83, 4.47, 0.29, 0.01, and 0.07 Tg/yr of CO_2, CO, CH_4, NO_x, and N_2O, respectively were emitted from protected area forests (such as national parks, sanctuaries, conservation and community reserves) in the year 2014. Several studies also highlight that aerosol loading is the highest during the forest fire season (Mitchell et al., 2014; Saxena et al., 2021; Tosca et al., 2013). This is of particular importance in countries such as India, where aerosol load is already significantly high due to air pollution and dust (Dey et al., 2004; Sonwani & Kulshrestha, 2019; Sonwani & Saxena, 2021). In such circumstances, a high forest fire activity can worsen the already poor air quality in India and significantly impact human health.

Satellite observation based thermal anomalies and active fire data sets are a convenient, easily accessible, and a reliable tool to provide long-term continental to local scale fire information and to continuously monitor forest fires over various parts of the world (Giglio et al., 2009, 2016; Jain, 2021; Kale et al., 2017; Littell et al., 2016; Yang et al., 2021). Even though attention towards the impact of forest fires in the tropics has greatly increased over the past few decades (Goldammer & Price, 1998; Saxena et al., 2021; Vadrevu et al., 2006), research on

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On a sum form functional equation emerging from statistics and its applications

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Abstract

In this paper, we obtain the general solutions of a sum form functional equation arising from the expected value of a discrete random variable. The significance of its general solutions in reference to entropies emerging from information theory and diversity index has been discussed.

Keywords: Additive mapping; bounded mapping; linear mapping; logarithmic mapping; the entropies of type (α, β); diversity index; expectation of a discrete random variable.
2010 MSC: 39B52, 39B82.

1. Introduction

Over the years, research in the field of functional equations with reference to information theory has evolved into studying those functional equations which are useful in characterizing entropies. The study of these entropies is interesting as well as demanding since they have been used in a wide variety of studies in Economics (Gini [4]); Ecology (Pielou [25]); Biology (Lewontin [11]) and many more. Thus this integrative approach of functional equations inspired us to explore those functional equations which not only characterizes entropies but are related to new branches too. In this paper, we have identified a functional equation arising from statistics and obtained its general solutions. Further, we have tried to establish a connect of this functional equation with information theory and diversity index.

Throughout the paper, let $\mathbb{R}$ denote the set of real numbers; I denote the closed interval $[0, 1]$. For $n = 1, 2, \ldots$; let

$$\Gamma_n = \left\{ (p_1, \ldots, p_n)\,;\ p_i \geq 0,\ i = 1, \ldots, n;\ \sum_{i=1}^{n} p_i = 1 \right\}$$

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On the stability of a nonmultiplicative type sum form functional equation

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Abstract. Our purpose is to obtain all possible general solutions of a sum form functional equation containing two unknown mappings and also discuss criteria for stability of the same.
Keywords: additive mapping, logarithmic mapping, entropy of type (α, β), stability.

1. Introduction

For $n = 1, 2, \ldots$; let

$$\Gamma_n = \left\{ (p_1, \ldots, p_n); p_i \geq 0, i = 1, \ldots, n; \sum_{i=1}^{n} p_i = 1 \right\}$$

denote the set of all n-component discrete probability distributions. Let $\mathbb{R}$ denote the set of real numbers; I denote the unit closed interval $[0, 1]$, i.e. $I = [0, 1] = \{x \in \mathbb{R} : 0 \leq x \leq 1\}$ and I^* denote the interval $]0, 1]$, i.e. $I^* =]0, 1] = \{x \in \mathbb{R} : 0 < x \leq 1\}$.

One of the captivating branches of research work in the field of functional equations with reference to information theory is to study those functional equations that are used to characterize various entropies. For a probability distribution $(p_1, \ldots, p_n) \in \Gamma_n$, the Shannon entropy [15] is defined as follows:

$$H_n(p_1, \ldots, p_n) = -\sum_{i=1}^{n} p_i \log_2 p_i \tag{1.1}$$

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On the stability of a multiplicative type sum form functional equation

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Abstract

In this paper we intend to discuss the stability of a sum form functional equation

$$\sum_{i=1}^{n}\sum_{j=1}^{m} f\left(p_i q_j\right) = \sum_{i=1}^{n} k\left(p_i\right)\sum_{j=1}^{m} q_j^{\beta}$$

where f, k are real valued mappings each having the domain I; $(p_1, \ldots, p_n) \in \Gamma_n$, $(q_1, \ldots, q_m) \in \Gamma_m$; $n \geq 3$, $m \geq 3$ are fixed integers and β is a fixed positive real power different from 1 satisfying the conventions $0^{\beta} := 0$ and $1^{\beta} := 1$.

Keywords: Additive mapping; bounded mapping; functional equation; stability of a sum form functional equation.
2020 AMS subject classifications: 39B52, 39B82. [1]

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Estimating the Parameters of COVID-19 Cases in South Africa

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In this paper we employ SIR model to study the Covid-19 data of South Africa for a chosen period. This model is solved using three numerical methods, namely, Differential Transform Method (DTM), Multistage Differential Transform Method (MsDTM), Repeated Multistage Differential Transform Method (RMsDTM) to obtain approximations of the number of susceptible, active infected and recovered in South Africa for 60 days starting from June 1, 2021. The proximity of the solution of the RMsDTM to the actual data in comparison to solutions using the other two methods was observed. MsDTM is an improvement over DTM as it uses updated values of the variables as new initial conditions at each iteration of the method. RMsDTM, in which the values of parameters are also changed at suitable intervals of time, besides using updated values of variables is a further improvement over both these methods.

Keywords: Approximation,; Covid-19; Differential Transform Method (DTM); Multistage Differential Transform Method (MsDTM); Pandemic; Repeated Multistage Differential Transform Method (RMsDTM); South Africa; SIR Model.

Time and again, many pandemics have wrecked havoc on mankind. Spanish flu, almost a century ago; H1N1 Swine flu pandemic, a decade back; and from recent past – the Ebola and Zika virus pandemics have affected mankind adversely. Coronavirus disease is a highly contagious disease caused by SARS-CoV-2[1]. Post its probable initiation in Wuhan, China, in December 2019, it spread rapidly across the globe, turning into one of the worst pandemics that human civilisation has ever seen. The Coronavirus was a novel virus, causing mild to moderate respiratory illness in most of the affected people. However, in some cases, the virus also led to serious diseases, sometimes even leading to death. There has been extensive research to understand the behaviour of this virus, in order to contain its spread and cure the infected. Many lives have been lost and a huge economic crisis has engulfed several countries due to the restrictions in travel and trade. Epidemics are region-specific

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ANALYSIS OF COVID-19 SPREAD IN HIMALAYAN COUNTRIES

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ANALYSIS AND PREDICTION OF COVID-19 SPREAD USING NUMERICAL METHOD

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Abstract

In this paper, we have discussed the impact of Coronavirus variants in a phase of 2021-22 along with a previous phase of 2020-21 in Italy. We analyse and compare the Covid-19 scenario in Italy for the period from October 04, 2020 to January 16, 2021 with a period from October 04, 2021 to January 16, 2022. For this study, we have used repeated multi-step differential transform method (RMsDTM). Also, we have predicted the number of active cases for 10 days following the period of study.

1. Introduction

Covid-19 is a highly communicable disease, known to be caused by the SARS CoV-2 virus. The disease largely has mild to moderate effect on people, though mortality has also been a significant outcome of the infection. Covid-19, first reported in China in December 2019, was declared Public Health Emergency of International concern by World Health Organization on January 30, 2020 [29]. Subsequently, on March 11, 2020 it was officially declared to be a pandemic. The disease spread to almost all countries and impacted them in various measures and ways. Besides loss of lives, livelihoods were also lost. In order to contain spread of the disease, restrictions were implemented on unnecessary movement of individuals. Social distancing was maintained through imposing curbs on gatherings at weddings, parties and funerals. Non-essential businesses were shut down.

To cut the costs, some businesses altered their mode of work by either shifting their office to a smaller area or through shifting to work from home. Restaurant industries also switched over from dine-ins to takeaways and home deliveries. Tourism industry saw a major decline. Such restrictions

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Original research article

A new numerical scheme based on Haar wavelets for the numerical solution of the Chen–Lee–Liu equation

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Abstract

This work based on a new numerical scheme for the numerical solutions of the Chen–Lee–Liu equation using Haar wavelet collocation method. In this work, we combined the backward Euler difference (BED) formula with the Haar wavelet collocation method

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NONLINEAR SYSTEM OF MIXED ORDERED VARIATIONAL INCLUSIONS INVOLVING XOR OPERATION

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ABSTRACT. In this work, we introduce and solve an NSMOVI frameworks system involving XOR operation with the help of a proposed iterative algorithm in real ordered positive Hilbert spaces. We discuss the existence of a solution of a considered system of inclusions involving XOR operation by applying the resolvent operator technique with XOR operation and also study the strong convergence of the sequences generated by the considered algorithm. Further, we give a numerical example in support of our considered problem which gives the grantee that all the proposed conditions of our main result are fulfilled.

Key words and phrases: Comparison; Convergence; Ordered; (α_A, λ)-XOR-weak-ANODD multi-valued mapping; System; XOR Operation.

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RESEARCH ARTICLE

A computational approach for finding the numerical solution of modified unstable nonlinear Schrödinger equation via Haar wavelets

Abdullah Abdullah, Mohd Rafiq

Source

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Abstract

In this work, we combined the Haar wavelet collocation method with the backward Euler difference formula to determine the approximate solutions of the modified unstable nonlinear Schrödinger equation. The backward Euler difference formula estimates the time derivative term and the Haar wavelet collocation method estimate the space derivative terms of the modified unstable nonlinear Schrödinger equation. This approach reduces the modified unstable nonlinear Schrödinger equation into a finite system of linear equations. In addition, we substantiate the efficiency and accuracy of the method graphically and numerically with the help of four examples.

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Fractal basins of attraction in a binary quasar model

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What do these dates mean?

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Highlights

- The position of equilibrium points are monitored with respect to the parameters the distances between galaxies (R), the masses of disk and nucleus of galaxies ($M_{d1}, M_{n1}, M_{d2}, M_{n2}$).
- The zero velocity curves are investigated under the effect of above

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ORIGINAL RESEATCH

Solution of singularly perturbed differential difference equations and convection delayed dominated diffusion equations using Haar wavelet

Akmal Raza[1] · Arshad Khan[1] · Pankaj Sharma[2] · Khalil Ahmad[3]

Received: 22 December 2018 / Accepted: 25 September 2020

Abstract
In this paper, we apply Haar wavelet collocation method to solve the linear and nonlinear second-order singularly perturbed differential difference equations and singularly perturbed convection delayed dominated diffusion equations, arising in various modeling of chemical processes. First, we transform delay term by using Taylor expansion and then apply Haar wavelet method. To show the robustness, accuracy and efficiency of the method, three problems of second-order singularly perturbed differential difference equations and three problems of convection delayed dominated diffusion equations have been solved. Also, results are compared with the exact solution of the problems and methods existing in the literature, which confirms the superiority of the Haar wavelet collocation method. We obtained accurate numerical solution of problems by increasing the level of resolutions.

Keywords Haar wavelet · Singularly perturbed · Convection delayed · Differential difference · Differential equations · Collocation point

Mathematics Subject Classification 65L03 · 65L10 · 65L11 · 65L12 · 65M70 · 65N35 · 42C40 · 42C42

Introduction

It appears from literature that using certain cautions, simple delayed mass-action systems can be used in chemical miniature. The Brown and DO miniature are indications in this direction [7]. The greatest serious magnificent problem is the treatment of fully unpredictable mechanisms operating near equilibrium in which systems require properly distributed delays. In a similar way, hypoglycemia remains a big barrier to the intensification of insulin therapy of a diabetic patient. Continuous glucose-monitoring devices measuring interstitial fluid glucose exhibit time delays when compared to capillary blood glucose. Short delays exist due to diffusion through glucose membrane, as the process of diffusion often depends upon membrane thickness [28]. Lower levels of glycated hemoglobin are unfortunately associated with an increased risk of hypoglycemia [18]. There are many reasons why we might wish to develop the class of miniature available among scholars to include delayed variable formulations. In several recent chemical miniature theories, delay differential equations (DDEs) are being used in place of the usual mass action ordinary differential equations (ODE) [44]. DDEs present important opportunities and unique problems for chemical miniature. Importance of creating a DDE model of a chemical system is shifted from tagging intermediates and their reactions to describing the dynamic affairs between the concentrations of key species. In preliminary investigations, the level of description afforded by

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A Comparative Study of Fluid Flow in Hemodialyzer using Differential Transform Method

Pradeep Kumar Singh and Pankaj Sharma**

In this paper, a series-based method called differential transform method (DTM) is used (which is relatively simple and high accurate) for solving the differential equations in biofluid problems. Diffusion equation governed during laminar flow of blood in hemodialysis is solved under the view of this method. The problem formulation of the present paper is modeled under the situation where patients are suffering from renal diseases due to the blockage of semi-permeable membrane in hemodialysis. The problem is modeled as a half channel model of a hemodialyzer (i.e., artificial kidney) and the wall of inner channel model is a semi-permeable membrane in which impure blood of the body loses waste products. In other words, it is described by a diffusion equation along with boundary conditions and angular displacement. Eigenvalues is obtained after the simplification of diffusion equation with different Sharewood number, Peclet number, and angular displacement using DTM. A significant impact on the concentration of unwanted materials found in the blood is observed . The obtained results show that the angular displacement is an important parameter that may be treated as an indicator for the purity (in medical terms) of the blood. Moreover, such solutions are illustrated by tables and figures.

1. Introduction

In today's highly polluted environment, kidney-related diseases are very significant and common problem among human beings. Maintaining the chemical balance of blood by excreting the waste products like uric acid, urea, creatinine etc. are the main works of the kidney in the human body. Thus, kidney failure implies the presence of higher level of concentration of the waste products in the blood of human body. An external device known as hemodialyzer, i.e., artificial kidney may usually use to maintain the chemical balance in the human body. The work of hemodialyzer is same as that of the natural kidney's. So clinical science considers hemodialyzer as a model to study the behavior of the kidney. The diagrammatic picture of the hemodialyzer is shown in **Figure 1** in which impure blood and a chemical mixture (called dialyzate) flow either side of the semipermeable membrane. The semi-permeable membrane is used as an extraction of waste products, reabsorption of water and other molecules, i.e., sodium, potassium, carbohydrate etc. where both the liquids (impure blood and dialyzate) flow in opposite directions.

Non-Newtonian fluids have many applications, especially in biomedical science. For example, blood can be a non-Newtonian fluid whose physical properties have been presented by Abdel Baieth.[1] Blood composedplasma, red and white blood cells, platelets, etc., and can be considered as one of the most important multi-component mixtures occurring in nature. Ogulu and Amos[2] modeled a kind blood flow in the cardiovascular system using the Navier-Stokes equation, and found an increase in the wall shear stress when the porosity of the medium was increased.

One of the model based on velocity and concentration profiles for laminar flow of Newtonian fluid in a dialyzer was proposed by Grimsurd and Babb,[3] which was further extended by Colton et al.[4] for a flat duct with permeable porous walls. In 1972, Verma and Bhatt[5] studied the laminar flow through parallel and uniform walls of different permeability by treating the velocity components in terms of unknown functions, boundary conditions and have successfully produced the velocity distribution and the stream function of flow. Further, Walker and Davis[6] have found the solution for the concentration profiles and mass transfer rates for the various wall Sherwood numbers which was experimentally characterized to understand the mechanical properties of hemodialysis hollow fibers and requirements for dealing with fluid boundary resistances.[7] A mathematical model for a hollow fiber dialyzer along with dialysate side resistance was developed by Klein et al.[8] and the related results in terms of dialyzer efficiency and average Sherwood number has been found.

However, in 2002 a 3D finite volume model of the blood dialysate interface over the complete length of the dialyzer was developed by Schena et al.[9] According to them the dialysate flow was assumed to be an incompressible, isothermal laminar Newtonian flow with a constant viscosity. The permeability characteristics of the membrane were calculated from laboratory tests.

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Happiness across Developmental Stage and Gender

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ABSTRACT

The present study was designed to study differences in happiness across age and gender. The sample consisted of 100 youth (50 men and 50 women) and 100 elderly (50 men and 50 women). The age group for youth and elderly were 20-30 years (Mean=24.75; SD=3.85) and 60-75 years (Mean=68.32; SD=5.14), respectively. The participants lived in the housing societies in Delhi the capital of India. The measure used was Oxford Happiness Questionnaire. Results showed no significant difference in happiness for either age or gender groups. Further the total sample was divided into four groups. No difference in happiness was found between the four groups either. All of them were found to be similar in happiness.

Keywords: Happiness, Youth, Elderly

INTRODUCTION

Happiness is defined as the degree to which one evaluates positively the overall quality of his or her present life as a whole. It can have different meanings both objectively and subjectively. In an objective sense, happiness is living in good conditions, such as material prosperity, peace and freedom. In subjective sense happiness is a state of mind. The term happiness or SWB carries the same meaning and can be used synonymously.

Hedonic conceptions of happiness, define happiness as the enjoyment of life and its pleasures. In contrast, eudaimonic conceptions of happiness, define happiness as self realization, that is the expression and fulfilment of inner potential. Eudiamonic happiness has much in common with humanistic emphasis on the concept of self actualization (Maslow,1968) and the fully functioning person(Rogers 1961)as the criteria for optimal functioning and healthy development. This means that happiness results from striving towards self actualization-a process in which our talents, needs, and deeply held values direct the way we conduct our lives. Eudiamonia or happiness results from realization of our potential.

Many studies have found that age has little relationship to an individual's reported level of happiness (Diener add Lucas 2000; Diener & Suh, 1998; Inglehart, 1990) In a study based on interviews of about 170,000 people from 16 countries, it was found that every age group, from 15years to 65 years and beyond, people expressed almost identical levels of happiness and life satisfaction (Inglehart, 1990). Some studies have found age related declines in happiness and well being. These declines were very small and occurred only among the very old.

In research little evidence was found for the "empty nest syndrome"(Myres&Diener1995) Most mothers are indeed happy to see their children begin their careers, getting married and starting their family. Parents love and enjoy their freedom to carry out and engage in new interests and activities in their "life-after-kids". The " mid-life crisis" assumed to hit men during their 40s has not been found in the researches(Mc Crae & Costa,1990) Research suggest that older adults often enjoy greater well being, more contentment and less anxiety than young adults(Lawton,Kleban,&Dean,1993)

A research team found that consumers are happier when they spend on experiential purchases versus material ones. The paper, "Spending on Doing Promotes More Moment-to-Moment Happiness than Spending on Having," (Kumar, 2020) has discussed this. The basic finding from a lot of experiments is that people derive more happiness from their experiences than from their possessions. The elderly as well as the young have now started spending on experiences like travelling.

Inglehart (2002) found that gender differences in happiness levels were dependent upon age, whereas young (18-44) women are happier than young men, middle aged (45-54) women and men do not differ in terms of happiness, but older (55+) women are less happy than older men.

A recent study by Siamak Khodarahimi (2013) attempted to determine roles of age and gender on the constructs of psychological hardiness, emotional intelligence, self-efficacy and happiness. In this study, 200 Iranian adolescents and 200

Nanoparticles: applications in medicine and agriculture

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Abstract- Nanotechnology, is a rapidly evolving field with immense potential in diverse sectors catering to mankind. Nanomaterials, generated and engineered with the help of nanotechnology offer a multitude of applications in biomedicine as well as in agriculture, owing to the unique, size-based physical and chemical attributes they exhibit. Theranostics, a branch of nanomedicine, employs these small- sized nanoparticles, endowed with large surface area, for diagnosis as well as for treatment of diseases. Agriculture is another sector where nanomaterials have range of applications from acting as fertilizers, enhancing nutrient uptake by the plants from soil, to nanopesticides managing wide spectrum of agricultural pests including- phytophagous insects, fungi and several weeds, resulting into increment in food production. This has generated a lot of interest amongst researchers as agriculture is inextricably connected with food security of an ever growing human population. Agriculture, at present is facing numerous challenges as in one hand climate change is severely impacting the agricultural yield, exacerbating the water crisis and influencing insect pests' distribution range on the other hand it's under tremendous pressure to ensure food security for a mammoth human population despite of dwindling resources. Nanomaterials, therefore, have enormous potential in agricultural sector and researchers are actively engaged in this area but this dimension remains relatively unexplored. However, the very attributes of nanomaterials making them promising candidates for development of novel products in medicine and agriculture also pose challenges due to potential environmental and health hazards, demanding risk assessment studies. Green synthesis of nanomaterials not only offers an ecofriendly, environmentally safe and cost effective solution but may also reduce application of harmful agrochemicals, contaminating environment and penetrating into biological systems through food chain. This critical review attempts to highlight applications of nanoparticles in medicine and agriculture.

Index Terms- Agriculture, environment, food security, nanomedicine, nanoparticles, nanotechnology

Mention the abstract for the article. An abstract is a brief summary of a research article, thesis, review, conference proceeding or any in-depth analysis of a particular subject or discipline, and is often used to help the reader quickly ascertain the paper's purpose. When used, an abstract always appears at the beginning of a manuscript, acting as the point-of-entry for any given scientific paper or patent application.

I. INTRODUCTION

In 1974, Norio Taniguchi, a Japanese Scientist introduced the term Nanotechnology [1] that has turned today into one of the most leading and promising multidisciplinary field with enormous potential in medicine as well as in agricultural sector. Nanotechnology, is a technology that deals with understanding, designing and controlling the matter, approximately in the range of 1-100 nm. The technology relies on the unique properties of matter exhibited at the nanoscale, opening doorways to create materials with novel applications in various fields. Nanotechnology can be used to produce nanoparticles (NPs) that represent a whole class of tiny materials consisting of carbon, metal, metal oxides or organic matter, having at least one of the dimensions less than 100 nm [2]. They can be classified on the basis of dimensions – zero dimensional, one dimensional, two dimensional and three dimensional [3,4]. They can also be classified based on their composition, physical and chemical properties: Organic, inorganic and carbon based nanoparticles. The impact of size on physiochemical properties of matter allow researchers to fine tune a property of interest and thus makes these materials immensely interesting. Further, the large surface area to volume ratio of these materials endows them with high reactivity. Together these properties turn them into ideal candidates for development of novel products with applications in the field of medicine and agriculture. Nanomedicine, an altogether new branch of medicine applying nanotechnology for-detection, prevention, improved diagnosis and treatment of several diseases, has emerged in the past couple of decades. The already existing nanomedicine products display a wide range from applications in drug delivery and pharmaceuticals to bioimaging and diagnostics. A variety of nanomaterials are already serving as alternate tools for rapid disease diagnosis and molecular level disease management [5,6].

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The relationship between PM2.5 and incidence and severity of Covid-19

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Abstract: *Covid-19 viral pandemic enforced restrictions and consequent short term reduction in anthropogenic emissions were reported to bear a positive impact on air quality in many parts of the world. At the same time numerous reports indicated a positive correlation between exposure to certain types of air pollutants especially fine particulate matter and incidence and severity of Covid-19. Several research studies have suggested an increment of Particulate Matter (PM2.5 and PM10) with an associated increase of Covid-19 mortality. Studies have established that aerosols generated from SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2) infected patients serve as a highly virulent direct transmission route while ambient aerosols can act as cargo helping indirect transmission of the virus though viability and virulence of the virus stuck on the surface of particulate matter is not confirmed yet.PM induces lung cells inflammation and exposure to PM could enhance the susceptibility and severity of the Covid-19 patients. This review study was conducted to comprehend the intricate relationship between PM2.5 and incidence and severity of Covid-19. An extensive search was carried out to gather published literature related to the review topic using online PubMed and Science direct databases. Articles focusing on relationship between Covid-19 and air pollutant PM2.5 were selected and analysed, based on their relevance with the current review topic. In conclusion, PM2.5 have a positive correlation with spread and severity of Covid-19. The study has implications for environmental intervention in regions with unusually high number of Covid-19 cases and framing stringent air quality policies to reduce the risk of other fatal outbreaks in future.*

Keywords: *Air pollutants; Covid-19; Particulate matter; PM2.5; SARS-CoV-2.*

1. INTRODUCTION:

It has been two years, world is struggling with Covid-19 a highly infectious and invasive pneumococcal disease caused by Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) first reported in December 2019 in Wuhan, China. By March 2020 the disease transformed from epidemic to pandemic [1] as the virus spread globally, owing to its highly contagious and aggressive nature. The virus affected all sections of society across the globe and a substantially high proportion of global population was infected. As per World Health Organization (data accessed as on 17 December 2021) there have been 271,963,258 confirmed cases of Covid-19 out of which 5,331,019 individuals have lost their lives, due to the disease [2]. SARS-CoV-2 primarily causes respiratory disease as it attacks the lungs but is reported to impact other vital body organs such as brain, heart and kidney too, causing various clinical symptoms [3]. Multiple transmission modes of SARS-CoV-2 [4] enhances the chances of its spread. Though the disease is a serious global health issue but the effects are not homogenous across the globe; few parts of the world affected more severely in terms of its incidence and severity as compared to others. The factors behind the variability could be numerous and we are yet to understand them completely. However, studies have suggested air pollution as a plausible player transmitting and aggravating this novel Corona virus and indicated a positive correlation between higher air pollution levels and Covid-19 [5-11] although some indicated a negative correlation [12]. Higher levels of particulate matter (PM2.5 and PM10) and increased Covid-19 infections and mortality are reported in many cases [13-19] indicating a link between exposure to PM levels and Covid-19 (Table1). In this review study an attempt has been made to understand the impact of PM2.5, a ubiquitous air pollutant on the spread and severity of SARS-CoV-2.

2. MATERIAL AND METHODS:

An extensive search was carried out to gather published literature related to the review topic using online PubMed and Science direct databases. Articles focusing on relationship between Covid-19 and air pollutant PM2.5 were selected and analysed, based on their relevance with the current review topic. Keywords used included: Covid-19, air pollution

North-East India: A Unique Biodiversity Paradise Unexplored or Lost?

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Abstract- The North-East India region is the "gateway" for much of India's flora and fauna as the ecosystem components exhibit great dynamism and has a relatively complex biogeography. It is considered as a genetic treasure house of plants, animals and microbial resources. The region fills in as a rich archive of plant and animal riches in different biological frameworks. Forests in this area vary from tropical, temperate to alpine meadows and cold deserts, having highest diversity of biomes. These biological communities mirror a mosaic of biotic communities at different spatial and hierarchical levels and also show high evolutionary activities. The North-East (NE) region contains more than one-third of the country's total biodiversity and the extent of endemism is exceptionally high in both flora and fauna. The NE region forms a part of Indo-Burma hotspot which is amongst the 34 globally identified hotspots in the world and also four global priority ecoregions are located in this region. This paper aims to highlight the extent of biodiversity of flora and fauna in the North-Eastern region of India, since most of the biota is unexplored or underexplored due to the remoteness of the area and troublesome landscape and has led to poor documentation of the floral and faunal diversity. New species that are being continuously discovered, justify that much is yet to be identified, and studied here. Further the emphasis is placed on the deteriorating condition of the flora and fauna and the measures taken for conservation at national and global levels.

Index Terms- Ecosystem, Biodiversity, Flora and Fauna, Biotic community, Conservation and Endemism

I. INTRODUCTION

North-East India covers the eight sister states which include Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. It is geographically nestled in one of the most biodiversity-rich regions of the world [1]. The tremendous assortment of the climatic, altitudinal and soil varieties in this area pays the route for an incredible scope of natural habitats for the biotic communities. North-East India dwell a wide variety of flora and fauna. Additionally, it has extensive variety of physiographic, economic and social diversity region indicating wide land varieties that differ from the surge field plains of Assam to most noteworthy mountain pinnacles of Khanchanzenga (8586 m) in Sikkim. Also, it is portrayed by highest precipitation territories like Cherrapunji in Meghalaya and the state like Mizoram has most noteworthy level of forest cover with few steep slopes [2]. The North-East region fills in as a rich archive of plant and animal riches in different biological frameworks. These biological communities mirror a mosaic of biotic communities at different spatial and hierarchical levels.Biodiversity means variety of life. Biological diversity is that part of nature which includes the differences in genes among the individuals of a species, the variety and richness of all the floral and faunal species at different scales in space, locally, in a region, and various types of ecosystems within a defined area [3]. On the basis of variation and distribution there are four types of biodiversity (Table 1).

Table 1: Types of Biodiversity [3]

Types of Biodiversity	Definition
i) Species Biodiversity	It is the change occurring in the variety of different types of flora and fauna present in different places in the same geographical area.
ii) Genetic Biodiversity	It deals with the genetic makeup of species and the variation in the genes of the species
iii) Ecological Biodiversity	The variation in the ecological area or environment such as forests, deserts, grasslands, streams and coral reefs etc.
iv) Functional Biodiversity	It refers to study of various types of chemical processes of species like cycling of matter, energy flow etc.

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HEAT TRANSFER ANALYSIS OF FORCED CONVECTIVE FLOW WITHIN AN ENCLOSURE

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Abstract. The paper is to study about the movement of heat analysis with respect to forced convective flow within sideways four-sided enclosure. The mathematical statements of the flow variables are represented using a discrete quantity by virtue of upwind control volume scheme. Non-dimensional parameters are suitably preferred so as to determine $\overline{Nu}$. This $\overline{Nu}$ for the sake of different fluids are calculated by using a suitable empirical correlation and thereby the transfer of heat between the top wall and forced convective flow of these fluids is examined. It is ascertained that, a substantial rise in $\overline{Nu}$ and hence the transfer of heat within the four-sided enclosure by way of forced convective flow of any fluid substantially increases within the sideways four-sided enclosure. The average Nusselt numbers for fluids such as air and water at different Rayleigh numbers of 1, 10, 100, 1000, 1700 in the range of $Ra \leq 1708$ are calculated and observed to increase linearly.

Keywords: four-sided enclosure; Rayleigh numbers; transfer of heat; control volume; forced convective flow.
2010 AMS Subject Classification: 76R10, 76M12, 80A20.

1. INTRODUCTION

The movement of heat in rectangular enclosures has been analyzed empirically and theoretically owing to an extensive enthusiasm in its numerous engineering applications such as

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ORIGINAL PAPER

Bi-Objective Capacitated Transportation Problem with Bounds over Distributions and Requirement Capacities

Sanchita Sharma[1,2] · **Shalini Arora**[1]

Accepted: 8 March 2021 / Published online: 27 May 2021

Abstract
This article explores a class of bi-objective capacitated transportation problem with bounds over the distribution capacity of origin points and requirement capacity of demand points. The concerned problem is converted into an equivalent balanced bi-objective transportation model with upper bound restrictions on the decision variables. The article proposes an iterative algorithm that constructs the comprehensive set of efficient pairs with bounded decision variables. The proposed iterative algorithm obtains efficient pairs in the criterion space and also takes care of upper bound restrictions of the decision variables. A numerical illustrating the algorithm has also been given at the end.

Keywords Bi-objective transportation problem · Capacitated transportation problem · Efficient solutions · Bounded rim conditions

Mathematics Subject Classification 90B06 · 90C05 · 90C08

Introduction

A generalized framework of transportation problem with capacity restriction on the shipping quantity of goods from origin to destination is termed as capacitated transportation problem. The characteristic feature of capacity restriction on the shipping quantity of goods can also be understood as lower and upper bounds of the decision variables. This rather well-known problem has been extended to several areas since its formulation [10,25].

Indeed, capacitated transportation problem is a bounded variable linear program and therefore can be solved by using bounded simplex algorithm. Charnes and Lemke [5] and Dantzig

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ORIGINAL PAPER

Alpha Labeling of Cyclic Graphs

Ajay Kumar[1] · Debdas Mishra[2] · Ajendra Kumar[3] · Vipin Kumar[3]

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Abstract
In this paper, we prove the following results.

(i) The hairy cycle $C_n \odot K_1, n \equiv 0\,(mod\,4)$ possesses an alpha labeling with the missing number $\frac{3n}{2}$.
(ii) The graph obtained by joining any path to a vertex of the cycle C_n, $n \equiv 0\,(mod\,4)$ possesses an alpha labeling with identifiable the missing number.
(iii) A graph obtained by joining two isomorphic copies of the graph in (ii) possesses an alpha labeling with the identifiable missing numbers.

Keywords Isomorphic graphs · Graceful labeling · Alpha labeling · Hairy cycles · Missing numbers

Mathematical Subject Classification 05C78

Introduction

The notion of graph labeling techniques evolved while people tried to address the problems involving graph decomposition. Alaxander Rosa [20] introduced varieties of graph labeling schemes including the most widely explored graceful and alpha labelings. Rosa [20] defined a *β-valuation* f of a graph $G = (V(G), E(G))$ with q edges as an injective mapping of

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AN INTRODUCTION OF GRAPH THEORY IN APPLIED MATHEMATICS

SWATI, DR. CHINTA MANI TIWARI

Abstract: Graph theory is an important area of Applied Mathematics with a broad spectrum of applications in many fields. Graph theoretical concepts are widely used to study and model various applications, in different areas. Further, with connections to other branches of mathematics, many various tools are being employed to considerable effect from algebra, analysis, geometry, number theory, probability, and topology. The main objective of this paper is to introduce the main concepts of Graph theory. Graph theory is a branch of mathematics which has wide application in the area of mathematics as well as in other branches of science. This paper aims to emphasize the applications of graph theory in Applied Mathematics, in Computer science, Operation Research, Chemistry etc

Keywords: Graph theory, Graph theoretical concepts, graph algorithms, Graph theory and its Applications

Introduction

Graph theory is becoming interestingly significant as it is being actively applied in biochemistry, nanotechnology, electrical engineering, computer science, and operations research. The powerful combinatorial method found in graph theory has also been used to prove the results of pure mathematics.

Graph theoretical ideas are extremely utilized by computer discipline applications. particularly in research areas of computer discipline such data mining, image segmentation, clustering, image capturing, networking etc., For example a data structure can be designed in the form of tree which in turn utilized vertices and edges. Similarly modelling of network topologies can be done using graph concepts. In the same way the most important concept of graph colouring is utilized in resource allotment, setting up. Also, paths, walks and circuits in graph theory are used in wonderful applications say travelling salesman problem, database design concepts, resource networking. This leads to the development of new algorithms and new theorems that can be used in tremendous applications.

A graph is a pictorial representation of a set of objects where some pairs of objects are connected by links. The interconnected objects are represented by points termed as vertices, and the links that connect the vertices are called edges. A graph is a pair (V,E), where V is a finite set and E is a binary relation on V. V is called a vertex set whose elements are called vertices.

E is a collection of edges, where an edge is a pair (u,v) with u,v in V. Graphs are one of the prime objects of study in discrete mathematics. Certain discrete problems can be profitably analyzed using graph theoretic methods.

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A STUDY OF PROBLEMS IN GRAPH THEORY AND PROBABILITY WITH APPLICATION

SWATI & DR. CHINTA MANI TIWARI

Abstract: Graphical model for probabilistic relationships among set of variables, has become a popular representation for encoding uncertain expert knowledge in expert systems. The techniques, that have been developed, are new and still evolving, but they have been shown to be remarkably effective for some data analysis problems. More specifically, these techniques can be conveniently employed in the study of data in Medical Sciences, Environmental Science, Business and Management Studies, Economics and various branches of Social Science. Formation of networks makes the problems easier to be solved and hence exact and advance inference can be derived from the analysis. The research work features a worked example of Bayesian graphical modelling. Our data for this exercise are (i) the antibody measurements after oral polio vaccination (OPV) obtained from the publication of W.H.O. (ii) The statistics of Pulse Polio immunization held in Jhunjhunu district of Rajasthan State. We begin our analysis by finding a relationship between antibody and time after Trivalent Oral Polio Vaccination (TOPV). Also, we shall formulate graphical models of the variables involved using relevant Probability distribution. Moreover, the success and efficacy of pulse polio immunization programme in Jhunjhunu district also be analysed.

Keywords: graphical model, Graph theory, Probability theory, Bayesian networks

Introduction

A "graphical model" is a type of probabilistic network that has roots in several different research communities, including artificial intelligence (Pearl, 1988), statistics (Lauritzen, 1996), error-control coding (Gallager, 1963), and neural networks. The graphical models framework provides a clean mathematical formalism that has made it possible to understand the relationships among a wide variety of network-based approaches to computation, and in particular to understand many neural network algorithms and architectures as instances of a broader probabilistic methodology.

A graph of order p and size q is called a (p,q)-graph.

It has become a tradition to describe graphs by means of diagrams in which each element of the vertex set of the graph is represented by a dot and an edge $e = uv$ is represented by a curve joining the dots that represent the vertices u and v.

For example, consider the graph G with $V(G) = \{v1, v2, v3, v4, v5\}$ and $E(G) = \{v1v2, v1v3, v2v3, v4v5\}$. Then a possible diagram for this graphs is shown in Figure 1.1

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An Overview of Probability in Mathematics

Swati & Dr. Chinta Mani Tiwari

Abstract: The word probability develops the concept of prediction in our mind and it is a certain relationship between the expected outcomes divided by total outcomes [Countable, Uncountable]. It gives a mathematical numerical certainity for an uncertain condition or situation. Moreover not only in mathematics, probability is widely used in all other areas related to prediction like sports, gambling, statics, weather reports, congenital disabilities etc. The proof of prophecy about many situations can be easily seen from the ancient time. We focused here on the concept of probability like its origin, definition, derivation of its formula, uses etc in mathematics. We looked for some previous studies, results, application on probability and research in mathematics to support our studies. Lastly, We tried to conclude the final result from all the supported material.

Keywords: *Probability, Gambling, Types of probability, Origin of Probability.*

Introduction

Probability is more likely based on prophecy or possibilities for something to happen. According to Oxford Dictionary definition 'Probability is how likely something to happen (countable, uncountably) or in more simple words it means chances of happening.'

symmetry

MDPI

Article

A Fuzzy Optimization Technique for Multi-Objective Aspirational Level Fractional Transportation Problem

Mukesh Kumar Sharma [1], Kamini [1], Nitesh Dhiman [1], Vishnu Narayan Mishra [2,*], Hamurabi Gamboa Rosales [3], Arvind Dhaka [4,*], Amita Nandal [4], Edgar González Fernández [3], Tania A. Ramirez-delReal [5] and Lakshmi Narayan Mishra [6]

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Abstract: In this research work, a soft computing optimization operating approach is developed for a multi-objective aspirational level fractional transportation problem. In the proposed technique, a mathematical model is formulated for the multi-objective aspirational level fractional transportation problem (MOFTP) based on the highest value of one and all objectives of the model. We also used the symmetry concept over our model to identify the best optimum solution based on symmetrical data. We constructed the membership grades for the set of fetched parameters having symmetry. In this work, we also used the concept of ranking function in our mathematical model to obtain the optimum solution of the fuzzy multi-objective fractional transportation. In this proposed algorithm, the aspiration levels are also associated with the objective function of MOFTP. We are also proposing a new approach for the optimization of fractional problems in which the objectives are being optimized by using the numerator function and denominator function simultaneously. Further, a methodology is also developed to find the average cost for each fractional objective of the model. After that, we will find the ranking function for each parameter by using the defuzzification method. By this methodology, we will be able to convert the MOFTP into a bi-objective transportation problem. The provided technique is elaborated with the help of numerical computations to prove the beauty and power of the proposed technique.

Keywords: aspiration level; fractional transportation problem (FTP); fuzzy programming (FP) approach; multi-objective fractional transportation problem (MOFTP); symmetry; transportation problem (TP)

1. Introduction

Commodities from one point to another are shifted at a lower cost within less time. These problems are acknowledged as transportation problems. The transportation problem was first introduced by Hitchcock [1] in 1941. In such a problem, a fixed commodity is shifted from a finite number of origins to a finite number of targets to fulfill the requirement of the system. Such types of transportation problems are known as classical transportation problems. Again, the concepts of classical transportation problems were discussed by

fractal and fractional

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Article

On Z-Intuitionistic Fuzzy Fractional Valuations for Medical Diagnosis: An Intuitionistic Fuzzy Knowledge-Based Expert System

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Abstract: In an uncertain situation, data may present in continuous form or discrete form. We have various techniques to deal with continuous data in a realistic situation. However, when data are in discrete form, the existing techniques are inadequate to deal with these situations, and these techniques cannot provide the proper modulation for adequate analysis of the system. In order to provide the proper acceleration to discrete data, we need an appropriate modulation technique that can help us to handle unconditional boundedness on the technique and will operate like the techniques used for continuous data with fractional variables. In this work, we developed an intuitionistic fuzzy fractional knowledge-based expert system using unconditional and qualified fuzzy propositions based on the Z-intuitionistic fuzzy fractional valuation probability density function. In this proposed method, the discrete fractional variables will be converted into intuitionistic fuzzy fractional numbers and then be used in our algorithm. The proposed Z-intuitionistic fuzzy fractional valuation knowledge-based system can easily be applied in the medical field for the diagnosis of diseases in a vague environment due to the ordered-pair characteristics of the Z-intuitionistic fuzzy fractional valuation. In this study, we collected data of dengue patients, which included seven clinical findings: Temperature, sugar, Pulse Rate (PR), age, cough, and Blood Pressure (BP).A numerical example was also carried out to elaborate on the present technique. In addition, a comparative study is discussed in this work. We also provide the managerial implications of the data, with the limitations of the proposed technique presented at the end of this work.

Keywords: intuitionistic fuzzy set; Z-intuitionistic fuzzy fractional valuation; knowledge-based system; intuitionistic fuzzy propositions; intuitionistic unconditional and qualified fraction fuzzy propositions

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1. Introduction

In real life, information may often be imperfect due to its vague nature. The aspects of imperfect knowledge are uncertain and imprecise. These uncertainties are characterized by the degree of truth in the form of the membership grade. In 1965, L.A. Zadeh [1] introduced the concept of fuzzy set theory. Fuzzy set theory is a useful tool to deal with these types of imprecise factors in the modelling of systems. The fuzzy logic approach has previously been used in the medical field [2,3] in existing studies. Different industrial and medical problems characterized by such uncertainty and imprecision [4,5] can be solved using fuzzy

IoMT Tsukamoto Type-2 Fuzzy Expert System in Medical Diagnostic

M. K. Sharma[a,*] and Nitesh Dhiman[a]

[a]*Department of Mathematics, Chaudhary Charan Singh University, Meerut-250004 (U.P.), India*

A R T I C L E I N F O

Keywords

Internet of Medical Things (IoMT)
Fuzzy sets
Type-2 fuzzy sets
Tsukamoto inference System
Tsukamoto type-2 inference system (TT2FIS)

A B S T R A C T

The exact monitoring of disease is an extremely tedious job for a medical expert and the technocrats involved in it for technological support for the diagnosis system. To overcome such situations, we developed an Internet of Medical Things (IoMT) based Tsukamoto type-2 fuzzy inference system (TT2FIS) that can easily deal with the diagnosis and prediction aspects of medical field. In the proposed system, we developed a type-2 Tsukamoto fuzzy inference system that involves the symptoms of the patient as input factor and medical equipment as output factors for the outcomes. The aim of this work is to show the utility of type-2 fuzzy sets in the diagnostic system for the Tuberculosis (TB) disease. Numerical computation is also been carried out for the illustration of applicability of the proposed method. The validation of the proposed inference for the propose IoMT model is also given. Results and conclusion of the proposed work are also been discussed in this work.

1. Introduction

The health care is a vital lead in a peace-loving and actual life for a humanwell being. The world health organization illustrated that wellbeing as a state of psychological and physical suitability without diseases and sickness. Human healthcare is a process of keeping the health with anticipation involving correct diagnosis. The data of the patient, billing, case history, medicine dossing and routine management in care affect the health of the patients. The medical things having the ability to transmission data through a network without demanding person to person and person to computer communication are called as Internet of Medical Things (IoMT). The IoMT [1] based development decreases the fault of human being involved and aid to the clinician and doctors for best suitable diagnosis. IoMT interrelate numerous nursing devices and formulate a support network system for creating the best suitable decisions. About billions of things will be connected to the internet in the upcoming time. This substantial quantity comprises emerging IoMT platforms. IoMT is an intelligence system mostly includes of instruments and electric circuits to obtain biomedical indications from a patient, dispensation unit to procedure the biomedical signs, a device to convey the biomedical information through a network, a temporary as well as permanent storing unit, with artificial intelligence structures to make the decision [2] according to the suitability and match ability of doctor.

On the other hand, so many problems in which fuzziness occurs due to unclear boundary of information. Zadeh [3] gave the concept of extension of traditional set theory in the form of fuzzy set theory. The word fuzzy indicates the vagueness or ambiguity. The traditional set theory permits the grade of a point in the set, in binary forms, i.e., 1 for belongingness and 0 for not belongingness. On the other hand, the fuzzy set theory permits grade value in the closed unit interval [0,1]. Zimmermann [4] gave major contribution to the literature of fuzzy sets and decision-making analysis. He presented many innovative results and incisive studies in the field of fuzzy set theory. There are so many applications of fuzzy set theory has been studied including Axiomatic fuzzy sets [5], in medicine [6], in Covid-19 detection [7-8], contradictory management [9], in power systems [10], in production management [11], in maintaining systems [12], in risk assessment with management [13], in Career selection [14] and many more.

Bon & Utami [15] presented a critical hierarchy method and Tsukamoto fuzzy inference system (TFIS) for manufacture planning. Ariani & Endra [16] gave an implementation technique by using Tsukamoto based fuzzy inference system for the study programme selection. Saepullah & Wahono [17] gave a comparative study of Mamdani, Sugeno and TFIS methods in the context of air conditioner energy saving. Fauzi et al. [18] determined an articles acceptance by using Tsukamoto fuzzy Logic based Inference System. Gerhana [19] gave a technique for the positions of football player based on TFIS.

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On the other hand, Karnik & Mendel [20] gave type-2 fuzzy logic systems and shown the utility of type-2 fuzzy sets in real life applications. Castillo et al. [21] also introduced the theory of type-2 fuzzy logic and its various applications. The present works attentions IoMT TT2FIS for health care monitoring, and enhanced illness treatment.

The type-2 fuzzy logic approach is applied in this work. The basic objectives of this work are illustrated as follows;

i. We will utilize the impact of type-2 fuzzy sets in instruction to coverup the doubtful and unclear information involve in the symptomatic input factors.
ii. We will develop a Tsukamoto type-2 fuzzy inference system (TT2FIS) and we will show applicability of developed system in the medical diagnosis process.
iii. The proposed TT2FIS will consist various symptomatic input factors like; fever, cough, weight loss, night sweat, tuberculosis (TB) test, and family history etc. on behalf of these input factor the output factor will further be categorized into three linguistic groups that will define the illness level of TB disease in the patient.
iv. We will design a IoMT based TT2FIS model, that consist various components including; input factors, IoMT, data mechanism, TT2FIS, detection level, and a cloud dataset.
v. We will give a valedictory module of proposed system in context of real-life application, so that we can validate our proposed IoMT based TT2FIS model.

This work is categorized into five segments, in the second segment, we discussed the concepts associated to our work including; fuzzy sets, type-2 fuzzy sets and their operations, and IoMT.

The third segment shows the proposed methodology of Tsukamoto type-2 fuzzy inference system (TT2FIS). Fourth segment describe the proposed IoMT based TT2FIS model. In the next segment, we gave the numerical computations of the work to validate our proposed model. In next and sixth segment describe the conclusion of entire work done.

2. Basic Concepts

2.1. Fuzzy set

A fuzzy set $\tilde{F}$on a universal set $\mathcal{U}$ is expressed as;
$\tilde{F} = \{(\tau, \mu_{\tilde{F}}(\tau)) : \tau \epsilon \mathcal{U}\}$, where, $\mu_{\tilde{F}}(\tau) : \mathcal{U} \to [0,1]$known as the membership function.

2.2. Fuzzy Number

A fuzzy set $\tilde{F}$ on the real line $\mathbb{R}$ is known as fuzzy number if it possesses the following three conditions;
(i) It is "normal", i.e., $\exists$ a point τ such that $\mu_{\tilde{F}}(\tau) = 1$,
(ii) α-cut is closed interval for all $\alpha \in [0,1]$.
(iii) Support i.e., $\{\tau \epsilon \mathcal{U} : \mu_{\tilde{F}}(\tau) > 0\}$ is closed & bounded.*2.3.*

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iv. We will design a IoMT based TT2FIS model, that consist various components including; input factors, IoMT, data mechanism, TT2FIS, detection level, and a cloud dataset.
v. We will give a valedictory module of proposed system in context of real-life application, so that we can validate our proposed IoMT based TT2FIS model.

This work is categorized into five segments, in the second segment, we discussed the concepts associated to our work including; fuzzy sets, type-2 fuzzy sets and their operations, and IoMT.

The third segment shows the proposed methodology of Tsukamoto type-2 fuzzy inference system (TT2FIS). Fourth segment describe the proposed IoMT based TT2FIS model. In the next segment, we gave the numerical computations of the work to validate our proposed model. In next and sixth segment describe the conclusion of entire work done.

2. Basic Concepts

2.1. Fuzzy set

A fuzzy set $\tilde{F}$on a universal set $\mathcal{U}$ is expressed as;
$\tilde{F} = \{(\tau, \mu_{\tilde{F}}(\tau)) : \tau \epsilon \mathcal{U}\}$, where, $\mu_{\tilde{F}}(\tau) : \mathcal{U} \to [0,1]$known as the membership function.

2.2. Fuzzy Number

A fuzzy set $\tilde{F}$ on the real line $\mathbb{R}$ is known as fuzzy number if it possesses the following three conditions;
(i) It is "normal", i.e., $\exists$ a point τ such that $\mu_{\tilde{F}}(\tau) = 1$,
(ii) α-cut is closed interval for all $\alpha \in [0,1]$.
(iii) Support i.e., $\{\tau \epsilon \mathcal{U} : \mu_{\tilde{F}}(\tau) > 0\}$ is closed & bounded.*2.3.*

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Employee Retention And Attrition Analysis: A Novel Approach On Attrition Prediction Using Fuzzy Inference And Ensemble Machine Learning

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Abstract

In Today's world, AI has become an essential tool for achieving and creating the unthinkable. It is helping in creating innovative solutions for almost every industry there is. In the wake of this ever-growing demand of computerized intelligence, the analysis of automation by HR (Human Resources) in the form of predictive form can be formulated. As the Human Resource departments is solely responsible for recruiting and bring valuable talent to the industry, it becomes essential that this task is done with maximum efficacy. Through this project, we intend to predict which employee would prefer a job change and which employee would stay in a company and hence, help constitutes as an active research domain is how AI based intelligence can be interpreted and utilized assess the input

Logic of Meyons: A Fuzzy Logic Based Approach

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Abstract

This physical world is mathematically modelled in terms of Binary Logic (BL) and Fuzzy Logic (FL) to get the output of an Objective-Function (O-F). The BL is qualitatively associated with Definite Philosophy (DPh) and complete certainty about the output while the FL talks about the Probabilistic Philosophy (PPh) of all sorts of possibilities in between the end limits of the output under the considered problem. In this communication, an attempt has been made to extend the concept of Meyon, the energy quanta of O-F generated by human mind which is the source of all kinds of Artificial Intelligence (AI). The Meyon Algorithm, Synchronisation Algorithm, and Optimization Algorithm of sample of Meyons to get the desired output have been discussed. We also applied fuzzy logic approach to develop a fuzzy inference system using eight input factors and one output factor to obtain the various categories of Meyon.

Key Words: Meyons, Synchronization-Algorithm (SA), Optimization, Fuzzy Inference system (FIS), Optimization.

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1. Introduction

The energy and matter are the duality of this 3-dimansional physical world in terms of content while in terms of behaviour there is again duality but it is in form of wave character and particle character. The matter associated every phenomenon and the several energy patterns (EP) interaction with energy itself as well as matter, are uninterruptedly flow in the4-dimension called time. Each component of this universe and knowledge created in its either form: artificial or natural [5], have their own: "Configuration (C)", "Brain (B)", "Emotions (E)", "Mind (M)" and "Individual Consciousness (IC)"(**CBEMIC**) in situation of active units, and (**CEMIC**) in situation of lifeless items where there is no B but M is present. The **C EMIC** of lifeless objects of this universe have their own exceptional energy designs of each **CEMIC** at a period and authorised with the in-built features of reconfiguration with the passageway of time. But human is the ultimate creation of cosmos and a broad replica of cosmos in form of Meyons once produced in their concluding touch about to complete the outcomes of an O-F by its maker, have their own Configuration C, Logic L, Emotions E, and the HC of the creator **[CLEHC].** It is the EP of **CLE** with the HC of its creator; their synchronization [1, 3, 6] and modulations yield the superiority and control of a Meyon formed by the mind to figure the O-F. The optimization of an illustration of Meyons created by M materializes the anticipated outcome of the O-F in least time with ideal form as the "prescribed time" by the maker. The Meyons formed by the M can be classified mainly of 4-types; **Thoughts (T), Concepts (C), Ideas (I),** and **Reasoning (R)** (**TCIR**) with diverse frequencies definite by the maker of Meyon.

M relates with the cosmos and eco-system in arrangement of Meyons moulded by it to materialize a dream, to address a challenge, to visualise a future project, to perform a task, etc. Since a Meyon contains of a big amount of wave designs each of diverse frequency, attitude,

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RESEARCH ARTICLE

WILEY

Riemann–Liouville fractional operators of bicomplex order and its properties

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In this paper, we construct the Riemann–Liouville fractional integral and differential operator of bicomplex order and illustrate some examples to calculate the fractional integration and differentiation of bicomplex order of some elementary bicomplex-valued functions. Also, we discuss some properties of these operators by proving analogues of the semigroup property, Leibniz rule, chain rule, etc.

KEYWORDS

bicomplex gamma and beta functions, bicomplex numbers, idempotent representation, Riemann–Liouville operators

MSC CLASSIFICATION

30G35; 26A33; 33B15

1 | INTRODUCTION

In the last few years, there has been a remarkable development in subject of bicomplex numbers and fractional calculus. The bicomplex number system has reached different results in complex number systems, and the fractional calculus has given many multidimensional and radical changes in the field of calculus.

Bicomplex number system is a special kind of generalization of complex number system as they are complex numbers appearing with another imaginary unit whose coefficients are also complex numbers. Bicomplex numbers were firstly defined by Segre[1] in 1892. Segre described an infinite set whose elements were later called bicomplex number, tricomplex number, … , n-complex numbers. The bicomplex numbers extend the complex numbers into a four-dimensional space and can be recognized as four-dimensional vectors, in the similar way that complex numbers are recognized as two-dimensional vectors. Also, bicomplex numbers can be conceptualized as ordered pairs of two complex numbers.

The initial development of bicomplex numbers basically rests on the pairs of complex numbers. The theory of bicomplex numbers has many applications in various branches of science.[2–5] Rochon and Tremblay[6] utilized the concepts of bicomplex numbers to study the bicomplex Schrödinger equation with continuity equations, bicomplex Born formulas under the discrete symmetries, and the standard Born's formula for the class of bicomplex wave functions having a null hyperbolic angle. Linear functionals and dual spaces are considered on hyperbolic and bicomplex Hilbert spaces and properties of linear operators were obtained in Rochon and Tremblay.[7]

Goyal et al[8] extended gamma and beta functions to bicomplex variables with conditions of validity and T-holomorphicity for these functions and various properties including Legendre duplication formula, Gauss multiplication theorem, and binomial theorem. The fundamental theory of bicomplex functions was developed by Elizarraràs et al.[9] Charak et al[10] introduced some geometric aspects of bicomplex numbers, viz., bicomplex Riemann sphere, etc., and discussed convergence of sequences of bicomplex meromorphic functions via bicomplex chordal metric with a detailed discussion of the concept of normality of a family of bicomplex meromorphic functions on bicomplex domains.

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RESEARCH ARTICLE

Ethnopharmacological survey of indigenous medicinal plants of Palampur, Himachal Pradesh in north-western Himalaya, India

Atul Arya[1] · Suresh Kumar[1] · Rajinder Paul[2] · Amrita Suryavanshi[1] · Dolly Kain[1] · Rudra Narayan Sahoo[3]

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Abstract

The ethnopharmacological investigation was done to study the traditional usage of indigenous medicinal plants of Palampur, Himachal Pradesh. Therefore, an extensive ethnopharmacological survey was conducted to document the traditional knowledge of ethnomedicinal plants. Direct interviews of 77 informants were conducted with the help of a questionnaire. Three quantitative factors (use value, factor informant consensus and fidelity level) were used for the analysis of generated data. A total of 102 species, belonging to 90 genera and 30 families were identified and collected with the help of traditional healers and local informants from different locations of the study area. Total 19 medicinal plants species were reported for new or less known ethnomedicinal uses. Also, 3 threatened wild plants species were collected from the study area. The maximum number of species belongs to the family Lamiaceae (7), Fabaceae (7), Asteraceae (6), Moraceae (4 species), Apocyanaceae (4 species) and Euphorbiaceae (3 species). Different plant parts were used by local informants such as leaves, galls, fruits, seeds, latex, stem, root, flowers, bark, and rhizomes. It was also observed that maximum numbers of plant species were used to cure gastro-intestinal disorders (48 species), skin disorders (34 species) and respiratory disorders (25 species). Ethnopharmacological data depict that medicinal plants were extensively used by local people to cure gastrointestinal, dermatological disorders and skeletomuscular disorders. Traditionally used medicinal plants have enormous potential to provide the raw material for the discovery of new bioactive compounds and drugs.

Keywords Ethnopharmacology · Traditional medicine · Palampur · Traditional healers · Medicinal plants

Introduction

Ethnopharmacological studies encompasses a beautiful arc of empirical data practised since antiquity among indigenous population (Pandey and Tripathi 2017). In many developing countries, the traditional system of medicine is used by 80% of indigenous people for their primary healthcare system (Oyebode et al. 2016)**.** Ethno medicines attribute a methodology to use medicinal plant, different diagnostic ways and a combination of two or more herbs together (Kanta et al. 2018). Ethnopharmacological investigations can be used as a useful method to find new polyherbal formulations which can be used to treat many diseases that cannot be treated by standard health practices (Ahmad et al. 2018; Kanta et al. 2018). Modern pharmacopeia manufacture around 25% of herbal drugs and several synthetic drugs using chemical substances isolated from plants (WHO 2002). Medicinal plants have bioactive compounds that can be used for various therapeutic purposes and synthesis of useful drugs (Kumar et al. 2016a, b). The Indigenous communities characterize medicinal plants based on two factors i.e. traditional knowledge and Indigenous practice (Kain et al. 2018). Traditional knowledge is integrated into the practice, customs, and culture of ethnic groups and communities. Indigenous populations have broad natural pharmacopeia's which consist of wild medicinal valuable plant species. During nomadic wandering, Indigenous knowledge and folk medicine was exchanged and expanded within tribal groups, neighbors, friends and foes (Palria and Vashistha 2017).

Kangra district is home to different indigenous tribes such as Gaddis and Gujjars of Himachal Pradesh. Palampur is a

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Article

Synthesis and Encapsulation of *Ajuga parviflora* Extract with Zeolitic Imidazolate Framework-8 and Their Therapeutic Action against G^+ and G^- Drug-Resistant Bacteria

Ab Majeed Ahanger, Suresh Kumar,* Atul Arya, Amrita Suryavanshi, Dolly Kain, and Vandana

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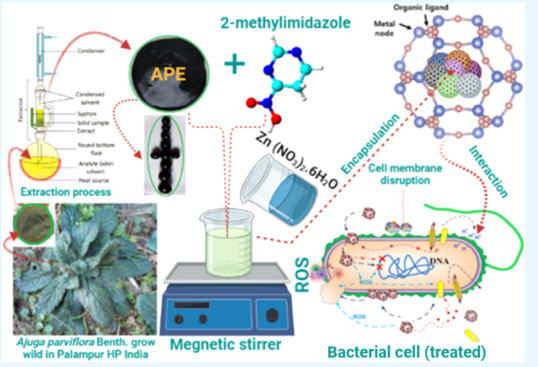
ABSTRACT: Infectious diseases caused by bacteria have become a public health issue. Antibiotic therapy for infectious disorders, as well as antibiotic overuse, has resulted in antibiotic-resistant bacterial strains. Zeolitic imidazolate framework-8 (ZIF-8) possesses a wide surface area, high porosity, variable functionality, and potential drug carriers. We have established a clear method for making a nanoscale APE@ZIF-8 nanocomposite agent with outstanding antibacterial activity against methicillin-resistant *Staphylococcus aureus* (MRSA) and cephalosporin-carbapenem-resistant *Escherichia coli* (CCREC). We present a unique approach for encapsulating molecules of *Ajuga parviflora* extract (APE) with ZIF-8. APE@ZIF-8 has a positive charge. By electrostatic contact with the negatively charged bacterial surface of *S. aureus* and *E. coli*, APE@ZIF-8 NPs produce reactive oxygen species (ROS) that damage bacterial cell organelles. As a result, the APE@ZIF-8 nanocomposite offers limitless application potential in the treatment of infectious disorders caused by drug-resistant gram-positive and gram-negative bacteria.



INTRODUCTION

Since the emergence of antibiotic resistance, bacterial-mediated infectious diseases have become a major health concern.[1] Antibiotic resistance occurs when bacteria develop their ability to withstand medications that kill them, allowing them to grow and become useless. Antimicrobial resistance is a global concern for human health and development. The World Health Organization (WHO) has issued a report calling for fast, coordinated, and ambitious action to avoid a devastating drug-resistance disaster. Drug-resistant diseases could kill 10 million people per year by 2050 if nothing is done. Drug-resistant infections claim the lives of at least 700,000 people each year, and nations spend heavily on innovative research and technology to tackle antibiotic resistance.[2] Methicillin-resistant *Staphylococcus aureus* (MRSA) is a gram-positive bacteria that causes blood poisoning (bacteremia),[3] toxic shock syndrome, renal failure, and pneumonia in people all over the world.[4] According to the Centers for Disease Control and Prevention, *E. coli* is resistant to cephalosporins (Cefotaxime).[5] A mutant strain of *Escherichia coli* is resistant to carbapenem (imipenem), according to a paper published by the Indian Council of Medical Research in 2020.[6] UTIs, renal failure, and newborn meningitis are all caused by multidrug-resistant *E. coli* virulence genes.[7−10] Antibacterial agents can effectively penetrate gram-positive bacteria's thick but porous cell walls, which contain peptidoglycan (20−80 nm in size) made up of N-acetylated muramic acid, glucosamine, and teichoic acid and bear a strong negative charge, but gram-negative bacteria have bilayer membranes with 5−10 nm outer membranes of negatively charged oligosaccharides and lipoproteins, and as a result, most antibacterial drugs that are efficacious against gram-positive bacteria are ineffective against gram-negative bacteria. So, to reduce the misuse of antibiotics, new antibacterial medicines are being developed.[11,12] Nanomaterials (1−100 nm) have so emerged as a viable alternative tool for combating multidrug-resistant bacteria. Nanomaterials' physicochemical features provide a diverse platform for developing novel therapeutic techniques for multidrug-resistant bacteria.[13] According to a recent study, ROS can generate oxidative stress in cells that damages bacterial cell organelles. Nanoparticles interact with the mercapto (−SH), amino (−NH), and carboxyl (−COOH) groups of proteins and nucleic acids, causing enzyme activity to be disrupted, cell structure to be altered, and the microorganism to be inhibited.[14−16] Plants have been used to generate a variety of medicinal chemicals that could be used as biomaterials. *Ajuga parviflora* Benth. (Lamiaceae) is a well-known medicinal herb having anti-

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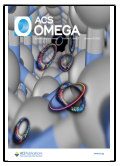

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Chemical composition, antioxidant and enzyme inhibitory properties of *Ajuga parviflora* Benth.

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Highlights

- *Ajuga parviflora* Benth. is used in folk medicine for treating hyperglycaemia in India.
- Potential of extracts are evaluated by antioxidant, enzyme inhibitory

frontiers in Medicine

CLINICAL TRIAL
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Breathing-Focused Yoga Intervention on Respiratory Decline in Chronically Pesticide-Exposed Farmers: A Randomized Controlled Trial

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Background: Occupational exposure to pesticides has been associated with lung and cognitive function exacerbations. In the present study, we tested the effectiveness of breathing focused yoga intervention on alleviation of adverse respiratory and cognitive effects associated with chronic pesticide exposure in farmers.

Methods: We undertook a parallel, two-armed randomized controlled trial with blinded outcome assessors on a chronically pesticide-exposed farming population. The study was conducted at district Panipat, State Haryana located in the Northern part of India from November 2019 to August 2020. A total of 634 farmers were screened, and 140 farmers were randomized to breathing-focused yoga intervention (BFY, $n = 70$) and waitlist control arms ($n = 65$). BFY was delivered weekly in 45-min group sessions over 12 weeks followed by home-based practice. The primary outcome was the change in spirometry-based markers of pulmonary function from baseline expressed as raw values, Global Lung Initiative (GLI) percent predicted (pp), and GLI z-scores after 24 weeks of intervention. Secondary variables were Trail making tests (TMT A and B), Digit symbol substitution (DSST), and WHO Quality of life-BREF (WHOQOL-Bref). Analysis was by intention-to-treat. Mediation analysis was done considering oxidative stress markers as potential mediators.

Results: At the end of 6 months of intervention, the overall follow-up in the participants was 87.85% ($n = 123$); 90% ($n = 63$) in the control group, and 85.71% in the yoga group ($n = 60$). The mean age of the study cohort ($n = 140$) was 38.75 (SD = 7.50) years. Compared with the control group, at 24 weeks post-intervention, the BFY group had significantly improved status of the raw sand z scores markers of airway obstruction, after adjusting for confounders, FEV1, FVC, FEF25-75 [z score-adjusted mean differences (95% CI); 1.66 (1.10–2.21) 1.88 (1.21–2.55), and 6.85 (5.12–8.57), respectively. A fraction of FEF25-75 change (mediation percentage 23.95%) was explained by glutathione augmentation. There were also significant improvements in cognitive scores of DSST, TMT-A and TMT-B, and WHOQOL-Bref.

Conclusion: In conclusion, regular practice of BFY could improve the exacerbations in the markers of airway obstruction in chronically pesticide-exposed farmers and

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cognitive variables. A significant mediating effect of glutathione augmentation was also observed concerning the effect of the intervention on FEF25-75. These findings provide an important piece of beneficial evidence of the breathing-based yoga intervention that needs validation across different farming ethnicities.

Clinical Trial Registration: www.ClinicalTrials.gov, identifier: CTRI/2019/11/021989.

Keywords: farmers, pesticide exposure, breathing-focused yoga intervention, respiratory decline, cognitive decline

INTRODUCTION

Pesticide use is an integral measure for agricultural sustainability, one of the primary objectives of the sustainable development goals (SDG-2) (1). However, the large-scale use of pesticides has surfaced as a double-edged sword associated with a varying range of detrimental health outcomes (2–15). Prevention of work-related respiratory disease constitutes the primary focus of the National Institute of Occupational Safety & Health (NIOSH) (16). Though the modifiability of occupational exposures through educational strategies has grabbed some clinical interest as a preventive measure for further exacerbations including chronic obstructive pulmonary disease (COPD), and chronic bronchitis (17). However, these interventions require changing the behavior of farmers which has been notified as a difficult outcome to achieve given the observation that many protective recommendations are never adopted by farmers (17).

Adverse respiratory consequences expressed as reductions in spirometric variables [forced expiratory volume in 1 s (FEV1), forced vital capacity (FVC), and their ratio percentage FEV/FVC%] are the most widely reported health concerns of chronic pesticide exposure (3–9). These manifestations are the established risk factors for fixed airway obstruction including chronic obstructive pulmonary disease (6). Several lines of evidence support the beneficial effects of yoga-based interventions on the respiratory system in various non-clinical and clinical settings exacerbations such as COPD and asthma (18–25). The improved efficiency of respiratory function associated with yoga practice has been attributed to various factors including enhanced ventilatory functions, increased forced vital capacity, FEV1, maximum breathing capacity and breath-holding time, maximal stretching of respiratory muscles, efficient use of diaphragmatic and abdominal muscle, blunting of excitatory pathways regulating respiratory systems, etc. (20, 22–25). Explicitly there is a particular indication of the limited effectiveness of the yoga-based intervention to its breathing-focused practices as compared to yoga postures against critical manifestations such as COPD (19). These respiratory exercises are relatively simple, low cost, and could be incorporated into the daily lives of farmers. However, there is no clinical trial report available addressing the effectiveness of these practices in pesticide-exposed farmers with adverse respiratory manifestations. Further, given the notion that the efficacy of yoga-based interventions depends on the fitness levels of the individuals (21), the generalisability of findings from different subject populations is limited.

Cognitive impairment is another major health exacerbation of chronic pesticide exposure. It is a risk factor for neurodegenerative diseases (13, 14) and could underline the reduced well-being of farmers directly linked to the sustainability of agriculture (26) and hence, calling for clinical attention. Several studies support role of yoga as an effective intervention to enhance cognitive function (Hedges' $g = 0.33$, standard error = 0.08, 95% CI = 0.18–0.48), with the strongest effects reported for attention and processing speed ($g = 0.29$, $p < 0.001$), followed by executive function ($g = 0.27$, $p = 0.001$) and memory (g = 0.18, $p = 0.051$) (27, 28). Importantly, these domains of cognition also intersect with pesticide exposure-induced cognitive decline, we thereby hypothesized that farmers with pesticide exposure will benefit cognitively through yoga-based interventions.

In view of the lack of available studies focused on the management of adverse chronic health effects in pesticide exposed farmers, we conducted a randomized clinical trial to test if 24 weeks of regular breathing-focused yoga practice could alleviate their adverse respiratory and cognitive manifestations against a wait-list control group.

Over recent years, there has been increased recognition of the importance of evaluating hypothesized mediating mechanisms in clinical trials (29). Oxidative stress is one of the unanimous pathological mechanisms underlying pesticide-induced toxicity of various pesticides (30–32), with lipid peroxidation and GSH depletion being the critical modulators of airway damage in obstructive lung diseases (33). Alleviation of imbalances in oxidative stress parameters has been one of the mechanistic insights obtained from yoga-based clinical research (34–36). Hence, the present trial also aimed to test the mediating role of the oxidative stress markers underlying the effectiveness of the breathing-focused yoga intervention on the respiratory and cognitive outcomes.

METHODS

Study Design

The study was a two-armed, randomized, parallel-group clinical trial with breathing-focused yoga intervention and the wait-list control groups with blinded outcome assessors (**Figure 1**). Details of the same have been appended in the study protocol (**Supplementary Material**). The trial was conducted at district Panipat, State Haryana located in the Northern part of India from November 2019 to

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Cytotoxic and genotoxic assessment of wastewater on HEK293 cell line

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The increasing industrialisation and urbanisation have deteriorated the quality and quantity of water bodies, harming the surrounding flora and fauna. Therefore, in our studies, we have chosen the HEK293 cell line to examine further the level of wastewater toxicity to which living beings are exposed. The water samples were collected from various sites around the Agra Canal in the Faridabad region of Haryana. Furthermore, cytotoxicity and genotoxicity confirmation of wastewater samples were done by MTT and comet assay, respectively. The water quality of the Agra canal is heavily influenced by agricultural, domestic, and industrial waste, which may affect the genetic material of species exposed to contaminated water and the sustainability of the local environment. As a result, continuous environmental monitoring and proper policy formulation are required to minimise the adverse effects of pollutants in waste, which would further enrich India's preparation to take India a step ahead, and that could be the best possible way to commemorate India's 75th year of Independence with the Azadi Ka Amrit Mahotsav.

Keywords: Cell morphology, Comet assay, Health hazard, MTT assay, Water pollution

Pollution-causing activities have considerably altered aquatic habitats over India's 75-year development phase. Contamination of water reserves owing to anthropogenic wastes has become a severe concern in metropolitan cities, leading to changes in water composition that will undoubtedly have negative consequences for the species that dwell in these water bodies and health problems for humans[1]. The discharge of heavy metals in water bodies from agricultural land, domestic waste, municipal solid waste, and industrial waste get bioaccumulated in the marine organism has been reported in a previous study conducted on the southeast coast of India[2]. Urban garbage contributes the most to the cumulative genotoxic burden imposed on ecosystems. It includes pharmaceuticals, endocrine disruptors (EDCs), and other substances among the micropollutants found in wastewater that contribute to the most cumulative genotoxic burden imposed on ecosystems. As a result, there has been a surge in interest in learning more about the possible human health impacts of using reclaimed water containing known and undiscovered micropollutants directly or indirectly[3]. Significant health risks for humans include fertility issues and changes in the cellular, metabolic, and DNA level that has been documented among the lethal and non-lethal effects of this hazardous wastewater[4].

It is essential to assess the toxicity of reclaimed water in the natural and anthropogenic aquatic ecosystem, including wastewater-effluent-dominated streams. Bioassay using a cultured cell line is an effective method for determining the toxicity of hazardous substances. This approach is highlighted as a simple and less time-consuming toxicity monitoring technique for water body[5]. The impacts of wastewater and treated wastewater on different human cell lines have been reported in multiple studies. Furthermore, the cytotoxic and genotoxic nature of wastewater, drinking water, and surface water samples were examined on HepG2 cells[6-8]. Likewise, human Caco-2 cells were used to investigate the effects of wastewater generated from the textile industry and its cytotoxic and stress response disruption[9]. The impact of reclaimed wastewater on MCF-7 and Caco-2 cell lines in terms of cytotoxicity and estrogenicity was also studied[10,11]. This work evaluated wastewater samples' cytotoxic and genotoxic nature on the HEK293 cell line (Human embryonic kidney 293). Wastewater sampling was done from the Agra canal on the outstretch of the National Capital Region (NCR) of Delhi. NCR of Delhi is known for its high pollution level due to increased urbanisation and industrialisation, which motivates us to choose Agra

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Effect of repeated exposure of Auxin (indole 3 acetic acid) in Pleurotus Sajor -caju Mushroom Cultivation: A case study

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Abstract - Mushrooms have long been used for medicinal and food purposes. Pleurotus sajor- caju is edible mushroom species. In present study, Pleurotus sajor -caju was cultivated on wheat straw and during its growth various doses of Indole 3 acetic acid (IAA) a plant hormone at 10ppm, 50ppm and 100ppm were sprayed in mushroom substrate. Thereafter its effect on the growth and yield of all three flushes were recorded. Results showed that IAA was able to induce stimulation in growth and ultimately increase in yield is also recorded. Various doses of IAA resulted in increased biomass production from 14% to 30 % with reference to control. This study suggest that exposure of the hormone to substrate can be important tool to increase the production of mushroom and thereby increase nutrition demand can be fulfilled.

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INTRODUCTION

Mushrooms have been reported as good source of nutrition and other health benefits substances. Mushroom possesses several vitamins, minerals and high energy level therefore can be exploited as good food source across the world.

India is known for the commercial production of mainly three species includes *Agaricus bisporus, Volvariella volvacea and Pleurotus*. Several health related benefits (medicinal and nutritional values) (Dunkwal et al., 2007) have been observed in these species. Mushrooms are known to have antioxidant potential, thus mushroom intake may reduce oxidative stress level in body hence mushroom show protective properties also (Adams et al., 1999). Earlier studies reported that plant based food products protect us from many diseases such as cancer, cardiovascular diseases and also plays immunomodulatory role (Halliwell & Gutteridge., 1984).

Pleurotus species which are usually known as oyster mushroom, are mainly edible mushroom and also have commercial importance. *Pleurotus* mushrooms are highly rich in protein minerals and vitamins therefore considered to be healthy source of food (Feeney et al., 2014). It has been taken as functional food due its several advantages i.e. high medicinal value, nutrition substances and good taste and aroma. *Pleurotus* species (Oyster mushrooms) are very important species due to its medicinal, nutritional and commercial advantages and hence it is being cultivated globally (Knop et al., 2015).

Agricultural based countries are facing issue in order to manage the agricultural residue. Oyster cultivation attracted world due its ability to use agricultural residue as substrate to grow thus address the nutritional scarcity on one hand and environmental protection in other hand. More than 900 million tons of agro waste is being produced worldwide such as wheat, paddy and various cereals straw. The cultivation of the *Pleurotus* mushrooms helps in recycling the agricultural wastes and also became an alternative food source to combat with nutritional scarcity globally, especially in developing countries where growing population is major challenge in order to provide nutritional food. Thereafter, utilized substrate rich in protein content can be further used for different purpose includes production of biogases, cattle feed and also as organic fertilizer (Kakon et al., 2012). Low cost production techniques are being employed for the production of the *Pleurotus* species (Jegadeesh et al., 2018). All edible mushroom are reported to be delicious however, *P. sajor-caju* is one of the most cultivated species among all (Zhang et al., 2002). Zadrazil 1980, reported that *pleurotus* can make its colonies in sterilized wheat straw which is pasteurized (60°C-90°C and fermented (55°C, 120 days) since it has high saprophytic colonizing properties. Unsterilized

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Research paper

Total Biomass Benefits due to a Plant Hormone (Kinetin) Application on Oyster Mushroom (*P. Sajor-caju*) Cultivated on Wheat Straw

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ABSTRACT

Pleurotus sajor-caju is an important edible mushroom species due encompassing significant medicinal and nutritional values, popularly cultivated worldwide. It contains several essential components such as proteins, fiber, vitamins, and minerals. Therefore, present study evaluated the growth and yield of oyster mushroom (*Pleurotus sajor-caju*) after the treatment of various doses of a plant hormone, Kinetin. *Pleurotus sajor-caju* was cultivated on wheat straw and sprayed with different doses of kinetin i.e. 10 ppm, 50 ppm and 100 ppm three times. All three flushes were collected and measured for total biomass production of mushroom. The results indicate that the hormonal treatment was able to enhance the biomass production in mushroom. Yield was found to increase from 8% to 27% as compared to control and the mushroom biomass from various treatment was 10 ppm (414 g), 50 ppm (482 g) and 100 ppm (298 g).

1. Introduction

Mushrooms are widely known for their wild availability and are being cultivated and harvested in natural condition at outdoor fields (Gupta, 1986). However, due to the increased mushroom consumption and its high nutrition values, indoor cultivation has been started where environmental condition can be controlled for the better productivity of mushrooms as it may provide suitable climatic and other conditions for its growth and dev-elopment (Sarker & Chowdhury, 2013).

Mushrooms have long been used for medicinal and food purposes. Mushrooms are known to be rich source of proteins, minerals and vitamins (Caglarirmak, 2007). Protein content in mushroom is commonly 19 to 35% which is higher whereas fat content is reported to be very low with respect to the carbohydrates (Wani et al, 2010). *Pleurotus* species contain high potassium to sodium ratio, which makes

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Municipal solid waste landfill leachate induced cytotoxicity in root tips of *Vicia faba*: Environmental risk posed by non-engineered landfill

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Landfills are considered the main option for dumping of municipal solid waste (MSW) all over the world, but these landfills are mostly non-engineered. The decomposition of solid waste in the landfill and rainwater penetration into the decomposing waste produces leachate that contains dissolved organic and inorganic compounds, heavy metals, suspended particles and hazardous substances. Leachate migration in the environment may pose serious health risks to organisms exposed. Hence, the present study explored the cytotoxic potential of landfill leachate collected in different seasons from the Okhla landfill site, Delhi, India. Cytotoxicity of leachate samples was evaluated by cell apoptosis and ultrastructural observations based on Transmission Electron Microscopic (TEM) observations of the cells of root tips of *Vicia faba* seedlings treated with the leachates collected in summer, winter and monsoon in a time and dose dependent manner. Leachate collected in all the three seasons induced apoptosis in cells of root tips of *Vicia faba* that increased in a time and dose dependent manner when compared to control. The apoptosis was highest in the samples treated with leachate collected in the summer season, followed by winter and monsoon. It was further confirmed with TEM images that there was induction of apoptotic-like morphological changes in the root cells treated with landfill leachate when compared with the control. The present study indicates that municipal solid waste leachate is very toxic and it should be treated before disposing it to the environment. This study may be useful for the assessment of hazardous and toxic effects of pollutants from solid waste landfill sites.

Keywords: Apoptosis, Hazardous, Landfill leachate, Solid waste, Toxicity, Transmission Electron Microscopy (TEM), *Vicia faba*

In the past 75 years, India has witnessed plethora of developmental activities accompanied by rapid urbanization and lifestyle changes. It has resulted in ever increasing generation of solid waste. Landfills are considered the main option for the dumping of municipal solid waste (MSW) all over the world, but these landfills are mostly non-engineered[1]. Compared to other technologies such as incineration and composting, sanitary landfilling is a relatively convenient, inexpensive, and widely employed method for MSW management[2,3]. It is believed that of the total MSW collected worldwide, up to 95% is disposed off in landfills[4].

The decay and decomposition of solid waste in the landfill and rainwater penetration into the decomposing waste produces a dark liquid with an unpleasant odor known as leachate[5,6]. Leachate can be considered as a water-based solution having dissolved organic and inorganic compounds, heavy metals, suspended particles, and hazardous substances[7,8]. Most of the above pollutants have accumulative, threatening, and detrimental effects on the growth of aquatic organisms, ecology, and food chains, thereby leading to enormous problems in public health, *e.g.*, carcinogenic effects, acute toxicity, and genotoxicity[9-11]. Gupta and Rajamani (2017)[12] have reported that the toxicity of landfill leachate was dependent on the

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Abbreviations: µm, micro meter; µS, microsiemens; AAS, Atomic Absorption Spectrophotometer; AN, Ammonical Nitrogen; BOD, Biochemical Oxygen Demand; Chloride, Cl; cm, centimetre; COD, Chemical Oxygen Demand; Cr, Chromium; Cu, Copper; CW, cell wall; DNA, Deoxyribonucleic Acid; EC, Electrical conductivity; ER, Endoplasmic reticulum; Fe, Iron; FITC, Fluorescein isothiocyanate; HEK, Human Embryonic Kidney; IARI, Indian Agricultural Research Institute; M, Mitochondrion; ml, mililiter; MSW, Municipal solid waste; NU, Nucleus; NUE, Nucleolus; OsO_4, Osmium tetra-oxide; Pb, Lead; PBS, Phosphate-buffered saline; PCD, Programmed Cell Death; PD, Plasmodesmata; PI, Propidium Iodide; PL, Plasma lemma; PM, Plasma Membrane; SO_4^{2-}, Sulphate; TDS, Total dissolved solids; TEM, Transmission Electron Microscopy; V, Vacuoles; Zn, Zinc; µg, micro gram

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ANALYSIS OF INTEGRATED PEST MANAGEMENT IN AGRICULTURE

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Abstract
Since humans first began raising plants and animals for food, pests have been a constant problem. Farmers have tried a variety of approaches to dealing with these pests throughout the years, with varied degrees of success. Commercial insecticides, on the other hand, revolutionized pest control in the 20th century. Pesticides of the 21st century have significantly reduced agricultural and livestock losses. One of its primary functions is to help farmers maximize their profits while simultaneously enhancing human health and environmental conditions. Due to recent advancements in agricultural technology, modern communication means, shifting consumer trends, growing awareness of sustainably produced food systems, as well as worldwide trade and travel, the IPM paradigm has become necessary in today's times. Host-plant resistance, natural plant products, biopesticides, natural enemies, and agronomic practices are all key components of integrated pest management (IPM) research. Crop cultivars with resistance to key insect pests and illnesses are also being developed using modern biotechnological technologies, such as marker assisted selection, genetic editing, and broad hybridization.

Keywords: IPM, Pest, Integrated, Crop, Productivity

Introduction

There is nothing new about IPM. A cotton pest management programme was devised in the 1920s, and the idea has been around ever since. Insecticides were applied in accordance with findings from regular assessments of pest and natural-enemy populations, which were "super-vised" by entomologists. [1] As an alternative to calendar-based pesticide treatments, this was seen as viable. Supervised management relies on a thorough understanding of ecology and forecasts of pest and natural enemy populations. An integrated approach (integrated control) aims to find the most effective combination of chemical and biological controls for a certain insect problem. For the sake of biological control, chemical pesticides are employed sparingly. Only when regular monitoring indicates that a pest population has exceeded an eco-nomic threshold level chemical controls are deployed. Consequently, this treatment is necessary to prevent the population from

Well-being in Relation to Identity Consistency in a Collectivistic Culture

***** *Grace Lalkhawngaihi & ** H.K Laldinpuii Fente*

Abstract

Empirical findings on the influence of identity consistency on psychological health and functioning in the Eastern and Western cultural settings tend to be dissimilar, understandably so, given the cultural differences especially in collectivism and individualism. The present study examined the importance of identity consistency in the context of group situations for emotional, social, and psychological well-being among young adults (20 to 40 years) of a strongly collectivistic society of Mizoram, India. Participants included 206 members of Community Based Organizations (CBOs) in Mizoram who were selected randomly in equal proportion of gender (103 males and 103 females). Mental Health Continuum-Short Form (Keyes, 2002), Identity Consistency Scale (Suh, 2002), and Levels of Group Participation Scale (Rasmussen, 2003) were used for measurement of the constructs. Results revealed that both Mizo young male and female adults were considerably consistent in their identity presentations across social situations; they were moderately involved in social activities and scored relatively high on measures of emotional, social, psychological and overall well-being. Moderation analyses showed that for young Mizo women who were inconsistent in situational self-presentation, higher social participation significantly increased their emotional well-being. For young adult males, no significant moderation effect of identity consistency between group participation and well-being was found. Discussions gleaned upon identity management in multiple social situations, cultural specific factors, concepts of self-continuity and social roles in the context of the Mizo society and well-being in collectivistic cultures.

Keywords: well-being, group participation, identity consistency

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Original Article

Experiences of single-parent children in the current Indian context

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Abstract

Background: Single-parent family structure involves only one parent responsible for rearing the child and their welfare. Among all types of families, single-parent families can have difficult individual and social experiences, which may affect both single parents as well as their children. Therefore, the present paper attempts to capture some of the lived experiences and social perceptions of single-parent children qualitatively in the current Indian context. **Method:** A qualitative research method was adopted in which data collection was done using semi-structured interviews followed by thematic analysis. The sample consisted of 11 college-going young adults residing in Delhi-NCR with their single mothers since the early years of their lives. **Result:** The results indicate that single-parent children participants had mixed experiences where some individuals' experiences were challenging; at the same time, other experiences led to positive changes and self-growth during the course of their lives. Findings suggest varied experiences of single-parent children in the Indian context, where 82% of participants reported additional "responsibilities" and 54% reported careful "decision making" process; lower "sense of belongingness," "social stigma," and higher "resilience" were reflected in responses by the majority of the participants (91%), and lastly, 73% reported difficulty in "emotional regulation." **Conclusion:** Experiences of single-parent children can be both positive and negative. Strengths such as an increased sense of responsibility, decision-making, and resilience can be considered while dealing with the unique challenges faced by them.

Keywords: Single-parent children, Lived experiences, Negative experiences, Positive outcomes

Introduction

Parenthood has always been an important area of research in psychology; various theorists and researchers have focused on different types of family structures and parenthood. Parents perform multiple culturally, socially, and biologically determined roles to ensure the development and well-being of their children.[1] Parental roles are mainly divided among both parents in dual-parent families (also known as intact families). Still, a breakdown in the family may lead to a different family structure altogether called a single-parent family. Single parenting can be understood as the availability of only one parent to take up the responsibility of two people for nurturing and rearing the child.[2]

Lately, the social shift in gender roles may have contributed to an increasing parental separation and single parenthood in society. According to recent statistics, globally, 320 million children under 17 years of age have been found living in single-parent families, and specifically in the Indian context, approximately 2.3 million children live with single parents.[3]

Single parenthood is not always an outcome of a breakdown in the family; it can also be a choice considering a rapid cultural shift in society. The possible reasons for single-parent family structure can include the death of one of the parents, divorce or

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ICT Tools & Implications for the Wellbeing of Divyangjan Working in Different Service Sectors

Artee Gupta* Tanya Johri**

Abstract

In this ever changing fast paced rapid world, the relevance of the information and communication technology (ICT) tools is acknowledged by almost every individual. Since the last decade, there has been a significant upsurge in the usage of such tools. Technology has helped in bringing a major revolution that was otherwise unimaginable. It has not only been a constituent factor in bridging the gap among people residing in different countries by bring them together on one platform for communication but has also been one of the major reasons for an interconnected and integrated economy. Due to such technological upgradation, globalization is no more a mere dream. In every sector of economy such as primary, secondary or tertiary, the role of ICT is evident. Recently, COVID-19 pandemic made an impact on almost the lives of every individual in various different ways, the entire nation had no option but to make a widespread shift by primarily focusing more on the increase usage of the Information and communication technology tools as per the changing need of the moment. As a major portion of people experience some of the form of disability, there is certainly no doubt about the injustice faced by them in day-to-day life as disability is still seen as a evaluative There are various forms of barriers which are faced by disables in their different aspects of life including the professional and social barriers. As everything is related to one another, this can also affect the mental and physical well-being of disabled population in the negative manner. People with disabilities working in organizations undergo through many issues. One of them is related to a gap that is visible between development of ICT tools for general workforce and for people with disabilities workforce in HRM at workplace. ICT tools can also be a source of maximizing the optimal functioning, making the community more effective and efficient. Therefore, the study aims to review the existing ICT tools with respect to the people with disabilities by doing a meta-analysis. The study will serve an important two-fold purpose through which not only the efficiency of "Divyangjan" will be maximized but will further also contribute to the organizational success by doing a deeper analysis. The knowledge of the ICT tools with respect to people with disabilities in India, thus becomes important. The findings will also add to the empirical evidence regarding the already existing literature of digital technology.

***Keywords**: Information and Communication Tools (ICT), divyangjan, people with disabilities (PWDs), Assistive Technology (AT), inclusion, accessibility.*

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Introduction:

'PWD can't do anything' let's break this old rule,
India has a huge PWDs Talent Pool.
Let us disable the disability,
Let us take a wakeup call and utilize the PWD talent with research on specialized ICT Tools.
Mainstreaming, inclusion and accessible technology are the budding thoughts in today's Research School.' - Artee Gupta (30 Aug.)

"चार बांस चौबीस गज, अंगुल अष्ट प्रमाण,
ता ऊपर सुल्तान है मत चूके चौहान।"

– *कवि चंदबरदाई* (Baradāī, Chanda; Mōhanasiṃha, Kavirāva (1954)

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RESEARCH ARTICLE

WILEY

Silent screams: Listening to and making meaning from the voices of abused children

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Abstract

Background: Sexual violence against children is a major clinical, public health and human rights concern globally. Specifically, child sexual violence (CSV) is one of the world's leading causes of trauma in children. In extreme cases, victims of CSV grow up with a plethora of maladaptive behaviours, which may be salient in the course of growth but later present in adulthood as severe cases of comorbid psychopathologies. It is expected therefore that CSV cases be treated with urgency and policies/laws against perpetrators be translated into visible outcomes. However, many CSV cases go unreported; and where there are attempts at reporting, the manner and approach of handling these cases is discouraging and futile. In this study, we explored the lived experiences of CSV survivors in Nigeria who tried reporting and opening up their experiences.

Method: Using the hermeneutic phenomenological approach, responses from 11 girls aged 15 to 17 years at the time of the study and 8 to 16 years at onset of abuse were obtained. Data were gathered through interviews, and the victims' experiences were aggregated using content analysis.

Results: The major findings were summarized under the following themes: (a) silent screams, (b) trauma and the search for a therapeutic ear, (c) stigma and (d) withdrawal: our last resort. Respondents reported crying out and begging perpetrators to stop the act. They also reported experiencing trauma and related physical/mental health issues after the act. As they sought whom to disclose to, they reported feeling stigmatized and eventually having to withdraw and recoil.

Conclusions: Implications of the study cut across medical practice, social work, therapeutics and policy formation/implementation for the prevention of CSV and attending to CSV victims in hospitals, homes and schools. The importance of empathic therapeutic processes was discussed. The need for a multisectoral and multi-stakeholder approach in tackling CSV was also highlighted.

KEYWORDS
child sexual violence, physicians, stigma, therapeutic listening, trauma

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Academic Stress, Social Support, Physical Health, and Psychological Well-being during Covid-19

Ravi Kumar[*], *Kumar Ujwal*[**], *Deepa Sharma*[***] *and Tanya Johri*[****]

ABSTRACT

The novel corona virus disease (COVID-19) has literally paused the world. Though the pandemic has put immense pressure on everyone, students are the one of the most prominent victims of the present pandemic. Due to uncertainty in examination procedure and date, anxiety of not completing the project and dissertation, unavailability of internet facilities all of these contributed to academic stress of students, and affected the psychological well-being of the students. In this time of crisis one important buffer factor that helped students to deal with anxiety and depression is social support, that is the level of support students got from family and friends. Also, due to the immense pressure and stress the physical health of the students were also at stake. So the present study aimed to investigate the impact of academic stress, social support and physical health on psychological well-being of the college going students. Total 175 college going students (18-21years) were approached, out of which 151 were included in the study. The data were obtained by Academic stress scale, Multidimensional scale of perceived social support scale, Short from general health survey, and Psychological well-being general index. The study obtained a significant negative relationship between psychological well-being and academic stress, and a significant positive relationship of psychological well-being with social support and physical health. Furthermore, the stepwise regression analysis showed that out of academic stress, social support, pain, role functioning, social functioning and physical functioning only four predictors were included in the final model, the prominent predictor of psychological well-being was role functioning, followed by academic stress, social support, and pain.

Keywords: *Psychological well-being, academic stress, social support, physical health.*

INTRODUCTION

The novel coronavirus disease (COVID-19) has been the most powerful thing in the current century till date. Due to its highly infectious nature, the

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NOTION OF NATIONALISM: AN INSIGHT FROM PSYCHOLOGICAL ANALYSIS

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Nationalism is an intrinsic phenomenon which is embedded at the cognitive level of almost every individual residing in the country. During Indian freedom movement, the freedom fighters of our nation made an enormous amount of effort to inculcate the feeling of "Deshbhakti" among citizens from conscious level to behavioral level. It has been proven that group polarization through the positive psychological constructs leads to group cohesiveness. Variables such as compassion and empathy also played an important role as a linking factor that contributed to strengthen all the ties and also helps an individual to associate themselves with the group and to the society as a whole. Civic engagement activities like volunteerism reduces tension arises between ethnocultural diversity and helps to reconcile differences with the help of social capital. It has also been seen that empathy plays an effective role through which other prosocial behaviors could be developed which in turn promotes the feelings of cooperation and brotherhood among the diverse population. The humanities concerns shown by the freedom fighters like Mahatma Gandhi, Swami Vivekanand, Sri Aurobindo and Dr Ambedkar has helped in the reunification of society at cognitive, emotional and behavior level. Historical sufferings like Jallianwala Bagh Massacre, Pulwama Attack to recent Galvan conflict with the neighboring country that have occurred at the collective consciousness had already generated many feelings that resulted in changing the negative orientation of mind to a rich mindset focusing on positive attitudes, hope, aspirations etc. It also forced the people of our nation to think and recalibrate our actions in the direction of nationalism by identifying our self in terms of collective self-identity as a Bhartiya. This study focuses on reinterpreting the feeling of nationalism through the lens of psychological enquiry.

***Key words**: Psychological Enquiry, Empathy, Compassion, Nationalism, Leaders.*

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Sentiment Analysis of Popular Hindi Songs

Ravi Kumar, Meghna Jaiswal, Ganga Tiwari, Tanya Johari

ABSTRACT

Since the time immemorial music has served as a universal language around the world. Lyrics, the heart and soul of music have historically been an important part of music's effectiveness as a medium for connecting with the general population. Lyrics have a high associative quality that makes them capable of influencing a person's emotional states. However, the potential for research into how lyrics affect happiness and sadness is usually disregarded. This study uses sentiment analysis to characterise good and negative emotions based on well-known Hindi songs. The present study intended to explore what kind of emotions different genre of songs elicit and what are the psychological mechanism of it.Using a focused-group interview technique, data were collected with the help of 15 Hindi songs which were categorised into three categories; patriotic, sad and romantic songs. It was discovered that while melancholy music carried the listeners back in time and made them feel sad, let down, and furious, patriotic songs made the listeners feel happy and proud. While the love songs brought back romantic memories for them, the main feelings they experienced were joy, partner longing, connection, and affection. The study holds its significance in advancing the understanding of how music affects emotions and mood regulation.

Keywords: Music, emotion, music and mood.

Introduction

Formally, music is an arrangement of sounds with melody, rhythm, and typically harmony can be referred to as music. However, music is much more than just a formally organised system of tones and tempos to humanity. Music is an expression, according to writer Victor Hugo, that cannot be expressed in words and cannot be silenced. It has been shown to be among the most often used forms of expression and communication. Regardless of age, culture, or gender, it resides in the daily lives of individuals all around the world (Mehr et al., 2019). Since the beginning of

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Effects of Gender and Type of Institutions on Teacher's Self-Efficacy and Job Satisfaction among Mizo Secondary School Teachers

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It is considered important for teachers to be contented and satisfied with their job as they play crucial roles in facilitating learners and students. Moreover, a teacher's belief on his/her competence determines the quality of education s/he create for students. Keeping these in mind, the present study explored the phenomenon of Job Satisfaction and Self-Efficacy among teachers. Gender comparison and the effect of Type of Institution/Schools on Teacher's Job Satisfaction and Teacher's Self- Efficacy were examined. Participants included 705 Secondary School Teachers from all districts in Mizoram (21) who were selected using purposive sampling from Mizoram situated in the North-East of India. Teacher Job Satisfaction Scale by Munir & Khatoon (2014) and Teacher Sense of Efficacy Scale – Short Form developed by Tschannen-Moran & and Woolfolk Hoy (2001) were used as psychological tools. Results revealed that Mizo Secondary School Teachers were generally high on Job Satisfaction (M= 3.98, SD= .44) Self-efficacy (M= 7.09, SD= 1.18) and Efficacy in Student Management (M= 7.3, SD= 1.15) . Gender effect on Job Satisfaction was significant t(1)= 16.46, p= .00 but not on Self-Efficacy t(1)= .002, p= .96 . No significant effect of type of institutions on Job Satisfaction t(1)= .05, p= .82 and Self-Efficacy t(1)= 1.13, p= .29 was found. Importance of teachers' contentment and self-confidence, implications for future supportive researches in similar areas were discussed.

Keywords: job satisfaction, teacher's self-efficacy, gender, private-public school teachers

Among variants of factors that may determine the effectiveness of school teachers, teacher's job satisfaction and self-efficacy are distinctively relevant. A teacher's dedication, work motivation and interest in teaching are sustained by their level of job satisfaction (Munir & Khatoon, Classroom management, level of involvement with students, visions and goals executed through sincere arrangement and teaching designs also contribute to teacher's belief in their efficacy (Allinder, 1994). The quality of teachers with high self-efficacy will include- excitement for

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Contribution of doubly and triply excited states in excitation energies with transition data and collisional excitation cross-section of Sn^{13+} and Sn^{14+} ions

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ABSTRACT

We have calculated atomic data such as energy levels, transition wavelengths, oscillator strengths, transition rates, lifetimes and Collision cross-section for Sn^{13+} and Sn^{14+} ions. We have employed Flexible atomic code (FAC) in our computations. We have computed lowest 50 and 17 fine structure levels for Sn^{13+} and Sn^{14+} respectively. We have provided transition data for all electric dipole (E1), magnetic dipole (M1), electric quadrupole (E2) and magnetic quadrupole (M2) transitions among lowest 17 levels and 50 levels for Kr-like Sn and Rb-like Sn respectively. We have also provided lifetimes of states of Kr-like and Rb-like Sn ions and predicted that magnetic dipole transitions have dominant contribution in lifetimes of states having large lifetime. We have also reported collision cross-section for Kr-like and Rb-like Sn from ground state to lowest 17 levels and 50 levels respectively. We have compared our calculated data with available theoretical and experimental results and discussed difference between them.

1. Introduction

The light emitted from neutral Sn and Sn ions exist in various types of plasmas such as laser produced plasma, discharge plasma, fusion and astrophysical plasma etc. (Banine et al., 2011; Svendsen and O'Sullivan, 1994; Coenen et al., 2014; van Eden et al., 2016; Eden et al., 2017; Mason and Eng, 2007; Hobbs et al., 1993; Proffitt et al., 2001; Chayer et al., 2005; Adelman et al., 1979; Savage and Sembach, 1996; Sofia et al., 1999; de Andrés-García et al., 2016; Dimitrijevic et al., 2018; Biswas et al., 2018). The accurate and precise atomic data such as excitation energies, transition data, excitation cross-sections, etc. have significant importance for understanding physics behind the generation, transportation of extreme ultraviolet (EUV) radiation and in the optimization of EUV sources (Svendsen and O'Sullivan, 1994; Stamm, 2004). The highly charged ions are the emitters of photons in a narrow spectrum centered at 13.5 nm. The radiation at this wavelength is used to mark features on commercial microchips. Due to open 4d-subshell structures, Sn ions are suitable and relevant to this application. Further, the excitation energies of these configurations across Sn ions makes them excellent radiators of radiation of wavelength of 13.5 nm (O'Sullivan et al., 2015; Versolato, 2019; Torretti et al., 2020). In industrial applications, Sn ions have been used in laser produced plasmas driven by CO_2 laser of wavelength 100 Å. For understanding drive laser wavelength change for future industrial purposes, a complete atomic data is necessary and this data will also be simulation of source performance, radiation hydrodynamics codes and for emission spectra. But on theoretical side, there is very fewer amounts of data are available in literature.

1.1. Atomic strcuture & spectroscopic studies

Early in 1970, Carlson et al. (Thomas et al., 1970) have calculated approximate solution of ionization potential of elements from nuclear charge 2 to 103. M. A. Ali (1992) has implemented concept of relativistic coulomb complex of Kim and Weiss in the calculation of fine structure splitting of highly charged ions including Sn^{13+} and $Sn^{14}+$. Rodrigues et al. (2004) have presented atomic binding energies of Lithium to Dubnium isoelectronic series by using Dirac-Fock approximation. V. A. Zilitis, 2004a, 2004b has calculated Rydberg energy levels of Rb-like ions including Sn^{13+} by using method of interpolation of relativistic quantum defects by employing Dirac-Fock method. Churilov et al. (Churilov and Ryabtsev, 2006) have experimentally analyzed spectra of Sn and In ions including Sn^{13+} and Sn^{14+} and identified 150 spectral lines in far VUV region having importance in projection vacuum UV

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Effect of plasma environment on spectral and structural properties of H-like C, N and O ions

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ABSTRACT

The novel studies of the dense plasma on transition properties and level structures for H-like Carbon, Nitrogen and Oxygen ions are presented. Plasma effect is included through the confined ion sphere plasma model. We have also included relativistic effects through mass-correction, Darwin and spin-orbit terms during the calculation. The energy level shift, oscillator strengths, transition rates, plasma shifts and probability densities are calculated by using Ritz's variation method for different ion sphere plasma concentrations. The variation parameters are calculated by minimizing the expectation value of the energy. Eigenstate, probability and average position are calculated with plasma concentration for the internal structure of the system. We have compared our calculated data with experimental National Institute of Science and Technology (NIST) database and other theoretical results in the literature and it is showing a good quantitative agreement. The study may be very useful in astrophysical and fusion plasma.

1. Introduction

The structural properties of atomic system in dense plasmas have been subject to comprehensive studies over the last several decades. This is primarily due to most of the laboratories for studying non-equilibrium plasma where high electron density ($n_e > 10^{22}$ cm^{-3}) can be attained easily. Examination of the plasma effects is essential for understanding spectra and for acquiring a diagnostic of the plasma conditions [1,2]. The effects of plasma environment such as in the gaseous-discharge plasma in the laboratory, plasma in the controlled thermo nuclear experiment such as Tokomak, space plasma in the solar corona and interstellar medium, the columbic effects dominate over the thermal ones [3,4]. Obviously, the interaction between plasma and bound electrons of an inserted ion modifies the transition properties of the ions and electronic structure bringing about spectral line shifts, changes in the line shapes and the line broadening when contrasted and those with the free ions.

In the ion sphere model, the ion contains the precise number of electrons to make ensure neutrality and it is surrounded in a spherically symmetric cell [5]. While the Debye-Hückel potential is used for high temperature (10^8K) and lower concentration ($10^{17} - 10^{20}$ cm^{-3}) and ion sphere model potential is used for low temperature (10^6K) and high concentration [6,7] ($10^{21} - 10^{23}$ cm^{-3}). For the dense plasma environment, ion sphere model is of wide use in many fields such as x-ray lasers, laser produced plasmas, astrophysical systems and so on [8,4]. As an example, the Copper (Cu) minimum of Lithium-like ions moving towards higher photoelectron energies with decreasing ion-sphere (IS) radius and the strongly coupled plasma effect on the ground state photoionization cross-section of ions was studied by Das [9]. M. Das [10] has also studied plasma screening effect on transition energies and polarizabilities of H-like ions using Debye-Hucke potential. Wu et al. investigated the plasma effects on the electron impact ionization using a distorted-wave approximation and identified that the ionization is strongly dependent on the plasma medium [11]. Chen et al. were studied the dense plasma effects on the energy levels and radiative rates by using the ion-sphere model [12]. The plasma effects on the radiative rates, energy levels and wave functions are studied by Mbelkhiri et al. [13] making use of flexible atomic code (FAC) code including the ion sphere. Li et al. presented the influence of plasma density on the oscillator strengths and transition energies of beryllium-like ions by initiating a correction to one electron potential to account for the screening of the ionized electrons and noted the role of the microscopic density variation of the ionized electrons [14–20].

In ion sphere potential, due to very high density of plasma electrons

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Excitation energies, transition data of SXR, HXR, EUV and far-UV spectral lines with partition function, thermodynamic parameters and level population for W LXVII and W XLIX

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ABSTRACT

We present excitation energies, emitted photon wavelength during the transition from upper level to lower level, lifetimes, transitions rates and other transition parameters for first fine structure 200 levels of W LXVII and W XLIX by using Multi-Configuration Dirac-Fock (MCDF) scheme in our calculations. We endorse that contributions of relativistic effects QED and Breit corrections in energies of levels are significant. We have also shown that our results of energies from both, Flexible Atomic Code (FAC) and General Purpose Atomic Structure Package (GRASP) matches with each other and also with NIST and other experimentally measured and theoretically calculated results. We have predicted all soft x-ray (SXR), hard x-ray (HXR), extreme ultraviolet (EUV) and far UV transitions from ground state in W LXVII and W XLIX. Furthermore, we have also provided relative population for first five excited states, partition function and thermodynamic quantities for both W LXVII and W XLIX and studied their variations with temperature. Besides, detailed new atomic data and thermodynamic data of W LXVII and W XLIX which are not published so far in the literature have been reported and can be advantageous in the field of modelling of fusion and astrophysical plasmas, cell biology and microscopic imaging.

1. Introduction

The spectroscopic properties of tungsten ions has become topic of interest from last few years due to its significant role in the development of magnetic fusion and radiation source. It has been proved that tungsten ions have become the most important impurity ions in plasma fusion reactors [1]. Various atomic properties namely, transition properties, collisional and photoionization data, etc, are urgently required for several ionization stages of tungsten to control the radiation loss and diagnosis of high temperature fusion plasmas. Tungsten ions are also of interest due to their exceptional thermal properties, low hydrogen retention, tensile strength which makes them first choice for plasma facing surfaces [2–6]. Consequently, several spectroscopic observational and theoretical studies on tungsten ions have been performed and some are under process from past few years. Several measurements have been completed and under process on electron beam ion trap (EBIT) at Berlin [7–11], National Institute of Standards and Technology (NIST) [12–15], Lawrence Livermore National Laboratory (LLNL) [16–19] as well as ASDEX upgrade tokomak [20–22]. The radiations emitted from L-shell or n = 2 shell tungsten ions i.e Li-like to Ne-like ions may be useful for the calculation of ion temperature and bulk velocity of plasma.

The atomic physics is an important branch of physics which helps in describing the different states of the plasma as well as in the analysis and diagnosis of plasma properties. Since the plasmas can be in local and non local thermodynamic equilibrium, therefore obtaining atomic properties such as atomic transition properties, energy levels and study of collisional excitation, ionization, and recombination is necessary to properly diagnose and describe high temperature plasmas. Further, O-like ions consist of open 2p subshell in ground state and radiative transition between ground state and excited state will lie in X-ray regime. The SXR transitions have been used in technique of soft X-ray tomography (SXT) for imaging tissues in cell for visualization of internal structure. Therefore, several SXT instruments and soft X-ray sources have been developed and under construction for solving current biological problems [23–30]. Due to the wide range of applications of tungsten ions, including W LXVII and W XLIX, there is urgent demand of atomic data of large number of states of these ions. But till date, a limited experimental and theoretical study on W LXVII and W XLIX is available in the

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Dye degradation study of Malachite green and Congo red by using $ZnIn_2S_4$

Dye degradation study of Malachite green and Congo red by using $ZnIn_2S_4$

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Abstract
In this manuscript, we demonstrate photocatalytic study of $ZnIn_2S_4$ powder sample under visible light irradiation on Malachite green and Congo red dye. The powder sample was synthesized usingIndium (III) sulphate,thioacetamide andZinc sulphate in aqueous solution. X-ray diffraction and FESEM were used to identify the hexagonal crystal structure and microspheres shape, while UV-Vis spectroscopy was used to acquire absorption and reflectance spectra under visible-light (λ= 420 nm) irradiation, the effects of process factors such as contact duration and adsorbent dose were studied on Malachite green and Congo red. Degradation efficiency of Malachite green and Congo red are 96.33%, 99.79% respectively.The results revealed that visible light photocatalytic degradation of dyes was highly efficient.

Key words: $ZnIn_2S_4$; Visible-light irradiation, Malachite green (MG), Congo red (CR)

1. Introduction

From last few years a great interest aroused for the investigation of photocatalytic dye degradation because lost about 15% of total production in worldwide. Peoples are also affected because due to cause of polluted water containing dye also creates a worldwide problem. Another various organic dyes methyl orange, malachite green, congo red are also very harmful and can be used as an antimicrobial and antifungal containing heavy water pollutant which are very toxic, affected for environment [1-3]. In order to remove these problems continuous search from last few decades to find the suitable and efficient catalysts to degrade of dye contaminants. To overcome this problem semiconductor photocatalytic and another nanostructured materials such as ZnO, TiO, andCds etc. because of their low cost and ecofriendly nature [4-7]. Out of which several are broadly investigated. These photocatalytic catalyst absorb photon in the range of UV due to containing a large band gap [8]. After tremendous effort we find a new micro/Nano catalytic $ZnIn_2S_4$ to remove pollutants of organic/inorganic pollutants, have a low cost, more efficient and synthesis by a simple root method in water solution. $ZnIn_2S_4$ have two polymorphous have been reported at hexagonal and cubic lattices [9]. $ZnIn_2S_4$ is degraded in the visible light range and widely use in photocatalytic applications [10]. In this work, Zinc Indium Sulphate powder sample was successfully synthesis by simple root method at low temperature. The crystal structure, morphology and photocatalytic activity of zinc indium sulfate were investigated. The effect of contact time and absorbent amount on Malachite green and Congo red in photocatalytic reaction was studied.

2. Synthesis method

$ZnIn_2S_4$ photocatalysts were made in aqueous solution at low temperatures using $ZnSO_4$, $In_2(SO_4)_3$, and thioacetamide (TAA). The quantities of Zinc Sulphate (4.0 mmol), Indium Sulphate (4.0mmol), and Thioacetamide (20.0 mmol) are dissolved in 250 ml flask of D.I water (80ml) which was sealed partially and placed at 80^0C in water bath for a specific duration of four hours. After final suspension, it was cool down at room temperature for four hours, and then final solution was filtered many times by DI-water and ethanol. After filtration sample dried for six hours at 60^0C in muffle furnace, and then collected sample was grinded by motor pestal. The final product essential for the study of dye degradation.

3. Characterization

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ORIGINAL PAPER

Strongly coupled plasma effect on excitation energies of O-like ions and photoionization of F-like ions

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Abstract: The main goal of the present study is to analyze and estimate the plasma screening effect on excitation energies O-like ions and photoionization process of F-like ions under the influence of strongly coupled plasma. We have employed an ion sphere model (ISM) in flexible atomic code (FAC) to study and analyze plasma effect in atomic structure of O-like ions and photoionization of F-like ions. We have presented shift in excitation energies of lowest 10 levels of Fe XIX, Co XX, Ni XXI, Cu XXII and Zn XXIII at electron densities ranges 10^{22}–10^{24} cm^{-3} under plasma environment. We have also compared our transition wavelengths for Fe XIX with wavelengths observed in ENEA laser facility and calculated from Hebrew University Lawrence Livermore Atomic Code (HULLAC) code at electron density 10^{21} cm^{-3}. The lowering in ionization potentials and effect on photoionization cross sections for ground and first excited states of Fe XVIII, Co XIX, Ni XX, Cu XXI and Zn XXII also studied at electron densities ranges 10^{22}–10^{24} cm^{-3} at five photo-electron energies ranges 100–500 eV.

Keywords: Energy levels; Radiative data; Spectroscopic parameters; Transition wavelength

1. Introduction

From last few years, the theoretical and experimental research on the study of plasma screening effect on atomic properties of highly charged ions immersed in hot and dense plasma has been increased remarkably [1–15]. Due to potential applications in plasma spectroscopy, inertial confinement fusion and astrophysics, atomic physics in hot and dense plasma has become an emerging and developing field. The screening effects help in the examination and investigation of radiation emitted from plasma and physical phenomenon such as continuum lowering and pressure ionization [16]. These effects play a significant role in the determination of fruitful details about change in spectral line shifts, line broadening and profiles of ingrained atoms or ions. The hot and dense plasma effects on atomic properties have also great interest in the diagnosis of plasmas, opacities as well as in the study of quantum field properties. Atomic processes such as photoionization (PI), electron impact excitation (EIE), radiative recombination (RR), etc., of atoms/ions also exhibit prominent variation under the effect of plasma environment [17, 18]. Under the influence of hot dense plasma environment, the plasma electrons and ions modify atomic potential thereby affecting atomic processes of ions/atoms. The study of photoionization is useful in the computation of charge state population and radiative properties of plasma.

Depending on the value of coupling constant, the plasma environment can be divided into two categories, weakly and strongly coupled plasma (SCP). For weakly coupled plasma (WCP), the screening effect can be introduced by Debye model. While for strongly coupled plasma, ion sphere (IS) model has been adopted. Both models have been employed several times in the past for different atomic systems embedded in plasma [19–40]. Apart from these two models, several other models such as polarized-correlation sphere model [41], hybrid model [42], nonlinear Debye–Hückel model [43] and Stewart–Pyatt model [44] have also been applied for describing plasma screening effect for different ranges of temperature and density. Further, for the study of properties of hot and dense

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ORIGINAL PAPER

Study of contribution of doubly excited $3d^{10}$ configurations in excitation energies and SXR transition data of Fe-like ions

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Abstract: We present calculations of excitation energies, emitted photon wavelengths during the transition from upper level to lower level, transitions rates and other transition parameters for lowest 200 fine structure levels of Fe-like Xe, Cs and Ba ions by using multi-configuration Dirac–Fock (MCDF) technique. The significant contribution of the relativistic and quantum electrodynamic effects (QED) in addition to Breit corrections in energies of levels is observed and reported in this work. The calculated energies from both flexible atomic code (FAC) and General Purpose Atomic Structure Package (GRASP) are compared with the critically evaluated experimental NIST and other recent reported experimental and theoretical results. The computed data validate the experimentally available data. We have estimated the wavelengths of all soft X-ray (SXR) from the ground state in Fe-like isoelectronic sequence. Furthermore, sufficient new radiative data of Fe-like ions, which have not been published up to our knowledge, have been reported in present paper. Due to high abundance of iron ($Z = 26$) in cosmic environments, the present study can be beneficial in the field of modeling of fusion and astrophysical plasmas devices such as tokamaks, laser spectroscopy, electron beam ion trap (EBIT) cell biology and microscopic imaging.

Keywords: Soft X-ray; Quantum electrodynamics; Radiative data; MCDF

1. Introduction

The neutral and ionized xenon, cesium and barium have been used for the spectroscopic study of several plasmas. Their large atomic mass results in small Doppler width make them an attractive option for tokamak and other high-temperature plasma devices. The X-ray spectra of high Z elements such as xenon, cesium and barium are of special interest due to applications in charged plasma diagnostics, lithography and X-ray laser research. The ions of iron-group elements have complex spectra due to open 3d shells and contain thousands of lines. They are important in spectra of interstellar medium (ISM), hot and cool stars, galaxies, nebulae and quasi-stellar objects. Problems in modeling spectra in UV and X-ray range are mainly due to lack of precise atomic data of higher excited states of iron-group elements. Further, the urgent requirement of new energy sources has forced developed countries to collaborate or participate in the demonstration of scientific and technological achievability of magnetic fusion through ITER to produces ten times more power than required to heat the plasma [1] and this demands the atomic data of highly charged ion. Recently, tungsten is the most probable candidate but due to high radiative efficiency of tungsten ions, and the influx of tungsten to burning plasma is topic of diagnosis and require stringent control. Thus, the analysis and study of higher ionization states of inert gases such as xenon and other high Z ions can be used understand the heat dissipation flux in ITER divertor. Therefore, in the present manuscript, we have provided the atomic data of Fe-like Xe, Cs and Ba ions.

In the past few years, doubly excited states of positive ions have been observed in collision of slow multiply charged ions with atoms or molecules. These states are mainly formed due to electron capture or by transfer excitation process. But the major constraint in the study of these collision dynamics is the lack of understanding and

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THE EUROPEAN PHYSICAL JOURNAL D

Regular Article – Atomic Physics

Theoretical analysis of relativistic energy corrections, partition function and thermodynamic properties of spherically confined hydrogen atom

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Abstract. The relativistic energy corrections for the spherically confined hydrogen with penetrable wall are calculated for various orbitals as a function of pressure and confinement radius. The relativistic corrections at high pressures of the order of 10^8–10^9 atm are found to be more than thousand times higher than the corresponding values for the free atom. For calculating the energy eigenvalues, the efficient Numerov method is adopted. The partition function and other thermodynamic properties are also calculated for temperature range 10^4 K to 10^{10} K at low (0–10 atm) and high pressures (10^4–10^8 atm). We investigate the behaviour of partition function and thermodynamic parameters graphically with pressure and temperature. We discuss the effect of high temperature and reduction of confinement radius on these parameters. The present study will be useful in Industrial applications like development of hydrogen fuel and in various physics branches such as in fusion and astrophysical plasma, condensed matter, statistical mechanics and also in other research areas where we encounter atoms which are subjected to high pressures.

1 Introduction

In the early stage, Michel's and co-workers investigated the atom under high pressure by confining the atom in an impenetrable spherical cage. There has been much attention of researchers on the study of confined atoms due to the fact that as the confinement increases the atom is subjected to more and more pressure. The atoms under such high pressure lie in the interior of stars and giant planets and hence considerable interest has been shown recently by various authors to calculate the structural properties of confined atoms [1–5]. These studies are relevant for understanding the boundary effects on energies and wavefunctions and has become very timely due to multiple applications of layered semiconductor nano-devices like quantum wires, quantum dots and also with the development of quantum computer. Spatial confinement alters the boundary conditions of the wavefunctions by imposition of a barrier. A plasma embedded atom or ion is also considered as a type of confined system [6]. Hence, the calculations of structural properties of confined atoms can prove to be a powerful tool in the understanding of the behaviour of atoms embedded in plasma environment.

Starting with the work of Sommerfeld and Welker, many authors have worked on the calculation of critical confinement radius and most of the studies devoted to the confined atoms have mainly focussed on the computation of the non-relativistic energy eigenvalues as a function of confinement radius [7–12]. Recently, many studies are devoted to endohedrally confined atoms [13–15]. A recent review on A@C60 [16] presents the electronic structure and dynamics of such systems. Fine structure calculations are important in explaining many phenomena involving interaction of light and charged particles like electrons. Many authors have performed fine structure calculations on different systems [17–19]. The relativistic corrections for the spherical QD have been calculated earlier [20–22]. We have presented here, the relativistic energy corrections for the first few levels of hydrogen for various values of confinement radius (i.e. at different pressures) which have not been presented till now in the literature.

New technologies, methods and experimental techniques are developing for intensive theoretical study of high-pressure plasmas [23, 24], confined quantum systems [25, 26]. Due to this reason, the study of thermodynamic parameters and partition function of high-density plasmas [27–33] has received a lot of attention for the understanding of multi-body interaction. A lot

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THE EUROPEAN PHYSICAL JOURNAL D

Regular Article – Atomic Physics

Theoretical analysis of excitation energies and transition parameters of C-like ions

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Abstract. Relativistic configuration interaction results are presented for several C-like ions (Kr XXXI, Rb XXXII, Sr XXXIII) using the multi-configuration Dirac–Hartree–Fock (MCDHF) method. The calculations are performed in the active space approximation with the inclusion of the Breit interaction, the finite nuclear size effect and quantum electrodynamic corrections. Results for fine structure energy levels for $2s^22p^2$, $2s2p^3$ and $2p^4$ configurations relative to the ground state are reported. The transition wavelengths, transition probabilities, line strengths and absorption oscillator strengths for electric dipole ($E1$) and magnetic quadrupole ($M2$) transitions are calculated among first 20 levels. The core-valence correlation effects are taken into account through single-double multireference expansions to increasing sets of active orbitals up to $n = 7$. Our calculated results are found to be very close to other available theoretical and experimental values. We hope that our results will be useful for experimentalists in identifying the fine structure levels in the future.

1 Introduction

The study of C-like ions is significant for modeling of high temperature astrophysical and laboratory plasmas [1]. Astronomical observations have shown that carbonaceous compounds are ubiquitous in the gas and solid state, refractory and icy in our own and distant galaxies [2]. High resolution spectra of astronomical objects have been obtained by Extreme ultraviolet Explorer spacecraft and Advanced X-ray Astrophysical facility in the extreme ultraviolet and X-ray wavelength ranges. Most of the spectral lines of C-like ions obtained from the spectra of solar atmosphere, stellar and astrophysical sources by Solar and Heliospheric Observatory (SOHO), Hinode and Chandra, lie in ultraviolet, far-ultra-violet, extreme ultraviolet and X-ray regions [3]. Krypton can easily be introduced into the plasma being a rare gas and does not pollute the vacuum vessel [4]. So, it can be widely used as an injected impurity for diagnosing tokamak fusion plasmas and a diagnostic element for the X-ray imaging spectrometer system on the forthcoming ITER project. Several diagnostic experiments for krypton ions (Kr XXXII–XXVIII) are being performed at the European Fusion Development Agency Joint European Torus (EFDA-JET) facility because of the fact that their spectral line intensity ratios, in the XUV region particularly, may prove useful in finding the production rate and concentration of the alpha particles produced in a burning DT plasma [5]. Due to very high temperature of tokamak fusion plasmas, various ionization stages of atoms are possible. To estimate the power loss from the impurities in ITER, atomic data such as energy levels and oscillator strengths are required for such highly ionized atoms. The extreme ultraviolet (EUV) spectra of highly charged ions Kr XXI–Kr XXXIV produced in an electron beam ion trap (EBIT) were observed and analyzed by Podpaly et al. [6], and the magnetic-dipole transition within the ground configuration $3s^23p$ was shown by collisional-radiative modeling. Accurate theoretical atomic data are therefore required for comparison of results as the atomic data available through experiments is very limited.

1.1 Available literature

A large amount of atomic data for C-like ions have been reported by many researchers but accurate atomic data for most of the carbon ions are still needed. Therefore, the main aim of this paper is to increase the database for highly ionized Carbon atoms and also to provide accuracy to the already available data. Feldman et al. [7] have reported line intensities of C-like ions and other ions for nuclear charge $Z = 26$–36. Chen et al. [8] have presented K-shell energies and transition rates for

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Regular Article

Theoretical study of excitation energies and radiative data with identification of SXR and EUV spectral lines for Li-like ions

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Abstract The fully relativistic multi-configuration Dirac–Fock (MCDF) method is employed to compute the excitation energies and radiative rates for Li-like ions ($57 \leq Z \leq 92$). Relativistic corrections quantum electrodynamics (QED) and Breit corrections have been included in the calculations. We have presented the lowest 24 fine structural level energies and radiative data for electric dipole (E1) transitions among these levels. We have compared our results with results compiled by NIST as well as with other results available in the literature. We have also performed analogous calculations for energy levels by using flexible atomic code (FAC), to assess the accuracy of our results. Further, we have identified soft x-ray (SXR) and extreme ultra-violet (EUV) spectral lines within listed E1 transitions. We strongly believe that our presented data will be helpful in future works related to high Z lithium ions.

1 Introduction

Spectroscopy study of lithium-like ions has got special attention and attracted scientists due to their valuable applications both in astrophysics and in theoretical and experimental atomic physic, plasma physics and other branches of physics. The atomic data consisting of transition wavelengths, oscillator strengths, line strengths and radiative rates for Li-like ions are important for the interpretation, understanding and analysis of emission spectra observed from a variety of astrophysical [1, 2] and laboratory plasmas [3, 4]. It has been found that determination of chemical abundances [5] and diagnostics of temperature and density of solar plasmas can be done with the help of transition data of Li-like ions. With this in view, we have already published atomic data for few Li-like ions [7]. A. Hibbert has developed CIV3 code in 1975 to calculate atomic data which have been used by many theoretical physicists. Schweppe et al. [6] demonstrated that in Li-like ions, transition energy for the transition $1s^2 2p\text{-}1s^2 2s$ can be measured with accuracy better than 0.1% of QED contribution. After this experiment, testing of quantum electrodynamics in 3 electron systems have become popular because three-electron ions are more accessible to experiments than one or two electron ions. Also, the resonance lines belonging to $1s^2 2p\text{-}1s^2 2s$ transitions are also beneficial for diagnosing and analyzing tokamak-type plasmas. Atomic data of lithium ions are important for vapor shielding in fusion devices [8]. Further, lithium has many biochemical and phenomenological effects and should be studied to understand effects of lithium on cancer [9].

Accurate and precise theoretical calculations of spectroscopic data of Li-like ions make them first choice for plasma spectra modeling [10, 11]. In the present work, our main goal is to report and discuss fine structure energies and transition data among the lowest 24 levels of Li-like La to U ions. We have adopted relativistic configurations interaction (RCI) technique in our calculations [12]. In this computational method, we have included relativistic effects such as Breit interaction and quantum electrodynamic (QED) effects. Further, we have also adopted fully relativistic code FAC [13] for the calculations of excitation energies of Li-ions to check the results.

As electric dipole (E1) transitions have high oscillator strengths as compared to other transitions, E1 transitions are strong transitions and can be easily observed in the spectrum from various sources. Due to this reason, theoretical study of E1 transitions is very important for identification of spectral lines and analysis of spectrum. Therefore, we have reported the transitions wavelengths (in Å), transition probabilities (in s^{-1}), oscillator strengths (dimensionless) and line strengths (in a.u.) for all E1 transitions among the lowest 24 levels. In Li-like ions, significant theoretical efforts have been undertaken [14–27] to produce reliable data. However, significant improvements are still required to provide complete, consistent, and accurate atomic data within the limits of experimental accuracy.

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Thermodynamic quantities of magnetised PNJL model in non-zero chemical potential

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Abstract. The recent research work of two-flavor quarks with magnetised Polyakov–Nambu–Jona–Lasinio (mPNJL) model has been upgraded with the inclusion of a finite chemical potential in the temperature-dependent quark mass and the chemical potential in the interaction potential of Lagrangian density in continuation of the work of Dahiya and Singh (*Pramana – J. Phys.* **94**:120 (2020)). The thermodynamic quantity like equation of state (EOS) and its relevant thermodynamic properties after the inclusion of the finite chemical potential in the temperature-dependent quark mass and potential are represented in the results. The outputs from the calculations show that all the thermodynamic quantities are obtained in such a way that it is enhanced and improved from the earlier result of thermodynamic properties of zero chemical potential. It means that the chemical potential really plays the role of upgradation in the outputs of thermodynamic parameters in comparison to the output produced by the absence of chemical potential in the thermal mass and potential of the Lagrangian density.

Keywords. Quantum chromodynamics; quark-gluon plasma.

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1. Introduction

In high-energy heavy-ion collisions, it has been found that it is an interesting research area since last two decades for the high temperature scale. The study in this area has given a very important and significant understanding to the families of theoretical and experimental groups of particle, nuclear and astrophysics. As it is the theory of strong interactions called quantum chromodynamics (QCD), the interaction is of short range and studying it deals with perturbative and non-perturbative features of QCD. Studying the perturbative part is not difficult whereas non-perturbative part is highly complicated. So the effect produced by non-perturbative features can be studied through the thermal excitation at high temperature and baryon chemical potential. At high temperature and nuclear density, QCD is of asymptotic nature in which the component parts of the matter are free quarks and gluon as the bound hadrons melts into a deconfined phase. In this QCD phenomena, there is a separation between these two matters, where one phase is obtained at a much lower temperature called hadronic matter of bound quarks and the other at very high temperature called deconfined matter of free quarks and gluons called quark gluon plasma (QGP). However, it is believed that the matter is found to coexist with a short span of life of a mixed phase in which the temperature is found to be around (150–250) MeV and then subsequently cooled down the system, and it becomes completely a hadronic phase. In addition, recently a particularly interesting phenomenon of rich baryonic matter has been discussed in some laboratories [1] and that laboratories also focus on finding the structure of the QCD phase. From this information, we get the motivation to study the QCD phase structure at finite temperature T and chemical potential μ. However, the possible critical temperature about the phase transition can be determined from the QCD phase diagram. The structure determines the possible order of phase transition depending on the temperature. In support of these studies, groups at Large Hadron Colliders (LHC) at CERN try to find out the QGP signature after doing a number of experiments with collisions of heavy ions. However, these experiments explain the involvement of huge magnetic field as the accelerated charged particles carry the magnetic field. So the QCD phase

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Equation of State of Magnetized PNJL Model in Finite Chemical Potential

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Abstract—We study on the recent research work of two flavor magnetized PNJL model incorporating finite chemical potential in the thermal mass and in the interaction potential of Lagrangian density. The equation of state (EOS) and its corresponding thermodynamic properties after introducing the finite chemical potential in the thermal mass and potential are shown in the results. The results show that the EOS and thermodynamic relations are found to be similar pattern and enhanced results from the earlier results of EOS and thermodynamic relations of zero chemical potential. It indicates that there is effect of finite chemical potential in the outputs of EOS and the thermodynamic relations.

Keywords: QCD, quark-gluon plasma

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1. INTRODUCTION

High energy heavy ion collisions is a very fascinating area since the birth of the colliding physics. It has become an interesting research topic since last two decades for the high temperature scale and high nuclear density. It gives the significant understandings to the community of particle physics, nuclear and astrophysics in both theoretical and experimental aspects. The study of such collision has given the similar thought with the theory of strong interaction called Quantum Chromodynamics (QCD) However QCD is defined as asymptotically free and its high temperature T and high density phases are dominated by free quarks and gluons rather than hadrons. This indicates that there is a phase separation between these two matters, viz the confined phase of hadronic matter at much lower temperature and the deconfined phase of quark-gluon plasma (QGP) matter at much higher temperature. Recently QGP is discussed at a very rich baryonic matter in some laboratories such as FAIR at Damsturd and NICA at Dubna. So experimenting for the future research,it is found that there is huge involvement of magnetic fields due to the particles in the system. This means that the QCD phase diagram is required to modify in presence of magnetic field and large chemical potential. So QCD physics is of extreme importance to the signature of QGP formation and its phase transition [1]. It is also believed that the transitions take place during the early phase of universe evolution, and the evolutions of universe is reproduced in contemporary heavy-ion collision experiments producing a state of matter called Quark-Gluon Plasma (QGP). From these experimental and theoretical proofs the curiosity on the study of QGP formation has been increased continuously and the proof is being signified from the different angles of signatures—photon/dilepton production, strange enhancement, hydrodynamical studies and QCD phase structure like equation of state (EOS) [2]. These information implies that QGP study is a complicated issue and to describe the system there is a relation between local thermodynamic quantities and the equation of state (EOS). The EOS is based on the parameters such as temperature T and chemical potential μ of the phenomenologically created matter of free quarks and gluons [4]. The most reliable method to calculate the QCD thermodynamic functions at finite temperature and zero (small) chemical potential is lattice gauge theory. Importantly, lattice QCD can be used to probe the behavior of QCD matter near the phase transition from the hadronic to the deconfined QGP phase. Near the phase transition temperature, the running coupling is large and nonperturbative methods like lattice QCD must be used [5]. In practice, it is possible to obtain information about the behavior of the thermodynamic functions at small baryon chemical potential by making a Taylor expansion of the partition function around zero baryonic chemical potential and extrapolating the result. Taylor coefficients can only be trusted at small value of chemical potential and it would be nice to have an alternative framework for calculating the finite temperature and chemical potential. So we are supposed to calculate the thermodynamical properties by con-

An Analysis of India's Economic Policy Response to Combat Covid-19

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Rohit Kumar Shrivastav****

Abstract: *The Novel Coronavirus pandemic has intensely impacted the financial system and made lives vulnerable especially for the low-income groups. The deep distress of losing family members, employment, home have left people destitute. Government of all nations took number of measures to save their nation and provide aid to their citizens, various sectors and other countries as well. Government of India along with Reserve Bank of India approached first those sectors who have more potential to grow like MSMEs, NBFCs, Agriculture, Health, Retail sector, Infrastructure sector, Distribution Companies (DISCOMs), MNREGS etc. through the initiative to make India an 'Atmanirbhar Bharat', a self-reliant Economy. Numerous Monetary & Fiscal measures have announced in F.Y. 2020-21 & 2021-22 to save the nation and economy. The basic rationale behind all the stimulus measures was to alleviate COVID-19's repercussions and improve long term sustainability. Prime Minister of India Mr. Narendra Modi endeavour to make India self-sufficient country in every aspect and capture the place of China in global supply chain.*

KEYWORDS: *Atmanirbhar Bharat, Self-Reliance, Stimulus Packages, Fiscal measures, Monetary Measures*

Introduction

A Crisis Like No Other (IMF Annual Report, 2020), the world's worst recession after the Great Depression, The Pandemic Coronavirus 2019 (COVID-19) spreads as an infectious disease by the SARS-CoV-2 virus (severe acute respiratory syndrome) was firstly detected in Wuhan city, China to the entire globe in very less time. The virus reached to every corner of the world very rapidly and shaken the world's economic fiber very adversely. World Health Organization declared this pandemic as Public Health Emergency for the whole world on 30th January, 2020 and from then, this pandemic seems to have had a very significant impact on lives and over 4.6 million, deaths were recorded worldwide till September, 2021. On the 30th January, 2020, the very first covid-19 case in India was recorded and reported more than 442 thousand deaths till September, 2021 ranked second just after USA. COVID-19 seems to have had a deep impact on World Economy, witnessed a significant decline of -17.19% in GDP Growth Rate in the year 2020, as per the IMF Annual Report, 2020. The whole world has experienced the unprecedented shock of economic collapse. Countless individuals have died and lost livelihoods, jobs, source of income and savings. Poor and Labor section faced their worst by becoming unemployed and helpless as they could unable to pay their rents and grocery, electricity & water bills due to which they were homeless

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A Study on Consumer Engagement through OTT Platforms in India

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Abstract

Indian market has witnessed a sharp growth in viewership of over-the-top (OTT) platform services due to technological advancement, especially in the field of media and entertainment. A new era of binge-watching on OTT platforms has gained popularity as it gives freedom to the viewers to watch their favourite content at their convenience. However, content openness, lack of regulatory framework, copyright issues and absence of censorship are emerging as barriers to the adoption of OTT services in India. The present paper intends to study consumer engagement with OTT services through trends and preferences of subscribers in terms of the genre of content, OTT model, and device used to access the OTT services. The study is based on a primary survey conducted on 156 respondents specifically students and young professionals through convenience sampling residing in Delhi. The findings of the research indicate that viewers of OTT services prefer web series due to the originality of the genre and prefer to adopt a freemium or subscription-based model. Viewers had mixed responses to the regulatory framework provided by the Ministry of Electronics and Information Technology and the survey clearly indicates that OTT services have a bright future in the Indian market.

Keywords: OTT platform, Content, Consumer Engagement, Regulatory Framework, Genre.

SHARE REPURCHASE: ANALYZING RESEARCH TRENDS USING BIBLIOMETRIC ANALYSIS

Monika Gupta[1], Shivani Abrol[2]*, Piyalee Bhattacharya[3]

Share repurchase has been a prominent feature of corporates worldwide. It's often believed that firms can improve their stock performance by repurchasing their own shares. A fixed percentage of the company's own shares are acquired from the current shareholders through this approach. It decreases the company's current share count while creating value for the shareholders. Therefore, the repurchase of shares is seen by businesses as an essential tool for financial restructuring, particularly when there is an overcapitalization. The present study is an attempt to use a bibliometric analysis of the body of literature to outline the recent trends in share repurchase research and to highlight the avenues for new research fields. The study examined the research trend in the field of share repurchase with the help of bibliometric data extracted from the Scopus database. The findings of the study demonstrate that the primary topics in the share repurchase papers are capital structure, dividend policy, and financial flexibility. Furthermore, it shows how the researchers relate the concept of share repurchase to these topics. New factors that contribute to corporations' decisions to repurchase shares have also been identified.

Keywords: *Share repurchase, Share buyback, Investments, Bibliometric analysis*

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A Study on Impact of Online Teaching to Post Graduate students of Mumbai University during Covid 19 pandemic

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Abstract

Covid 19 Pandemic in India brought all activities to a standstill. The so called life line of Mumbai, the local train also stopped abruptly to stop the spread of virus. Overnight entire India came to a full stop with lock down imposed by Central Government. Home stays became the way of life and slowly entire economy stopped moving. All industries stopped except the health care and education industry. Health care for the obvious reasons could not stop, at the same time education industry for knowledge dissemination. Suddenly online education, virtual education, online exams, proctoring etc came out in open. As every coin has two sides online education has its benefits and challenges too. This article attempts to bring in or uncover some of these aspects of online education.

Key words: lock-down, online education, virtual education, online exams, proctoring

Introduction

On March 2020 brought about usual guest on the doors of Republic of India. It was none other than a minuscule virus which emerged from China and brought entire world to a grinding halt including India. The COVID-19 pandemic in India is component of the global pandemic of corona virus disease 2019 (COVID-19) caused by SARS-CoV-2. On 30th January 2020 the earliest case of COVID-19 detected in India. (Wikipedia.org, 2020)

On 16th March, 2020 the central government ordered total lock-down of educational institutions. Examination guidelines were modified by CBSE on 18th March, 2020. This includes maintaining a distance of at least 1

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Namita Rajput (India), **Sufiya** (India)

IMPACT OF COVID-19 ON FINANCIAL INTEGRATION: STUDY ON BRICS

Abstract

The paper examines the shift in stock indices' behavior in BRICS nations, prior to and following the outbreak of the COVID-19 pandemic, using daily data of relevant stock indices from April 2019 to March 2021. The study seeks to ascertain the influence of COVID-19 on stock markets of BRICS countries. The descriptive analysis and graphical presentation established that the pandemic period was extremely variable, with high average returns. Furthermore, the findings reveal that, with the exception of China and South Africa, the BRICS nations' stock indices were not cointegrated prior to the epidemic. Interdependence has increased throughout the epidemic, as three BRICS nation pairings, particularly Brazil and China, China and South Africa, and Russia and South Africa, are all cointegrated. This demonstrates that the COVID-19 problem strengthened the BRICS countries' cointegration or relatedness. As a result, portfolio diversification opportunities have dwindled. Additionally, given the relatively high average stock indices, investors may generate significant returns by investing in indices rather than individual firms, especially during the pandemic crisis time.

Keywords COVID-19, BRICS, pandemic, cointegration

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INTRODUCTION

With the emergence of the unique coronavirus known as " COVID-19," the globe is dealing with pandemic calamity, as major cities throughout the world have shut down and the businesses around the world get affected by the pandemic. This has also resulted in the stock market crash. The Black Death of 1347–1351 and the Spanish Flu of 1918–1919 are almost identical historical events. Recent events appeared to have obvious, significant, broad, and serious short-term financial disruptions, as well as medium-term economic growth and development implications.

WHO has implemented several social distancing measures to prevent the outbreak of contagious disease. Also, there was widespread labor mobility and travel restrictions that took effect immediately after entering into the new year 2020 by most of the countries. The coordinated closure of plant production lines resulted in considerable cost reductions and a significant reduction in manufacturing, both of which had significant economic consequences. COVID-19's financial market impact has been felt in the first half of 2020 specially.

The spread of COVID-19 in March 2020 caused most global financial markets to overreact, resulting in a very unexpected trajectory. As a result of panic selling and falling stock index prices, the markets experienced trade halts and frequent circuit breaks in March and April 2020. In most stock markets around the world, aggressive and worrisome reactions persisted.

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Challenging the spatial constraints: The case of '*Sarpdansh'* and '*Thakur ka Kuan'*

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Abstract
This article explores the depiction of the oppressor and oppressed relationship with special reference to literature written in Hindi. Oppression and exploitation are a part of almost every society, with both sides having an unsaid claim to their respective regions, which are seldom crossed. Such a setting that has been contested for centuries often finds its portrayal in literary works of art. The demarcation of the space allocated to the people belonging to upper and lower caste in a village along with the restrictions and constraints practiced on the poor results in their insubordination. The article discusses the narratives that depict the subjugated challenging the authority for justice and equality, taking keen focus on their quest to attain spatial equality.

Keywords: space, uprising, caste, authority, justice, equality, superstition

Introduction

The realm of Indian prose literature consists of intricately woven tales representing social and economic realities of the country. Indian Literature gradually developed with the writers raising their voice against the British and attempting to appeal to the people to function as a united whole, with nationalist fervor prevailing in their works. In the decades that followed, a parallel trend of unity that project itself in the works of various writers can be noticed. V.K.R.V Rao writes about the different Indian languages in their treatment of peasant-landlord relationships in the sympathy extended to the exploited and under-privileged, and in the description of the rural masses with their backwardness, superstition, privation and penury (1029)

Such traits are spun alive in Ramdarash Mishra's '*Sarpdansh*', which begins *in medias res* with the protagonist, Gokul, having been bitten by a snake, treated by Bhawani Baba, *mantrik*. Superstition can easily be traced in twines that structure and thrive in every civilization. The existence of supernatural belief is ubiquitous and has existed since time immemorial and they have been represented vividly in various literatures. The villagers, steeped deeply in the charms of superstitious belief, chose to have him treated by Bhawani Baba rather than a practicing physician. For they believe that it is the chanting of *mantras* that will save the life of the poor peasant rather than medicines.

> *Is jamaane mein bhi doctor ki dava na karaakar maantrik se vish utaravaane ki kriya haasyapad hi nahin, khataranaak bhi kahi jaayegi. Kintu meelon tak is ilaake mein na koi aspataal hai, na doctor* [1].
> Not only would it be considered ridiculous to be treated by the *mantrik* rather than a physician, at these times, but it would be rather dangerous too. But there was no hospital facility or doctor available within the radius of a few miles. (Mishra 58)

It is not just blind faith that should be blamed for this decision, but also, the lack of facilities that result in the villagers' choosing the *mantrik* who was easily accessible for the treatment. The *mantrik*, for the people, is the only hope they have and they trust him, and he trusts his *mantras*. As the news spreads, other inhabitants of the village assemble around Gokul and Bhawani Baba to watch the spectacle. Among the *harijan* audience, the caste Hindus also stand amass, commenting every now and then on the wounded Gokul. Gokul is looked down upon and blamed for what he has to undergo. One may note the drawing of the peasant-landlord relationship shaping its way in the narrative, as it is pointed out that Gokul must have been stealing from the fields.

> '*Lekin yah Gokula itni raat gaye khet ki mend par kya karane gaya tha. Jaroor khet mein chori karane gaya hoga. Arey, yah jahaan padha tha, vah to pradhan ka khet hai. Arey, yah saala to janm ka chor hai.'*
> 'But why had *Gokul* gone to the field-ridge at night? He must have gone to steal something from the fields. Arre, he was found lying in the *Pradhan's* field. He has been stealing since childhood.' (Mishra 58)

Gokul, a marginalized labourer is treated with distrust and contempt while undergoing such excruciating pain. The onlookers have lack of sympathy for Gokul, a lower class, and lower caste labourer. With the arrival of his family, Gokul overcomes the pain and attempts to recover, which is anticipated by the superstitious crowd as sign of Bhawani Baba's *mantra's* working. It is only after Gokul recovers that he begins to introspect why he chose to stay put and not raise an alarm after being bitten. This familiarises the reader to Gokul's plight; his being a poor, lower caste labourer who is caught in the web of exploitation by the mighty landlords. It is abject poverty and being under-privileged, with a small piece of barren land that makes Gokul enter the spatial territory that he is not allowed to enter, i.e. field of the *pradhan* and pluck the cobs.

The dismantling of the factors of exploitation, which is employed by writers that represent the lived experience in

[1] All translations have been done by the researcher

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"Prompter's Whisper": History, Travel and Narrative in Post-Colonial Indian English Travel Writing

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Abstract
The theory revolution and the counter-traditional wave in humanities in the 1980s have garnered attention towards new localism by positing alternatives to the great tradition. In this, Travel writing has proved adaptable and responsive to post-colonial and Globalization studies, thereby shaking off its 'middlebrow' status. Keeping in mind the relevance of travel writing in Global politics, the paper aims to engage with *In an Antique Land*: *History in the Guise of a Traveller's Tale* (1992) by Amitav Ghosh to delineate the question of History, Travel and Narrative in Indian English Travel Writing. The paper contends that Ghosh uses the Hybrid non-fiction space of the travelogue to write a counter-narrative to the Eurocentric discourse of Travel writing. It seeks to foreground that the reverse Grand tour of Amitav Ghosh problematizes the western hegemonic hold on the field of Ethnography and History. The paper is divided into two parts- the first part will establish *In an Antique Land* as Resistive subaltern history, followed by the second part, which focuses on Ghosh's privileging of third world ethnography to write an alternative narrative.

Keywords*:* Travel, Subaltern History, Ethnography, Narrative.

1. Introduction

Etymologically, the word "travel" derives its meaning from the word *travelian* connotating 'toil', 'to labour', and making a journey. Travel has always been conflated with the Europeanised form of travel which involves mapping, surveying, and gazing at the place encountered. The assumption, therefore, is that all other types of travels imitate the 'Grand Tour' taken by the Europeans in which the figure of English Gentleman was dominant. The ignorance of different forms and modes of travels explicates how Europeans used travel as a genre to disseminate their colonizing mission. The paper posits that postcolonial Indian English Travel writings offers innovative narrative techniques and straddles the generic boundaries to subvert the predominance of the Europeanised form of Travel writing and offers a counter-narrative form of narrative. By directing focus on the themes of history, identity and poetics and politics of mobility in *In an Antique Land*, the study dismantles the status of Travel writings as "Profit-driven or entertainment-oriented (Lisle,47)" and foregrounds its participation and role in the new condition of the modern world.

In an Antique Land: History in the guise of a traveller's Tale as a hybrid non-fiction travelogue recounts the dual narrative of traverses of Amitav Ghosh into two Egyptian Villages- Lataifa and Nashway. What started as his endeavour to unearth the identity of a slave of MS H.6 in his anthropological research culminates in a travelogue. The narrative en-captures Amitav Ghosh's Journey to the Antique land to record present-day Egypt's cultural configuration and his scholarly

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Research article

Impact of crop residue burning in Haryana on the air quality of Delhi, India

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ABSTRACT

Crop residue burning (CRB) over northern India is a major air quality and human health issue. The present study assesses the impact of PM_{10}, $PM_{2.5}$, NO_2 and SO_2, emitted during CRB activities in Haryana on the air quality of Delhi. The transition from pre-burning to burning period, in both rabi and kharif seasons, shows considerable increase in pollutant concentrations. PM_{10} and $PM_{2.5}$ concentrations exceeded NAAQS limits by 2–3 times, while NO_2 and SO_2 stayed within the limits. MODIS fire observations used to estimate CRB fire counts (confidence ≥80%) shows that rabi (burning period) fires in Haryana are ~3 times higher and more intense than in kharif. Furthermore, backward trajectories shows air mass movement from Haryana, Punjab and Pakistan. Thus, pollutants emitted reach Delhi via air masses, deteriorating its air quality.

Meteorological conditions influence pollutant concentrations during both seasons. Frequent dust storms in rabi, and Dusshera and Diwali firework celebrations in kharif season exacerbate air pollution. In rabi, PM_{10} and $PM_{2.5}$ have a significant negative association with (relative humidity) RH and positive association with (air temperature) AT. High AT during pre-monsoon, accompanied by low RH, loosens up soil particles and they can easily disperse. Stronger winds in rabi season promote NO_2 and SO_2 dispersion. In kharif, lower AT, higher RH and slower winds exist. Both PM_{10} and $PM_{2.5}$ have a negative association with AT and (wind speed) WS. With lower temperature and slower winds during winter, pollutants are trapped within the boundary layer and are unable to disperse. As expected, NO_2 has a significant negative association with AT in Haryana. However, in case of Delhi, the association is significant but positive, and could be due to the odd-even scheme imposed by the Delhi government. More research is needed to determine the health effects of Haryana's rabi CRB activities on Delhi.

1. Introduction

Biomass burning is an important source of atmospheric particulate matter (PM) and trace gases, which has a significant impact on local and global climate, in addition to causing severe health risks for humans (Zhang et al., 2011; Wang et al., 2013). Biomass burning includes various types of forest fires and agricultural burning after crop harvest, typically known as crop residue burning (CRB) (Singh et al., 2010; Rana et al., 2019). At a global scale, as much as 90% of wildfires are attributed to CRB and forest removal activities, are mostly restricted to Amazonia, Africa and Asia (Prabhu et al., 2020). The remaining 10% is largely due to fires in wild forests and grasslands (Rana et al., 2019). Moreover, biomass burning, particularly, during and after crop harvest, emits massive quantities of gaseous and particulate pollutants, which often increases pollution at local and regional scales (Crutzen and Andreae, 1990; Langmann et al., 2009; Wang et al., 2013; Tsay et al., 2016; Jethva et al., 2019). The severity of pollution is greatly dependant on the amount of biomass burnt, air mass transport, wind direction and the distance from CRB source (Witham and Manning, 2007; Targino et al., 2013).

In developing countries, quickly clearing arable lands via CRB is a general practice adopted by farmers to directly increase the yield. In Asia,

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Earth and Space Science

COMMENTARY
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Special Section:
The Power of Many: Opportunities and Challenges of Integrated, Coordinated, Open, and Networked (ICON) Science to Advance Geosciences

Atmospheric Sciences Perspectives on Integrated, Coordinated, Open, Networked (ICON) Science

P. D. Blanken[1], D. Brunet[2], C. Dominguez[3], S. Goursaud Oger[4], S. Hussain[5], M. Jain[6], G. Koren[7], Y. Mu[8], P. Ray[9], P. Saxena[10], S. Sonwani[11], and D. Sur[12,13]

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Abstract This collaborative article discusses the opportunities and challenges of adopting integrated, coordinated, open, and networked (ICON) principles in atmospheric sciences. From the global nature of the atmosphere, there has always been a need for atmospheric science to be an ICON science. With the help of evolving technology, it is possible to go further in implementing and spreading the ICON principles for productive global collaboration. In particular, technology transfer and applications could be approached with reproducibility in mind, and data-sharing infrastructure could enable easier and better international collaboration. There are, however, various challenges in following the ICON principles in the acquisition, quality control, and maintenance of data, and the publication of results in a systematic way. Moreover, the extent of such issues varies geographically and hence poses different challenges to implementing ICON principles. In this commentary article, we briefly state our perspectives on the state of ICON, challenges we have met, and future opportunities. Furthermore, we describe how atmospheric science researchers have benefited from these collaborative multi-dimensional approaches that fulfill the core goal of ICON.

Plain Language Summary The integrated, coordinated, open and networked (ICON) principles help researchers generate and disseminate knowledge in the atmospheric sciences. These principles can be achieved by designing strategies for data collection, analysis, modeling, and interpretation, and by involving scientists and stakeholders worldwide to maximize the benefit to science and society. However, challenges in openly sharing data produced in field campaigns or handling large volumes of atmospheric data remain. Therefore, coordinated and networked efforts are needed worldwide.

Key Points:

- Atmospheric scientists have benefited from the principles of integrated, coordinated, open, and networked science
- Effective coordination in data collection, monitoring, and modeling can help achieve substantial progress in atmospheric science
- Progress in global collaboration is possible through sharing infrastructure and enhanced support for scientists from lower-income countries

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1. Introduction

Integrated, Coordinated, Open, and Networked (ICON) science aims to enhance synthesis, increase resource efficiency, and create transferable knowledge (Goldman, Emani, Pérez-Angel, Rodríguez-Ramos, Stegen, et al., 2021). This article belongs to a collection of commentaries (see Goldman, Emani, Pérez-Angel, Rodríguez-Ramos, & Stegen, 2021 for details) spanning geoscience on the state and future of ICON science. The article discusses an integrated and coordinated approach toward collecting and managing field, remote sensing, and real-time data for research and applications, and insights about global collaboration, technology transfer, reproducibility, data sharing, and infrastructure in atmospheric sciences. Overall, this commentary highlights the importance and challenges in implementing ICON principles in atmospheric sciences.

frontiers in Sustainable Cities

REVIEW
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Inhalation Exposure to Atmospheric Nanoparticles and Its Associated Impacts on Human Health: A Review

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Nanoparticles (NPs) are receiving an increasing attention from many scientific communities due to their strong influence on human health. NPs are an important marker of air pollution caused by a variety of natural and anthropogenic sources. Due to their ultrafine size, they can be suspended in the atmosphere for a long time and can thus travel larger distances and cause several health issues after exposure. A variety of NPs that are found in indoor and outdoor settings cause respiratory and cardiovascular diseases. Exposure to NPs through active and passive smoking and household and occupational subjection is reported with thick septum, shortness of breath, and a high level of interleukin protein and tumour necrosis factor (TNF-α) that cause tumour generation in the exposed population. This comprehensive review summarises NPs' source, exposure, and impact on different organ systems. Respiratory models (experimental and computational) used to determine the particle's deposition, airflow transport, and health impact are also discussed. Further, muco-ciliary escalation and macrophage activity, the body's clearance mechanisms after exposure to NPs, have been mentioned. An in-depth analysis of exposure to NPs through inhalation and their health impact has been provided with detailed insights about oxidative stress, inflammation, genotoxicity, and tumourigenicity. Overall, this review offers scientific evidence and background for researchers working in the field of epidemiology, biochemistry, and toxicological studies with reference to atmospheric nanoparticles.

Keywords: nanoparticles, atmosphere, respiratory system, air quality, human health

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INTRODUCTION

Among particles of various sizes present in the atmosphere, NPs are particles with sizes of 1–100 nm in diameter (Kumar et al., 2010; Nemmar et al., 2013). The residence time of particles in the diameter range of 0.1–10 μm is ∼1 week. Coarser particulate matter is removed by settling, while smaller particles can only be removed *via* diffusion and coagulation (Scholl et al., 2012; Slezakova et al., 2013; Bakshi et al., 2015). Moreover, the fine size and higher atmospheric retention time of NPs are the basic reasons behind the difficultly in their removal from the atmosphere, consequently causing human health hazard. Nanoparticles originate from vehicular

Chapter 1
Hydrogen Sulfide on the Crossroad of Regulation, Protection, Interaction and Signaling in Plant Systems Under Different Environmental Conditions

Zahid H. Siddiqui, Zahid K. Abbas, M. Wahid Ansari, and M. Nasir Khan

Abstract Due to climate change, the severity of the damage caused by the biotic and abiotic stress is unprecedented. In order to overcome the loss of productivity plant scientists are trying to elucidate the mechanisms of organism's response to environmental changes worldwide. Their findings recorded that the organisms make physiological adjustments and genetic changes to adapt in a new environment. These adjustments and changes require the participation of an array of signaling molecules like reactive oxygen species (ROS), reactive nitrogen species (RNS), carbon monoxide (CO), nitric oxide (NO), hydrogen sulfide (H_2S), calcium (Ca), salicylic acid, phospholipids etc. The understanding of how these molecules cross talk within the organism will elucidate the mechanisms through which they adapt to their external environment. Among these molecules, H_2S is on the crossroad of regulation of the processes at key cellular, sub-cellular, and molecular level in plants and known to play a vital role in plant growth and development. The signaling molecule H_2S, protects plants from various types of biotic and abiotic stresses. Moreover, H_2S also interacts with different phytohormones and other signaling molecules like Ca and NO in different metabolic processes in plants under different environmental conditions.

Keywords Abiotic stress · Autophagy · Climate change · Hydrogen sulfide · Photosynthesis · Signaling

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In Vitro Biosynthesis of Natural Products in Plant Roots

Lebin Thomas, Zeeshan ur Rahman, Kuldeep Sharma, Devendra Nagar, Akanksha Vashishtha, Gaurav Kumar, and Siva P. K. Chetri

Abstract Various plants are composed of structurally and chemically diverse secondary metabolites. Especially plant root systems are remarkable accumulators of high-valued phytomedicines. But the production of different secondary metabolites in the root system can be limited. Also, enhanced and controlled synthesis of secondary metabolites in plants is challenging. Plant tissue culture holds great promise for ecofriendly, economical and industrial-scale production of phytochemicals and natural bioactive compounds. Use of elicitors for enhanced de novo synthesis of natural products from roots cultures can be used as effective alternative strategies for improved productivity of bioactive compounds. Elicitation involves signaling pathway, which transfers the extracellular stimulus to the inside plant cell, leading to molecular and physiological changes for their better survival, persistence and competitiveness, and activates the synthesis for different compounds. The present article sheds light on the use of different elicitors including abiotic (physical and chemical) and biotic (bacteria, fungi and hormones), which enhance the accumulation of secondary metabolites in the root system of medicinal plants.

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Chapter 7 - Wastewater treatment and sludge management strategies for environmental sustainability

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Abstract

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God Online- Indian Spirituality in the Digital Space

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Abstract

This book is published as a part of the Book Project Vertical of the Grand Academic Portal (GAP). GAP is an NGO registered with the NITI Ayog of the Government of India and working in the field of capacity building in the higher education sector. There are moments when you are certain that your religious beliefs are correct and will not be altered. Our points of view are likely to evolve or be passed on to our children and grandchildren through time, or they may just disappear altogether. If the past is any indication, this will most certainly happen as well. Religious beliefs and interactions with religious institutions have changed over time as a result of historical developments. Is God's physical appearance constantly changing? This question is explored in-depth in this book from the perspective of the digital universe.

Saurabh Sonwani
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Greenhouse Gases: Sources, Sinks and Mitigation

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Introduction to Greenhouse Gases: Sources, Sinks and Mitigation

1

Saurabh Sonwani and Pallavi Saxena

Abstract

Greenhouse gases (GHGs) is considered as one of the biggest reasons behind climate change in Anthropocene. The GHGs (carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), chlorofluorocarbons (CFCs) and carbon tetrachloride (CCl_4) play a major role in balancing the radiative budget, by absorbing or emitting some of the infrared rays reflecting from the earth's surface. The increasing levels of most of the GHGs (except CH_4 and some hydrocarbons) in atmosphere is due to increasing rate of anthropogenic activities from past few decades. The present chapter summarizes the varied sources of GHGs that includes burning of fossil fuels, growth of urbanization, waste management, transport, agriculture, habitat fragmentation, land use land cover change (LULCC), cultural and economic activities, weak policies and strategies by the government, etc. GHGs being an integral part of an ecosystem consist of natural sinks such as terrestrial vegetation, soil, geological, biological and stratospheric sinks; although artificial sinks are also available as well that can act as a sink. However, it is necessary to prevent or reduce the emission of GHGs to mitigate climate change. Mitigation refers to the concept of using new technologies, making older equipment energy-efficient, using renewable energy, changing management practices, etc. Thus, the present chapter explains about the overall view of GHGs including their different sources, sink and impacts. This chapter

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Optimization of Mask-Less Laser Lithography

Manisha Bharati, Lokesh Rana, Reema Gupta, Monika Tomar, and Vinay Gupta

Abstract The hybrid microcircuits with small size and low weight are advantageous in medical electronics, space electronics, and other applications. Miniaturization of these circuits makes it convenient for mass scale production and portability, etc. The key step in miniaturization of the devices is lithography which is used to transfer geometric patterns to a substrate or film. The type of lithography used is decided by the minimum dimension of the geometric pattern being used. Present work is focused on the use of Laser lithography technique for the fabrication of microelectronic devices. In the laser lithography technique, the power and focus of the laser light play a very important role. In the present work, results obtained on optimization of the laser power, focus, thickness of the polymer layer, and developing time are presented.

1 Introduction

Lithography is the technique of transference of a geometric pattern on a substrate or a thin film, where dimension of one or more features lies in micrometers or lower range. There are various lithography techniques like photolithography, laser lithography and electron beam lithography which can be utilized for device fabrication [1–4]. Basic steps involved in the lithography technique include coating of a polymer layer on the substrate, exposure of the geometric pattern on the polymer, and developing of the exposed pattern. The polymers used for the lithography technique are called photoresists. It is named so, as when exposed to light it changes its property and becomes susceptible to a certain etchant, i.e., developer. The photoresists are positive or negative depending on its behavior after exposure to light. A positive photoresist get dissolved in the developer when exposed to light due to the weakening of its bond while in the negative photoresist, polymerization of the exposed photoresist occurs

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Innovative Design for Efficient Solar Cell

Mukesh Kumar, Lokesh Rana, and Amruta Pattnaik

Abstract With increasing population and industrialization, interest in energy is expanding day by day. Knowing the limitations of fossil energy, a lot of researchers are continuing to investigate the different wellsprings of energy. Among different energy sources, for example, sun-oriented energy, wind energy, tidal energy, and biomass energy: Solar energy is the most appealing as the sun is the enormous source of energy. Solar energy can be utilized to produce power legitimately, utilizing photovoltaic cells, or can be utilized as warm energy. Immense exploration is going on in the field of sun-powered photovoltaic cells and still, there is a great scope of extension to increase the effectiveness of solar cells and henceforth decreasing the expense of non-renewable energy. The various factors such as cell Geometry, numbers of absorbing layers, heat generated, and other forms of energy loss affect the efficiency of cells. This paper revolves around the different innovative approaches to investigate several types of losses to increase the productivity of solar cells.

Keywords Solar energy · Solar losses · Energy efficiency · Cell design

1 Introduction

Energy is the need of great importance and everybody is searching for increasingly proficient and dependable strategies and hunger for energy assets too to take care of the requirements of residents. Further, their expanded non-sustainable power source assets abuse is thoroughly destroying the biological parity and nature. The energy age isn't just a tricky issue yet in addition to their productive use and their protection as well. To have financially savvy, dependable, proficient, and naturally, benevolent answers for our energy needs—sun-oriented energy, a boundless type of sustainable

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A Perspective on Reproductive Toxicity of Metallic Nanomaterials

7

Usha Singh Gaharwar, Sonali Pardhiya, and Paulraj Rajamani

Abstract

Nanotechnological tools have been greatly exploited in all possible fields. However, advancement of nanotechnology has raised concern about their adverse effects on human and environment. These deleterious effects cannot be ignored and need to be explored due to safety purpose. Several recent studies have demonstrated possible health hazard of nanoparticles on organism. Moreover, studies showed that toxicity of metallic nanomaterial could also lead to reproductive toxicity. Various deleterious effects have demonstrated decreased sperm motility, increased abnormal spermatozoa, altered sperm count, and altered sperm morphology. Morphological and ultrastructural changes also have been reported due to the accumulation of these nanomaterials in reproductive organs. Nonetheless, studies also suggest crossing of metallic nanoparticles through blood testes barrier and generation of oxidative stress which plays major role in reproductive toxicity. In the present study, we have incorporated updated information by gathering all available literature about various metallic nanomaterials and risk related to reproductive system.

Keywords

Histopathological changes · Reactive oxygen species · Teratogenicity · Fertility · Iron oxide nanoparticles · Gold nanoparticles

7.1 Introduction

Nanotechnology deals with the particles of size less than 100 nanometers (nm) at least in one dimension. Nanotechnology includes synthesis, exploitation, and handling of nanomaterials (NMs) (Hoyt and Mason 2008) due to their unique features. Nanoparticles are being employed in various fields such as medicine, cosmetics, and industrial purposes (Gaharwar et al. 2019).

However, the huge concern that has arisen is because of the extraordinary physiological properties of the nanomaterials which resulted in their increased used in different applications. Nanoparticles are highly reactive as they possess high surface area-to-volume ratio which ultimately results in adverse effects in organism (Oberdorster et al. 2005). There are several means through which nanoparticles may come in contact with human lives and ecosystems such as water, food products, commercial applications, and medicinal uses (Gaharwar et al. 2019). Medicinal and therapeutic uses of nanomaterials lead to their distribution in different organs

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Handbook on Processing

and

Preservation of Fruits and Vegetables

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CHAPTER 15

Role of Fungi in Biofuel Production Chain

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Abstract: The demand of fuels as source of energy to be used in various operations is increasing day by day. This has led to increased demand of fossil fuels, particularly by transportation and industrial sectors. There are multiple problems which are related to conventional fossil fuels like firstly, they are non-renewable resources with limited reserves. Secondly, fossil fuels pose serious environmental and health issues. Fossil fuels are one of the leading sources of emission of atmospheric greenhouse gases (GHG), resulting in global warming and thus climate change. These limitations and adverse effects of the use of fossil fuels have warranted scientists and policymakers to look for renewable and greener alternatives such as biofuels. Based on the type of feedstock used, biofuels are classified as first-generation, second-generation and third-generation. First-generation biofuels are based on edible resources which are already scanty. This has led to increased interest in second and third-generation biofuels. The agricultural waste and inedible crops constituting lignocellulosic materials are important second-generation biofuel feedstocks. The second-generation feedstocks can be a great alternative to conventional fossil fuels, but there are a few limitations, such as the cost and efficiency of production. Currently, scientists are looking at the role of fungi and utilization of various fungal enzymes in the hydrolysis of the lignocellulosic substrates for efficient and cost-effective production of biofuels. Nanomaterials have the ability for the better utilization of enzymes, biofuels, biodiesels and other microbial fuels. Therefore, nanotechnology can be utilized to address the challenges through various mechanisms and processes. This chapter is an attempt to focus on the role of fungi and fungal enzymes for better utilisation of feedstock and sustainable production of renewable, cost-effective, environment-friendly biofuels.

Keywords: Biofuels, Fossil fuels, Fungi, Fungal enzymes, Lignocellulosic materials.

INTRODUCTION

There is increased demand of energy due to fast growing world's population along with the unprecedented speed of industrialization leading to energy crises. Guo *et al.* 2015, has predicted increased world energy demand to 8.6×10^{20} J in

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REVIEW ARTICLE

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A review on carboxylic acid cross-linked polyvinyl alcohol: Properties and applications

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Abstract

Polyvinyl alcohol (PVA) is a nontoxic, biodegradable, and biocompatible polymer and has been used extensively in various fields. Indeed, important features of PVA such as its film-forming ability, high tensile strength and flexibility, high viscosity, solvent tolerance ability, thermostable nature have made it vital and drawn the attention of scientific community. However, being a water-soluble polymer, some chemical modifications are required to alter this property of PVA. Cross-linking is the most attractive and widely used method to change the properties of PVA to make it more valuable material. Different carboxylic acids have already been used for PVA cross-linking in various applications such as pervaporation, reverse osmosis (RO), wound dressing, drug delivery, and fuel cells. However, a comprehensive study on structure–property correlation of carboxylic acids as PVA cross-linker is not available. In this review, different available studies on carboxylic acid cross-linked PVA are summarized and are used to develop structure–property correlations of carboxylic acids as cross-linker on the properties of cross-linked PVA. Advantages and limitations of different carboxylic acids as PVA cross-linker are also summarized for various fields such as tissue engineering, wound dressing, drug delivery, fuel cell/solid polymer electrolyte, pervaporation, desalination and RO solid polymer electrolytes, and food packaging.

KEYWORDS

carboxylic acids, cross-linked PVA, cross-linking, films, membranes, water-soluble polymers

1 | INTRODUCTION

Polyvinyl alcohol (PVA) is a synthetic, linear, semicrystalline polymer that is composed of carbon chain as backbone and hydroxyl group as a functional group. It is obtained by the hydrolysis of polyvinyl acetate, and its physical properties are affected by its degree of hydrolysis, that is, complete or partial. Therefore, PVA is available commercially in two grades, namely, fully hydrolyzed and partially hydrolyzed. It is also available in different molecular weights mainly due to the variation in length of polymeric chain.[1,2]

PVA exhibits many important features such as it is readily available, having low cost, biodegradable, biocompatible, nontoxic, water soluble, excellent film-forming ability, thermostable, good chemical resistance, and adhesive. All these features make it a very valuable material in a wide range of applications.[3–7]

