

# BOOK OF ABSTRACTS

*9<sup>th</sup> International and 18<sup>th</sup> National Conference on*

# Biodiversity & Medicinal Plant:

**A WAY FORWARD TO  
SUSTAINABLE DEVELOPMENT**

**14-16 DEC.  
2023**

**(BMP-SD 2023)**

**Organized by**

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**DEPARTMENT OF BOTANY**  
PMAS Arid Agriculture University, Rawalpindi

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1. Dr. Khafsa Malik, Assistant Professor, Botany (Convener)
2. Mr. Nadeem Ahmed Malik, Director, NITSC (Member)
3. Dr. Ghulam Hussain Babar, DSA (Member)
4. Dr. Muhammad Zubair Anjum, Assistant Professor, ZWF (Member)
5. Ms. Ayesha Siddiq, Ph.D Scholar, Botany (Member)
6. Ms. Syeda Sobia Gillani, Ph.D Scholar, Botany (Member)

### **Poster Presentation Committee**

1. Prof. Dr. Muhammad Javaid Asad, UIBB (Convener)
2. Dr. Muhammad Sajid Nadeem, Associate Professor, ZWF (Member)
3. Dr. Muhammad Qaiser, Associate Professor, Soil Science (Member)
4. Mr. Muhammad Ishaq, Additional Director, ORIC (Member)

### **Food/Refreshment Committee**

1. Prof. Dr. Muhammad Hanif, Stats (Convener)
2. Dr. Zia ur Rehman Mashwani, Assistant Professor, Botany (Member)
3. Dr. Muhammad Zubair Anjum, Assistant Professor, ZWF (Member)

### **Press & Media Committee**

1. Mr. Nadeem Ahmed Malik, Principal Officer, PRP (Convener)
2. Mr. Muhammad Musa Kalim, Public Relations Officer (Member)
3. Mr. Mustafa, Deputy Registrar, Vice Chancellor Office (Member)

### **Transport Committee**

1. Dr. Mahmood ul Hassan, P.O. Transport (Convener)
2. Dr. Zia ur Rehman Mashwani, Assistant Professor, Botany (Member)
3. Mr. Hassan Rashid, Incharge, Transport Pool (Member)



### **Accommodation Committee**

- |    |                                                        |            |
|----|--------------------------------------------------------|------------|
| 1. | Dr. Ghulam Qadir, Associate Professor, Agronomy        | (Convener) |
| 2. | Dr. Noshin Ilyas, Associate Professor, Botany          | (Member)   |
| 3. | Dr. Muhammad Naveed Iqbal, Associate Professor, Botany | (Member)   |
| 4. | Mr. Sajid Hussain, Ph.D Scholar, Botany                | (Member)   |
| 5. | Mr. Zahid Mahmood, Deputy Registrar, Registrar Office  | (Member)   |

## ABOUT THE CONFERENCE

Plants are vital to life and provide food, food, shelter, and clothing, secure water supplies, and support health. It contributes directly to local livelihoods and economic development. Besides, they enrich healthy natural ecosystems that support reducing flood risk, filter air pollutants, and provide a reliable supply of clean drinking water. There is now unequivocal evidence that plant diversity loss reduces the efficiency by which ecological communities capture biologically essential resources, produce biomass, decompose and recycle biologically essential nutrients, and many more.

Department of Botany, Pir Mehr Ali Shah Arid Agriculture and Weed Science Society of Pakistan are jointly organizing the 9<sup>th</sup> International Conference on Plant Sciences & Expo 2023 (ICPSE-2023) scheduled from December 14 to 16, 2023. ORIC, PMAS-Arid Agriculture University Rawalpindi, Pakistan Science Foundation, Punjab Higher Education Commission have sponsored the conference.

The theme of the conference is “Biodiversity and Medicinal Plants: A Way Forward to Sustainable Development (BMP-SD 2023)” to bring new insights into plants and to bring together leading researchers and scientists working in the domain. The conference will be attended by the leading Botanists, Ecologists, Agriculturalists, Herbalists, and Industrialists of the world. This event shall provide an ideal platform for the researchers, and scientists to exchange ideas, and share their experiences. The scientific program covers plenary lectures from invited speakers and presentations from researchers. The conference promotes the participation of scientists by encouraging them to submit their original work to be considered for “Oral Presentation” or “Poster Presentations”.

The Department of Botany, Pir Mehr Ali Shah Arid Agriculture University has a rich history of organizing conference/seminars/webinars to create awareness among scientific communities, stakeholders, and students. The present conference assisted is a part of that action-oriented activity in which all stakeholders like herbalists/practitioners, researchers, government organizations, faculty and herbal industries are actively participating. The conference will be attended by the leading Botanists, Ecologists, Agriculturalists, Herbalists, and Industrialists of the world. Following are some objectives of the conference:

## **Aims & Objectives**

- To disseminate knowledge and research findings related to plant biodiversity with a main focus on medicinal plants for product development.
- To provide a platform for scholars, researchers, academia, herbal practitioners, students, and various stakeholders to sit together and chalk out viable solutions for the challenges in the particular industry.
- To find new avenues in the field of plant sciences with an emphasis on medicinal plants
- To develop collaboration and networking between researchers, professionals, and industry-academia linkage
- To display various products by the relevant industry for technology development

## **Conference Sub-Themes**

Plant Biodiversity and Conservation, Ethnobotany and Medicinal Plants, Plant Ecology and phytogeography, Weed Sciences, Alien species, Medicinal and industrial Hemp, Nano and green Technology, Plant-Microbe interaction, Physiology, Microbiology, Proteomics, Horticulture and minor Crops, Pharmaceutical Sciences, Biochemistry, Climate-Smart Agriculture

# MESSAGE OF THE CHIEF ORGANIZER

**Prof. Dr. Rahmatulla Qureshi,**

Chairman, Department of Botany,  
PMAS-Arid Agriculture University, Rawalpindi



From the towering trees of ancient forests to the delicate petals of wildflowers, biodiversity provides us with countless resources that sustain life, promote health, and inspire awe. But among these wonders, medicinal plants hold a special place. For millennia, these botanical treasures have served as humanity's natural pharmacy, offering healing remedies and promoting well-being. Even today, over 80% of the world's population relies on traditional medicine for their primary healthcare needs. These medicines often based on the wisdom and knowledge passed down through generations; utilize the unique properties of medicinal plants to treat a wide range of ailments. In recent decades, scientific research has shed light on the remarkable healing powers of these botanical wonders. As we continue to explore the vast potential of medicinal plants, we are unlocking new avenues for treating and preventing diseases, offering hope to millions around the world. The task before us is daunting, but the rewards are immeasurable. By protecting our biodiversity and conserving our medicinal plants, we are investing in our health, our planet, and our future. We are ensuring that the gifts of nature continue to heal, nourish, and inspire us for generations to come. Let us work together to protect our biodiversity, conserve our medicinal plants, and ensure that these treasures of nature continue to enrich our lives for generations to come. This conference is addressing all these issues. The conference will be attended by the leading Botanists, Ecologists, Agriculturalists, Herbalists, and Industrialists of the world. Join the conference to learn the potential of this world benefiting to our universe.

# THE VICE CHANCELLOR'S MESSAGE

**Prof. Dr. Muhammad Naeem**

Vice-Chancellor,

PMAS-Arid Agriculture University, Rawalpindi



Plants' contribution to human wellbeing and healthcare is undeniable. The dynamic range of plant species and a vibrant array of phytochemicals and their marvelous potential to be processed as medicines is the real cause behind the widespread use of plant resources. Despite significant application of plants in this context, there is still much to be explored. From discovering novel species to testing their latent capability for human healthiness and as disease treatment, the voyage involves significant scientific contribution from screening to processing of plant metabolites. In sustainable human health management, medicinal plants have played a vital role which has led to the growing interest in alternative therapies and therapeutic use of plants. The scheduled conference shall provide a magnificent opportunity to the plant scientists community to discuss the role, contributions and usefulness of medicinal plants in tackling the diseases of public health, from current strategic approaches to disease prevention. The conference will definitely serve as a platform to orientate new horizons to the contemporary research as well as their clout to demonstrate sustainable development.

## MESSAGE FROM DR. KHAN BAHADAR MARWAT

Meritorious Professor (Rtd),  
Ex-VC University of Agriculture,  
Ex-VC SBBU Sheringal  
***Weed Science Society of Pakistan***



Biodiversity plays a vital role in human living and development globally. More than around 80 % of the global population relies on botanical drugs. Infect several medicines owe their origin to medicinal plants. Natural substances have long been serving as sources of therapeutic drugs. A multifaceted approach needs to be adopted for drug discovery from natural resources that merges botanical, phytochemical, biological, and molecular techniques. A systematic and organized drug processing from plants has high potential outputs in achieving leads against various pharmacological targets. Plant based medicines have drawn attentions on massive scale globally over the passage of time. However this growing demand has resulted in unscientific exploitation of the natural resources worldwide ultimately causing a decline in biodiversity. Several other factors have also contributed in waning biodiversity. Thus, the need of the day is that plant biodiversity be preserved, to provide future structural diversity and lead compounds for the sustainable development of human civilization at large. A well-planned bioprospecting coupled with nondestructive commercialization may contribute in the conservation of biodiversity. This conference is an effort to update our knowledge about the diverse therapeutic application of different plant products against various pharmacological targets as well as finding better, improved and more productive ways to utilize plant resources thereby preserving natural biodiversity through more systematic approaches. This provides a gigantic platform for plant scientists from all over the world, from diverse disciplines in accordance with the conference subthemes to share their work and come up with more systematic solutions to the issue in hand; and exchanging their ideas under one roof for greater betterment of mankind.

# FOREIGN SPEAKERS

## **Prof. MUHAMMET UZUN**

working as Professor at Marmara University, Turkey.

He is working on Textile Engineering and Technology, Textile Materials, Textile Physics, Yarn Technology (Spinning, weaving, knitting), Cloth Technology, Textile Design, Technical Textiles.

He has done his Ph.D from the University of Bolton, Institute For Materials Research And Innovation, United Kingdom.

He has a good publication record of 126 papers and has earned research projects.



## **Dr. Moha Haddouch**

*UNESCO Biosphere Reserves National Committee, Morocco*

Agricultural engineer graduating from the Hassan II Agronomic and Veterinary Institute of Rabat in 1985. He was engaged with the Moroccan Government for more than 20 years and the UN system thereafter in several sustainable development programs. Strategic territorial planning, Agricultural engineering, Circular bio economy, Ecosystem services-based adaptation to climate change, Eco branding are his main area of interest.



## **Prof. Dr. Monier Abd Elghani** **Cairo University, Egypt**

He is PhD and DSc and a Distinguished Professor at the Faculty of Science, Cairo University. He has published more than 70 scientific articles and 10 international books.



**Prof. Dr. Ömer KILIÇ**

Is working as Professor at Adıyaman Üniversitesi, Eczacılık Fakültesi (Adıyaman University Pharmacy Faculty).

He is working on Phytochemical content, antioxidant activity, and enzyme inhibition of medicinal plants.

He has significant contributions in research , has published in highly reputed journals and is also member of editorial board of few journals



**Dr. Mumtaz Ali**

Working as Coconut Research Institute (CRI) Chinese Academy of Tropical Agricultural Sciences (CATAS), Wenchang, China.

He has done his Ph.D from Agricultural Biotechnology (Plant Pathology) Zhejiang University, China

He has earned multiple scholarships, has made significant contributions in research





# CONFERENCE PROGRAM

## 9<sup>th</sup> International Conference & Expo on “Biodiversity and Medicinal Plants: A Way Forward to Sustainable Development (BMP-SD 2023)”

| S. No.                                                                                                                                   | Activity                                                                                                                                                                                                                                                                                             | Plan                                                                                        | Timings       |
|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------|
| <b>BMP-SD 2023 - Day – 1: Inaugural Session December 14, 2023 (Thursday)</b><br><b>Venue: Main Auditorium Hall, Administration Block</b> |                                                                                                                                                                                                                                                                                                      |                                                                                             |               |
| 1.                                                                                                                                       | Inauguration Ceremony                                                                                                                                                                                                                                                                                | Registration                                                                                | 8:30 – 9:30   |
|                                                                                                                                          |                                                                                                                                                                                                                                                                                                      | Guests to be seated                                                                         | 9:30 – 9:45   |
|                                                                                                                                          |                                                                                                                                                                                                                                                                                                      | Tilawat-e-Quran                                                                             | 9:45 – 9:50   |
|                                                                                                                                          |                                                                                                                                                                                                                                                                                                      | Naat-e-Rasool                                                                               | 9:50 – 9:55   |
|                                                                                                                                          |                                                                                                                                                                                                                                                                                                      | National Anthem                                                                             | 9:55 – 10:00  |
|                                                                                                                                          |                                                                                                                                                                                                                                                                                                      | Welcome Note by Prof. Dr. Rahmatullah Qureshi, Chief Organizer                              | 10:00 – 10:10 |
|                                                                                                                                          |                                                                                                                                                                                                                                                                                                      | Journey of the Weed Science Society of Pakistan by Prof. Dr. Khan Bahadar Marwat, President | 10:10 – 10:25 |
|                                                                                                                                          |                                                                                                                                                                                                                                                                                                      | Keynote Speaker By Prof. Dr. Zabta Khan Shinwari                                            | 10:25 – 10:45 |
|                                                                                                                                          |                                                                                                                                                                                                                                                                                                      | Keynote Speaker By Prof. Dr. Monier Abd Elghani, Cairo University, Egypt                    | 10:45 – 11:00 |
|                                                                                                                                          |                                                                                                                                                                                                                                                                                                      | Speech by the Chief Guest                                                                   | 11:00-11.10   |
|                                                                                                                                          |                                                                                                                                                                                                                                                                                                      | Vote of Thanks by Prof. Dr. Muhammad Naeem, Vice Chancellor, PMAS-AAUR                      | 11:10 – 11:15 |
| 2.                                                                                                                                       | Tea Break                                                                                                                                                                                                                                                                                            |                                                                                             | 11:15 – 11:45 |
| 3.                                                                                                                                       | Visit to Exhibition                                                                                                                                                                                                                                                                                  |                                                                                             | 11:45 – 12.00 |
| 4.                                                                                                                                       | Panel Discussion on <b>Cultivation and Sustainable Market Chain of Medicinal Plant: Challenges &amp; Opportunities</b>                                                                                                                                                                               |                                                                                             | 12:00 – 12.50 |
| 5.                                                                                                                                       | Lunch & Prayer Break                                                                                                                                                                                                                                                                                 |                                                                                             | 12:50 – 2.00  |
| 6.                                                                                                                                       | <b>Technical Session-IA: Weed Science</b><br>Chair: Prof. Dr. Khan Bahadar Marwat, EX-VC & President, WWSP<br>Co-Chair: Prof. Dr. Muhammad Azim, Chairman, Weed Science, UAP<br>Moderator: Ms. Ayesha Siddiq, PhD Scholar Botany<br>Venue: Agriculture Seminar Hall, Ground Floor, Agriculture Block |                                                                                             |               |
| 7.                                                                                                                                       | Prof. Dr. Khan Badadar Marwat, President, WWSP (Invited Speaker)                                                                                                                                                                                                                                     |                                                                                             | 2:00 – 2:15   |
| 8.                                                                                                                                       | Prof. Dr. Muhammad Azim, Chairman, Weed Science, UAP                                                                                                                                                                                                                                                 |                                                                                             | 2:15 – 2:30   |
| 9.                                                                                                                                       | Dr. Mubashrah Munir, University of Veterinary Sciences, Lahore (Invited Speaker)                                                                                                                                                                                                                     |                                                                                             | 2:30 – 2:45   |
| 10.                                                                                                                                      | Dr. Asma Tabassum, University of Karachi, Pakistan                                                                                                                                                                                                                                                   |                                                                                             | 2:45 – 3:00   |
| 11.                                                                                                                                      | Dr. Muhammad Rafi Qamar Hashmi, University of Sargodha, Pakistan                                                                                                                                                                                                                                     |                                                                                             | 3:00 – 3:15   |
| 12.                                                                                                                                      | Dr. Aqeel Ahmad, University of Poonch, Rawalakot, AJK, Pakistan                                                                                                                                                                                                                                      |                                                                                             | 3:15 – 3:30   |
| 13.                                                                                                                                      | Dr. Muhammad Abdullah, CIDS, The Islamia University of                                                                                                                                                                                                                                               |                                                                                             | 3:30 – 3:45   |

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|    | Bahawalpur, Pakistan                                                                                                                                                                                                                                                                                                                       |             |
| 14 | Dr. Shujaul Mulk Khan, Quaid-i-Azam University Islamabad                                                                                                                                                                                                                                                                                   | 3:45 – 4:00 |
| 15 | <b>Technical Session-IB: Agriculture Sciences</b><br>Chair: Prof. Dr. Manzoor Hussain Soomro, Advisor, ECO-SF<br>Co-Chair: Prof. Dr. Muhammet Uzun – Marmara University, Turkey<br>Moderator: Mr. Sajid Faraz Laghari, PhD Scholar Botany<br>Venue: KOICA Seminar Hall, KOICA Building                                                     |             |
| 16 | Prof. Dr. Manzoor Hussain Soomro, Advisor, ECO-SF (Invited Speaker)                                                                                                                                                                                                                                                                        | 2:00 – 2:15 |
| 17 | Prof. Dr. Muhammet Uzun – Marmara University, Turkey (Invited Speaker)                                                                                                                                                                                                                                                                     | 2:15 – 2:30 |
| 18 | Dr. Mumtaz Ali, Chinese Academy of Agricultural Sciences, Wenchang, China (Invited Speaker)                                                                                                                                                                                                                                                | 2:30 – 2:45 |
| 19 | Dr. Mahmooda Buriro, Sindh Agriculture University, Tandojam                                                                                                                                                                                                                                                                                | 2:45 – 3:00 |
| 20 | Dr. Naik Nazar, Mian Nawaz Sharif University of Multan                                                                                                                                                                                                                                                                                     | 3:00 – 3:15 |
| 21 | Dr. Hamid Nawaz, The Islamia University of Bahawalpur                                                                                                                                                                                                                                                                                      | 3:15 – 3:30 |
| 22 | Mr. Muhammad Arif, PMAS-Arid Agriculture University, Rawalpindi                                                                                                                                                                                                                                                                            | 3:30 – 3:45 |
| 23 | Mr. Khan Muhammad Zangejo, DPRI, Shah Abdul Latif University, Khairpur, Sindh                                                                                                                                                                                                                                                              | 3:45 – 4:00 |
| 24 | <b>Technical Session-IC: Agriculture Sciences</b><br>Chair: Prof. Dr. Jahan Bakht, Vice Chancellor, UAP<br>Co-Chair: Prof. Dr. Tariq Mukhtar, PMAS-Arid Agriculture University, Rawalpindi, Pakistan<br>Moderator: Ms. Tahira Sultana, PhD Scholar Botany<br>Venue: Postgraduate Seminar Room, 2 <sup>nd</sup> Floor, Agriculture Building |             |
| 25 | Prof. Dr. Jahan Bakht – University of Agriculture Peshawar (Invited Speaker)                                                                                                                                                                                                                                                               | 2:00 – 2:15 |
| 26 | Prof. Dr. Tariq Mukhtar, PMAS-Arid Agriculture University, Rawalpindi, Pakistan (Invited Speaker)                                                                                                                                                                                                                                          | 2:15 – 2:30 |
| 27 | Dr. Adnan Zahid, University of the Punjab, Lahore                                                                                                                                                                                                                                                                                          | 2:30 – 2:45 |
| 28 | Dr. Areej Javaid, GC Women University, Faisalabad                                                                                                                                                                                                                                                                                          | 2:45 – 3:00 |
| 29 | Ms. Asfa Bhutto, Shah Abdul Latif University, Khairpur, Sindh                                                                                                                                                                                                                                                                              | 3:00 – 3:15 |
| 30 | Ms. Aroosa Azeem, Mirpur University of Science and Technology (MUST), Mirpur, AJK                                                                                                                                                                                                                                                          | 3:15 – 3:30 |
| 31 | Mr. Syed Sabir Hussain Shah, PMAS-Arid Agriculture University Rawalpindi                                                                                                                                                                                                                                                                   | 3:30 – 3:45 |
| 32 | Dr. Shafiq Ahmad, University of Poonch Rawlakot, AJK                                                                                                                                                                                                                                                                                       | 3:45 – 4:00 |
| 33 | <b>Technical Session-ID: Biotechnology</b><br>Chair: Prof. Dr. Muhammad Mukhtar, Vice Chancellor, National Skill University, Islamabad                                                                                                                                                                                                     |             |

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|                                                                                                                                                                                                                                                                                                           | Co-Chair: Prof. Dr. Ghazala Kaukab, PMAS-Arid Agriculture University,<br>Rawalpindi, Pakistan<br>Moderator: Dr. Abdul Rauf, AJK University<br>Venue: UIBB Seminar Hall, University Institute of Biochemistry &<br>Biotechnology |               |
| 34                                                                                                                                                                                                                                                                                                        | Prof. Dr. Muhammad Mukhtar - National Skill University (Invited Speaker)                                                                                                                                                        | 2:00 – 2:15   |
| 35                                                                                                                                                                                                                                                                                                        | Prof. Dr. Muhammad Gulfraz, Grand Asian University, Sialkot (Invited Speaker)                                                                                                                                                   | 2:15 – 2:30   |
| 36                                                                                                                                                                                                                                                                                                        | Dean Sciences<br>Grand Asian University, Sialkot<br>Dr. Alevcan Kaplan, Sason Vocational School, Batman University,<br>Turkey                                                                                                   | 2:30 – 2:45   |
| 37                                                                                                                                                                                                                                                                                                        | Dr. Nyla Jabeen, International Islamic University, Islamabad (Invited Speaker)                                                                                                                                                  | 2:45 – 3:00   |
| 38                                                                                                                                                                                                                                                                                                        | Dr. Sardar Irfan Mehmood, Govt. PGC Abbaspur Poonch, AJK                                                                                                                                                                        | 3:00 – 3:15   |
| 39                                                                                                                                                                                                                                                                                                        | Mr. Khalid Ahmad, MNS University of Agriculture Multan                                                                                                                                                                          | 3:15 – 3:30   |
| 40                                                                                                                                                                                                                                                                                                        | Ms. Aliza Batool, MNS University of Agriculture, Multan                                                                                                                                                                         | 3:30 – 3:45   |
| 41                                                                                                                                                                                                                                                                                                        | Mr. Abdur Rahman, The University of Agriculture, Peshawar                                                                                                                                                                       | 3:45 – 4:00   |
| 42                                                                                                                                                                                                                                                                                                        | <b>Posters Competition at Respective Venues</b>                                                                                                                                                                                 | 4:00 – 5:00   |
| 43                                                                                                                                                                                                                                                                                                        | <b>Cultural Show</b>                                                                                                                                                                                                            | 5:30 – 7:00   |
| 44                                                                                                                                                                                                                                                                                                        | <b>Dinner</b>                                                                                                                                                                                                                   | 7:00 – 8:00   |
| <b>BMP-SD 2023 - Day – II: December 15, 2023 (Friday)</b>                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                 |               |
| <b>Technical Session-IIA: Flora, Biodiversity, Ecology</b><br>Chair: Prof. Dr. Muhammad Qaiser, EX-VC & Chief Editor, Pakistan Journal of Botany<br>45. Co-Chair: Dr. Nasir Mehmood, Ex-IG, Forest<br>Moderator: Ms. Saba Latif, PhD Scholar Botany<br>Venue: Agriculture Seminar Hall, Agriculture Block |                                                                                                                                                                                                                                 |               |
| 46                                                                                                                                                                                                                                                                                                        | Prof. Dr. M. Qaiser – University of Karachi (Invited Speaker)                                                                                                                                                                   | 9:00 – 9:15   |
| 47                                                                                                                                                                                                                                                                                                        | Dr. Nasir Mehmood– Fatima Jinnah Women University Rawalpindi (Invited Speaker)                                                                                                                                                  | 9:15 – 9:30   |
| 48                                                                                                                                                                                                                                                                                                        | Dr. Moha Haddouch, Biodiversity Specialist, Secaderd, Morocco (Invited Speaker)                                                                                                                                                 | 9:30 – 9:45   |
| 49                                                                                                                                                                                                                                                                                                        | Prof. Dr. Sher Wali Khan, Karakoram International University Gilgit-Baltistan, Pakistan (Invited Speaker)                                                                                                                       | 9:45 – 10:00  |
| 50                                                                                                                                                                                                                                                                                                        | Dr. Haidar Ali, University of Swat (Invited Speaker)                                                                                                                                                                            | 10:00 – 10:15 |
| 51                                                                                                                                                                                                                                                                                                        | Dr. Qamar Abbas, Karakoram International University Gilgit-Baltistan, Pakistan                                                                                                                                                  | 10:15 – 10:30 |
| 52                                                                                                                                                                                                                                                                                                        | Dr. Muzaffar Sirohi – Shah Abdul Latif University, Khairpur (Invited Speaker)                                                                                                                                                   | 10:30 – 10:45 |
| 53                                                                                                                                                                                                                                                                                                        | Dr. Nasim Iqbal, Punjab Forest Department, Lahore                                                                                                                                                                               | 10:45 – 11:00 |
| 54                                                                                                                                                                                                                                                                                                        | Ms. Mahrine Rashid, National Herbarium of Pakistan, NARC,                                                                                                                                                                       | 11:00 – 11:30 |

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|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|    | Islamabad, Pakistan                                                                                                                                                                                                                                                                                                                       |               |
| 55 | <b>Technical Session-IIB: Ethnobotany/Ecosystem Services</b><br>Chair: Prof. Dr. Hasan Sher, Vice Chancellor, University of Swat<br>Co-Chair: Dr. Humayun Shaheen, UoAJK, Muzaffarabad<br>Moderator: Ms. Qurrat ul Alain, PhD Scholar Botany<br>Venue: KOICA Seminar Hall, KOICA Building                                                 |               |
| 56 | Prof. Dr. Ömer Kiliç – Adıyaman University, Turkey (Invited Speaker)                                                                                                                                                                                                                                                                      | 9:00 – 9:15   |
| 57 | Prof. Dr. Hasan Sher – University of Swat (Invited Speaker)                                                                                                                                                                                                                                                                               | 9:15 – 9:30   |
| 58 | Dr. Humayun Shaheen – University of AJK, Muzaffarabad (Invited Speaker)                                                                                                                                                                                                                                                                   | 9:30 – 9:45   |
| 59 | Prof. Dr. Shaukat Iqbal, Capital University of Sciences & Technology, Islamabad, Pakistan                                                                                                                                                                                                                                                 | 9:45 – 10:00  |
| 60 | Dr. Amin Shah, University of Sargodha, Pakistan                                                                                                                                                                                                                                                                                           | 10:00 – 10:15 |
| 61 | Dr. Arshad Mehmood Khan, Govt. Hashmat Ali Postgraduate College, Rawalpindi (Invited Speaker)                                                                                                                                                                                                                                             | 10:15 – 10:30 |
| 62 | Dr. Areeba Imtiaz, Government College University, Faisalabad                                                                                                                                                                                                                                                                              | 10:30 – 10:45 |
| 63 | Dr. Muhammad Sheeraz Ahmad, PMAS-Arid Agriculture University, Rawalpindi                                                                                                                                                                                                                                                                  | 10:45 – 11:00 |
| 64 | Prof. Dr. Zahid Iqbal, The Islamia University Bahawalpur (Invited Speaker)                                                                                                                                                                                                                                                                | 11:00 – 11:30 |
| 65 | <b>Technical Session-IIC: Nanotechnology</b><br>Chair: Dr. Abdul Rauf, Director (ORIC), AJK University, Muzaffarabad<br>Co-Chair: Prof. Dr. Abida Raza, PMAS-Arid Agriculture University, Rawalpindi<br>Moderator: Ms. Fozia Abbasi, PhD Scholar Botany<br>Venue: UIBB Seminar Hall, University Institute of Biochemistry & Biotechnology |               |
| 66 | Dr. Abdul Rauf, University of Azad Jammu & Kashmir, Muzaffarabad (Invited Speaker)                                                                                                                                                                                                                                                        | 9:00 – 9:15   |
| 67 | Dr. Feroza Hamid Wattoo – PMAS- Arid Agriculture University (Invited Speaker)                                                                                                                                                                                                                                                             | 9:15 – 9:30   |
| 68 | Dr. Rehana Kausar, University of Azad Jammu & Kashmir, Muzaffarabad                                                                                                                                                                                                                                                                       | 9:30 – 9:45   |
| 69 | Dr. Sundus Sohail, University of Lahore (Islamabad Campus), Islamabad                                                                                                                                                                                                                                                                     | 9:45 – 10:00  |
| 70 | Dr. Farhana Amin, National Institute of Genomics and Biotechnology (NIGAB), NARC, Islamabad                                                                                                                                                                                                                                               | 10:00 – 10:15 |
| 71 | Dr. Dawood Ahmed, The University of Haripur, Pakistan                                                                                                                                                                                                                                                                                     | 10:15 – 10:30 |
| 72 | Dr. Sehrish Asad, Abdul Wali Khan University Mardan, KPK                                                                                                                                                                                                                                                                                  | 10:30 – 10:45 |
| 73 | Dr. Ramsha Akram, MNS University of Agriculture, Multan                                                                                                                                                                                                                                                                                   | 10:45 – 11:00 |
| 74 | Ms. Ayesha Rasheed, Quaid-i-Azam University, Islamabad                                                                                                                                                                                                                                                                                    | 11:00 – 11:30 |
| 75 | TEA BREAK                                                                                                                                                                                                                                                                                                                                 | 11:30 – 11:45 |
| 76 | <b>Technical Session-IIIA: Plant Diversity &amp; Conservation</b><br>Chair: Dr. Ibrar Shinwari, International Islamic University, Islamabad<br>Co-Chair: Dr. Haider Ali, University of Swat<br>Moderator: Ms. Syed Sabir Hussain Shah, PhD Scholar Botany<br>Venue: Agriculture Seminar Hall, Agriculture Block                           |               |
| 77 | Dr. Ibrar Shinwari, International Islamic University, Islamabad                                                                                                                                                                                                                                                                           | 11:45 – 12:00 |

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|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|                                                              | (Invited Speaker)                                                                                                                                                                                                                                                                                                                            |               |
| 78                                                           | Dr. Shazia Erum, National Herbarium, PGRI, NARC, Islamabad                                                                                                                                                                                                                                                                                   | 12:00 – 12:15 |
| 79                                                           | Dr. Rabia Afza, Hazara University Mansehra                                                                                                                                                                                                                                                                                                   | 12:15 – 12:30 |
| 80                                                           | Dr. Rabiya Ikram, Punjab University, Lahore                                                                                                                                                                                                                                                                                                  | 12:30 – 12:45 |
| 81                                                           | <b>Technical Session-IIIB: Medicinal Plants &amp; Natural Products</b><br>Chair: Prof. Dr. Rahmatullah Qureshi, PMAS-Arid Agriculture University, Rawalpindi<br>Co-Chair: Dr. Syed Faisal Zaidi , Hamdard University, Islamabad Campus<br>Moderator: Ms. Neelam Naheed, PhD Scholar Botany<br>Venue: KOICA Seminar Hall, KOICA Building      |               |
| 82                                                           | Prof. Dr. Rahmatullah Qureshi, PMAS-Arid Agriculture University, Rawalpindi (Invited Speaker)                                                                                                                                                                                                                                                | 11:45 – 12:00 |
| 83                                                           | Dr. Syed Faisal Zaidi , Hamdard University, Islamabad Campus (Invited Speaker)                                                                                                                                                                                                                                                               | 12:00 – 12:15 |
| 84                                                           | Dr. Sardar Irfan Mehmood, Govt. PGC Abbaspur Poonch. AJK                                                                                                                                                                                                                                                                                     | 12:15 – 12:30 |
| 85                                                           | Dr. Muhammad Ilyas, IMCB, G-10/4, Islamabad (Invited Speaker)                                                                                                                                                                                                                                                                                | 12:30 – 12:45 |
| 86                                                           | <b>Technical Session-IIIC: Phytochemistry</b><br>Chair: Prof. Dr. Abida Riaz, PMAS-Arid Agriculture University, Rawalpindi<br>Co-Chair: Prof. Dr. Javed Asad, PMAS-Arid Agriculture University, Rawalpindi<br>Moderator: Ayesha Siddiq, PhD Scholar Botany<br>Venue: UIBB Seminar Hall, University Institute of Biochemistry & Biotechnology |               |
| 87                                                           | Dr. Hafiz Abdul Rafey, Shifa Tameer-e-Millat University, Islamabad, Pakistan                                                                                                                                                                                                                                                                 | 11:45 – 12:00 |
| 88                                                           | Dr. Ghulam Zahara Jahangir, University of the Punjab, Lahore, Pakistan                                                                                                                                                                                                                                                                       | 12:00 – 12:15 |
| 89                                                           | Dr. Sehrish Sadia, University of Veterinary and Animal Sciences, Lahore, Pakistan                                                                                                                                                                                                                                                            | 12:15 – 12:30 |
| 90                                                           | Dr. Hina Ilyas                                                                                                                                                                                                                                                                                                                               | 12:30 – 12:45 |
| 91                                                           | <b>Poster Sessions-IA to ID: Respective Sessions</b>                                                                                                                                                                                                                                                                                         | 9:00 – 2.00   |
| 92                                                           | Jumma Prayer & Lunch Break                                                                                                                                                                                                                                                                                                                   | 12:45 – 2:30  |
| 93                                                           | <b>Concluding Ceremony</b><br>Venue: UIBB Seminar Hall, University Institute of Biochemistry & Biotechnology                                                                                                                                                                                                                                 |               |
| 94                                                           | Guests to be seated                                                                                                                                                                                                                                                                                                                          | 2:30 – 3:00   |
| 95                                                           | Tilawat-e-Quran                                                                                                                                                                                                                                                                                                                              | 3:00 – 3:05   |
| 96                                                           | Concluding Remarks by Prof. Dr. Shamim Akhtar, Dean Sciences                                                                                                                                                                                                                                                                                 | 3:05 – 3:10   |
| 97                                                           | Comments by participants                                                                                                                                                                                                                                                                                                                     | 3:10 – 3:15   |
| 98                                                           | Vote of Thanks by Prof. Dr. Rahmatullah Qureshi, Chief Organizer                                                                                                                                                                                                                                                                             | 3:15 – 3:20   |
| 99                                                           | Shield & Certificate Distribution                                                                                                                                                                                                                                                                                                            | 3:20 – 3:40   |
| <b>BMP-SD 2023 - Day – III: December 16, 2023 (Saturday)</b> |                                                                                                                                                                                                                                                                                                                                              |               |
| 10                                                           | Field Excursion to Murree Hills                                                                                                                                                                                                                                                                                                              | 8.00 – 5.00   |

## **INVITED SPEAKERS**

## **HEMP-A MENACE OR BLESSING OF NATURE**

Rahmatullah Qureshi

Department of Botany, PMAS-Arid Agriculture University, Rawalpindi, Pakistan

*E-mail: rahmatullahq@uaar.edu.pk; Cell: +92300-6730496*

### **Abstract**

#### **Abstract**

Hemp (*Cannabis sativa* L.) is a natural gift of the nature that meets the major needs of human well-being. It is the most valuable, versatile, and earliest plant on this planet which is cultivated as a source of medicine and textiles. The plant is native to Central Asia, Xinjiang, and Pakistan and may extend to north and northeastern Tibet, Mongolia, and southern Siberia. This is one of the oldest plants grown for food, fiber, and medicine. It is now cultivated for food, drugs, and medicine, as well as for the production of rope, paper, fiber, and oil. It is grown as a medical and recreational crop in more than 50 nations due to its wide range of therapeutic benefits. This is a trillion-dollar crop with over 50,000 uses worldwide that can create local economies and reduce poverty. This is the only plant on our planet that meets the 2030 agenda for sustainable development goals (SDGs) supporting 3Ps (i.e. People, Planet, and Profits) covering all 17 objectives. Historical records indicate that this crop was cultivated in the tribal belt of the countries in the early seventeen. The experiment for the execution of the hemp project was carried out at the Institute of Hydroponics Agriculture, Rawat, Punjab, Pakistan by using four native hemp germplasm. This communication shall highlight the potential of this crop and the latest updates on the initiation of the hemp project in Pakistan.

**Keywords:** Hemp, Botany, Ecology, Ethnobotany, Phytochemistry, Pharmacological properties.

## **RETHINKING LANDSCAPING THROUGH NATIVE PLANTS, CATALYSTS FOR ACHIEVING SUSTAINABLE GOALS: CASE OF US EMBASSY, ISLAMABAD**

**Charles Andrew McCook**

Regional Facility Manager (Islamabad/Lahore/Peshawar)

US Department of States

#### **Abstract**

This abstract provides a glimpse into the significant contribution of native plants to the attainment of sustainable development goal. The multifaceted benefits of integrating native flora into the US Embassy Islamabad compound ecosystems has yielded in mitigating climate change, improving underground water quality, preserving biodiversity, social benefits and promoting ecological balance. Through inhouse case studies and empirical evidence, it elucidates how the cultivation and conservation of native plants contribute to sustainable

growth, water management, and resilient landscapes. Furthermore, the approach also addressed the cultural and social aspects of native plant utilization, emphasizing the importance of community involvement in fostering sustainability. Most native plants are perennial and have extensive root systems that hold soil and slow runoff. Persistent stems, leaves, and flower parts which remain through the winter also reduce runoff, especially in the spring, as rainfall begins before new growth is present. Particulate matter accumulates around these native plants and the plants themselves absorb chemicals such as nitrogen and phosphorous that would otherwise enter the runoff. Native plants are self sustaining, and they support wildlife including beneficial insects, pollinators, and native birds. Successfully growing native plants requires an understanding of the evolutionary adaptations plants make to specific light and soil moisture conditions. Prairie plants have adapted to dry, sunny uplands, while woodland plants tolerate shade. Wet meadows contain plants species tolerant of sun and wet soils, while plant species in the emergent zone grow with their stems above water and their roots in water. The Flora established at US Embassy Islamabad over the last decade with dedicated efforts towards rethinking landscaping on an area of 22 Acres through native plants promotes towards the efforts of achieving sustainable goals.

### **CULTIVATING A SUSTAINABLE FUTURE: HOW PLANT SCIENCES PROPEL PROGRESS TOWARD SDG GOALS**

*Prof. Zabta K. Shinwari T.I., S.I.; UNESCO Laureate  
Distinguished National Professor/ Prof. Emeritus,  
Quaid-i-Azam University, Islamabad-Pakistan.*

*Fellow, The World Academy of Sciences (TWAS); Pakistan Academy of Sciences & Vice  
President Islamic World Academy of Sciences*

#### **Abstract:**

In an era marked by pressing global challenges such as climate change, food security, and environmental conservation, the role of plant sciences in achieving the Sustainable Development Goals (SDGs) has become increasingly significant. This abstract offers a glimpse into the comprehensive exploration of how plant sciences are instrumental in advancing the SDGs. By investigating the potential of innovative agricultural techniques, the development of climate-resilient crops, and the preservation of biodiversity, this research sheds light on the crucial role that plant sciences play in forging a sustainable future. The abstract introduces key findings and highlights the synergistic relationship between plant sciences and the attainment of the SDG objectives. As we delve into the pages of this work, readers will uncover the profound impact that these sciences have in transforming our world towards a more sustainable and equitable future.

The achievement of the Sustainable Development Goals (SDGs) is an intricate interplay of multiple factors, with plant sciences playing a pivotal role in advancing these objectives. In the context of SDG-1, which aims to eradicate poverty, it is evident that impoverished communities, often residing in rich biodiversity areas, possess valuable resources that can be harnessed sustainably to alleviate poverty. However, these indigenous populations often sell these treasures at meager prices, receiving little in return. Addressing SDG-1 not only combats



poverty but also has a cascading effect on SDG-2 (Zero Hunger) and SDG-3 (Good Health and Well-Being). By providing proper guidance and support, it can enhance food security, nutrition, and sustainable agriculture, including the cultivation of off-season vegetables and high-value medicinal plants.

To tackle SDG-3, which focuses on promoting good health and well-being, there is a need to address the skepticism surrounding herbal medicine. The lack of scientific validation and clinical trials for herbal products has hindered their acceptance in healthcare. Clinical trials are essential for assessing the safety and efficacy of therapeutic strategies, guiding healthcare decision-making. This relates to SDG-4 (Quality Education) and SDG-5 (Gender Equality) as well, as the research into herbal medicine can empower women and children who are often the primary collectors of medicinal plants.

The path to achieving the initial six SDGs involves engaging indigenous communities in sustained, inclusive, and sustainable economic growth, thereby connecting with SDG-8 (Decent Work and Economic Growth) and SDG-9 (Industry, Innovation, and Infrastructure). Bridging the resource-rich but technology-limited poorer countries with the developed world is essential to reduce inequality (SDG-10) and subsequently work towards SDGs 13 to 16, which deal with climate action, life below water, life on land, and peace, justice, and strong institutions. International partnerships are a critical enabler for these efforts (SDG-17).

One pressing challenge is how science can effectively serve impoverished populations. The misidentification and adulteration of herbal materials can compromise the effectiveness of herbal products and even lead to accidental poisonings. Ongoing research efforts include molecular barcoding of medicinal plants, exploring therapeutic applications of these plants, and investigating the bio-synthesis of nanoparticles. These scientific endeavors not only enhance the safety and efficacy of herbal products but also underscore the potential of plant sciences in promoting a sustainable and healthier world while advancing the SDG agenda.

## **MEDICINAL PLANTS OF EGYPT**

**Monier M. Abd El-Ghani**

Department of Botany and Microbiology, Faculty of Science, Cairo University, Giza 12613,  
Egypt

### **Abstract**

Egypt has a rich history of using medicinal plants, dating back to ancient times. Many of the medicinal plants used in Egypt today have been used for centuries, and their effectiveness has been proven through both traditional knowledge and scientific research. Some of the important medicinal plants include Aloe vera, Coriandrum sativum, Foeniculum vulgare, Hibiscus sabdariffa, Matricaria chamomilla, Nigella sativa, and Zingiber officinale. Medicinal plants are an important part of Egyptian culture and healthcare system. They are used to treat a wide range of diseases and conditions, and they offer a number of potential advantages over conventional pharmaceuticals.

## **INQUIRY BASED LEARNING AND FARMER FIELD SCHOOL APPROACH FOR SUSTAINABLE CONSERVATION OF BIODIVERSITY & ECOSYSTEMS**

*Manzoor Hussain Soomro*

*Advisor, ECO Science Foundation (ECOSF)*

*Vice President, BRISEC (B&R International Science Education Consortium)*

*Hon. Professor, BTBU & China Agriculture University, Beijing P.R. China*

*Distinguished S&T Expert, China Association for Science and Technology (CAST)*

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### **Abstract:**

Social and economic development has been and remains the target and priority of each entity, community and country around the globe. Biodiversity is directly related to food security and sustainability of ecosystems and the services that they provide to humans. Science education and science literacy of youth, students and communities at large play a vital role to prepare societies to ensure conservation and sustainable growth of biodiversity and ecosystems, leading to socioeconomic development of people. Recent epidemic of COVID-19 has particularly underscored the importance of science education and literacy for all. Science education and literacy of public at large also enables and empowers communities to tackle the future global challenges, including the climate change. In fact, the World Economic Forum report on jobs in 2023 emphasizes that the skill of learning and the “Critical Thinking” is the top most skill in demand in 2023. And to nurture critical and innovative thinking amongst the young students as well as the communities, becomes very crucial.

In this respect, though there are various ways of teaching and learning, the *Inquiry Based Science Education (IBSE)- hands-on and minds-on* approach, especially for the science subjects including biodiversity conservation and sustainability, has been recognized globally, as the best methodology for learning of the scientific and technological processes and natural phenomena taking place in the environment around us. IBSE has become a brand for teaching and learning at different levels around the world. IBSE by the global network- Inter-Academy Partnership (IAP) or *La main a la pate* (LAMAP)- the French brand, have been quite popular in many countries including Pakistan, which has led to establishment of an Office of Climate Education (OCE)- a UNESCO Category 2 Centre in Paris in the wake of 2015 Paris Agreement on Climate Change. Under the Belt and Road Initiative of China, we have the “Belt and Road International Science Education Consortium (BRISEC)” that emphasizes on maker camps for the youth. IBSE way of teaching and learning instills the willingness of learners to explore new ideas and rely on the evidence and logic for conclusion and decision making. IBSE develops understanding of different science concepts through learner's own physical and mental activity. In the IBSE approach, different facts, questions, problems and scenarios are presented to the learners for investigation by using their own skills of observation, raising investigative questions, planning and conducting investigations/experiments, reviewing evidence in the light of what is already known, drawing conclusions and communicating and discussing results. Thus, the learners work just like scientists. The process with communities is facilitated by the

biodiversity expert facilitators. The Inquiry approach, may it be practiced at schools, universities, protected areas, biodiversity sanctuaries, Biosphere Reserves or Farmer Field Schools (FFS), nurtures inquisitiveness among learners/participants and could ensure sustainable conservation and use of biodiversity leading to socioeconomic development as a whole. The practical IBSE modules developed by experts and pedagogy specialists, can be incorporated in the syllabi of schools, colleges and universities, as well as for educating the communities directly living on biodiversity in the biodiversity hotspots or around biosphere reserves. This would in-turn lead to their sustainable socio-economic development. The key players in the whole system are the “teachers”, who need to be trained and retrained in a fast technologically developing world. I hope the National Academy of Higher Education (NAHE) of HEC also takes note of this and incorporates into their training methodologies.

This presentation will highlight the basic concepts of inquiry science education in educational institutions and beyond in Biosphere Reserves and Farmer Field Schools (FFS), and emphasize on hands-on minds-on learning for biodiversity conservation and use on sustainable basis.

## **EVALUATION OF INDUSTRIAL HEMP (CANNABIS) TO SUSTAINABLE AND CIRCULAR BIO-BASED MATERIALS**

***Muhammet UZUN***

Textile Engineering Department, Faculty of Technology, Marmara University  
Center for Nanotechnology & Biomaterials Applications and Research, Marmara University  
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The industrial hemp industry is growing rapidly and continued its attractions as sustainable materials for many sectors, textile, pharmacy, cosmetics, composite, food etc. New product innovations are gaining popularity in the hemp fiber market trends. According to the reports for hemp fiber market, increasing legalization to cultivate industrial hemp is expected to propel the growth of the hemp fiber market going forward. The global hemp fiber industry growth is expected to reach \$26.41 billion in 2026 at a CAGR of 35.2% and making it a positive for both the economy and the environment. The industrial hemp industry is even also growing rapidly in Europe, where the full potential of hemp is not even fully used as textile fiber. The area of hemp cultivation in Europe increased by 70% from 2013 to 2018. All the arguments listed have resulted in rising global interest in hemp cultivation and use, as well as predictions about the growing hemp market. It is important to mention that environmental claims, such as "green," "eco- friendly," and "good for the environment," will only be allowed for specific European Green Deal based Ecolabels, Green labels etc. This includes making growth sustainable, climate-neutral, energy- and resource-efficient, as well as promoting a clean and circular economy that respects nature. The strategy-for-sustainable-textiles aims to shift to a climate-neutral, circular economy where products are designed to be more durable, reusable, repairable, recyclable, toxic-free, and energy-efficient in the World. Currently, more than 73% of all fibers used to manufacture textile products are petroleum-based. In addition, the textile and apparel industry produce an enormous volume of plastic, of which only 9% is based on renewable raw materials. Textile industry has a negative impact on the environment for water pollution,

greenhouse gas emissions and landfill and responsible for about 20% of global clean water pollution from dyeing and finishing products. Laundering synthetic clothing is responsible for releasing 35% of primary microplastics into the environment and contributes to 10% of global carbon emissions. Globally less than 1% of clothes are recycled as clothing, partly due to inadequate technology. The strategy takes a comprehensive approach, focusing on the entire lifecycle of textile products and proposing measures to change production and consumption practices in a coordinated manner. Industrial hemp, which also gains importance due to lack of raw material, are attracting interest in both technical and traditional textiles. In this study, industrial hemp trials from seed to end-products will be discussed. Within the scope of the study, alternative products will also be evaluated as by-product

**GREEN SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL EVALUATION  
OF NANO-PARTICLES USING EXTRACTS OF MEDICINALLY IMPORTANT  
*TRILLIUM GOVANIUM* AND *ANGELICA GLAUCA***

*Prof. Dr. Jahan Bakht*

*The University of Agriculture Peshawar*

**Abstract**

Green synthesis is a method of synthesizing nanoparticles using natural materials, such as plant extracts. This method is more environmentally friendly and sustainable than traditional methods of nanoparticle synthesis, which often use toxic chemicals. *Trillium govanianum* and *Angelica glauca* are two medicinal plants that have been shown to be effective in synthesizing nanoparticles. Extracts from these plants contain a variety of bioactive compounds that can act as reducing and capping agents. Green synthesis of nanoparticles using extracts of *Trillium govanianum* and *Angelica glauca* is a promising approach for the production of nanoparticles with a variety of biological activities. These nanoparticles have the potential to be used in a variety of applications, including medicine, agriculture, and environmental remediation. More research is needed to fully characterize and evaluate the biological activities of these nanoparticles. However, the preliminary results are promising and suggest that green synthesized nanoparticles from *Trillium govanianum* and *Angelica glauca* have the potential to be used to develop new and effective treatments for a variety of diseases.

**IMPORTANCE OF FLORA OF PAKISTAN – ACADEMIC AND APPLIED**

*Muhammad Qaiser*

*Centre for Plant Conservation, University of Karachi & Pakistan Academy of Sciences,  
Islamabad.*

**Abstract:**

The Flora of Pakistan project was initiated in 1968 with Prof. E. Nasir (Rawalpindi) and Prof. S. I. Ali (Karachi), both were appointed as joint editors. First fascicle of Flora of Pakistan appeared in 1970 (Flacourtiaceae) and the last fascicle (Cactaceae No. 225 in 2022). In 1995 Nasir was replaced by M. Qaiser after his death. In 5875 species of flowering plants, belonging to 1593 genera and 219 families are treated. Beside detailed description of each taxon, generic keys for species are provided under each

family, supported by line drawings and color plates of some important taxa. Examined specimens are cited according to grid system. After the publication of the first modern Flora “**Flora of Pakistan**”, our knowledge on the flora of Pakistan is greatly increased. It may be hard to overstate the impact of Flora of Pakistan on the scientific understanding of plant diversity of Pakistan, need of the protection of natural resources and on the development of the scientific infrastructure in the country. The printed Flora especially the earlier volumes was not easily available outside the major scientific centers. The Flora of Pakistan is now present in the online database TROPICOS, the largest database of the plants. In term of actual merit of Flora of Pakistan is the only virtually modern account of Plants of South Asia Tariq (at least since Hooker in the 19<sup>th</sup> century). This online Flora has had and will have wide ranging positive impacts on the development of plant sciences in Pakistan. It has led or contributed to monographic and phylogenetic studies on the taxa from the region and to biogeographical analysis of this complex region that sits astride a major biogeographic zone of east west and north south transition. The Flora of Pakistan provides the basic plant distributional data underlying ecological studies in the region, which are essential for planners and scientists seeking to ameliorate environmental damage, salinization, desertification, over all climate change and to prioritize the area for biodiversity conservation. Moreover this Flora has been extensively utilized by phytochemists, pharmacists, agriculturists, foresters and ethnobotanists for the correct identification and the detailed information on the plant wealth of Pakistan. There are very few online Floras such as Flora of China and Flora of North America. As the Flora of Pakistan includes such extensive information the database is nearly a monographic in detail. It is only comparable database for South Asia and fully compatible with the database of Flora of China.

### **CONTRIBUTION TO ADIYAMAN (TURKEY) FLORA**

Prof. Dr. Ömer KILIÇ

Adiyaman University, Turkey

#### **Abstract**

Adiyaman is a province in southeastern Turkey, known for its rich flora biodiversity. The city is home to a wide variety of plants, including many endemic species. In all, 250 seed plant species belonging to 149 genera and 44 families were recorded from Mountain region of Adiyaman. Of these, two taxa were gymnosperms and 248 were angiosperms. Some of new and endemic onion species are also recorded. This talk shall discuss the diversity of plants from this region.

### **CANNABIS SATIVA: NATURE’S WEAPON AGAINST TYHE MENACE OF ROOT-KNOT NEMATODES (MELOIDOGYNE SPP.)**

*Tariq Mukhtar*

*Department of Plant Pathology, Pir Mehr Ali Shah Arid Agriculture University,  
Rawalpindi, Pakistan*

*E-mail: drtmukhtar@uaar.edu.pk*

#### **Abstract:**

Because of being costly and pernicious to the environment and human health, the use of

nematicides has become prohibitive in many countries and the management of plant parasitic nematodes using antagonistic plants can be a very attractive alternative. In the present studies the effectiveness of aqueous extracts of *Cannabis sativa* at different concentrations viz. S, S:1, S:5, S:10, S:25, S:50 and S:100 was assessed on hatching, mortality and infectivity of *Meloidogyne incognita*, the most devastating root-knot nematode responsible for colossal yield losses in cucumber. The extracts had significant effects on juvenile mortality and hatching inhibition in a dose-dependent manner. Time duration also affected mortality and hatching inhibition significantly. Significant inhibition in invasion of *M. incognita* juveniles on cucumber cv. Royal Sluis was observed by different treatments with extracts. *M. incognita* juveniles exposed to 'S' extracts of *C. sativa* for 24 and 48 h caused no infection. Exposure for 12 and 6 h caused more than 95 and 90% reductions in infectivity of *M. incognita* juveniles respectively. Similarly, soil drench and root dip treatments also caused significant reductions in infection. The efficacy of leaves of *C. sativa* was also evaluated by incorporating in the soil at the rate of 0, 2, 4, 6, 8, 10 and 20 g per kg of soil. *C. sativa* significantly reduced nematode infestations and enhanced plant growth criteria compared to the untreated check. The maximum reductions in number of galls, egg masses, nematode fecundity and build up were recorded with 20 g dosage. In another study, when *C. sativa* was assessed for its nematicidal potential against *M. javanica* on peach plants, it significantly reduced nematode populations and reproduction factors, in a dose dependent manner. The results of the studies showed that *C. sativa*, commonly found locally, possess high potentials for the control of root-knot nematodes and could be the possible replacement for synthetic nematicides.

### **CLIMATE CHANGE AND POST HARVEST LOSSES IN MEDICINAL PLANTS: A CRITICAL THREAT TO BIODIVERSITY AND SUSTAINABLE DEVELOPMENT OF THE RESOURCE**

*Muhammad Ibrar Shinwari*

*Bio-sciences, CIRBS, International Islamic University Islamabad*

#### **Abstract:**

Global pharmaceutical markets are in flux due to major restructuring, there is an opportunity to strategically enter the global off-patent drugs market that will be worth USD 700 billion in branded generics and USD 381 billion in generics by 2025. In 2019 Pakistan's total exports in these lines were USD 210 million. Developed countries have shifted focus to large molecules, called biologics. This has created opportunities for developing countries to fill the gap for production of cost-efficient, competing small-molecule therapeutics, especially for high-quality me-too generics, super-generics, and simpler biologics like vaccines and antisera. Pakistan, with a local market of 215 million consumers and more than 700 pharmaceutical companies is poised well to gain from opportunities provided under these shuffling global patterns of supply and demand. However, the current practice of simply importing 95 per cent of the raw material, compounding active ingredients with recipients, coating the pills, and packaging the drugs cannot continue to be the long-term goal of the sector. Moreover, climate change and post harvest losses are the two critical threats to the sustainable development of this precious resource. However, application of nanotechnology is a new hope to overcome these vulnerabilities. This is the right time to analyse the situation and start efforts in the right

direction. Pakistan can get a lot of socioeconomic benefit out of this resource if latest technology are applied to address the existing and future's threats.

## **A CIRCULAR ECONOMY APPROACH TO CONSERVE BIODIVERSITY OF AROMATIC AND MEDICINAL PLANTS**

*Dr. Moha Haddouch*

*UNESCO Biosphere Reserves National Committee, Morocco*

### **Abstract:**

A circular economy approach to conserve biodiversity of aromatic and medicinal plants (AMPs) is a systems-based approach that aims to reduce waste and pollution and to keep materials in use for as long as possible. This approach can be applied to the entire value chain of AMPs, from cultivation and harvesting to processing, distribution, and consumption. A circular economy approach is a promising way to conserve the biodiversity of AMPs. By keeping materials in use for as long as possible to ensure that AMPs are available for future generations. This talk shall highlight various latest approaches used for the sustainability of these germplasm resources for future generations.

## **ENHANCING AGRICULTURAL SUSTAINABILITY AND BIODIVERSITY CONSERVATION THROUGH WILD PLANT CULTIVATION IN ARID ZONES OF PAKISTAN**

*Muhammad Azim Khan and Muhammad Fawad*

*E-mail: azim@aup.edu.pk*

### **Abstract:**

Pakistan is an arid to semi-arid country with about 5 M ha of which is rainfed. The southern Khyber Pakhtunkhwa and southern Punjab (Multan) is arid zone where, the farmers are dependent on rainfall for crop cultivation. These farmers have variable constraints and management requirements in agriculture to make livelihood. Farmers in these region generally cultivate chickpea, millet, wheat, sorghum, lentil, rapeseed-mustard, and guar. However, a huge area is left uncultivated due to water scarcity, while grazing animals is the only way of its utilization. The farming practices are old in addition to many problems like moisture stress, soil erosion, nutrient depletion, low rainfall, climate change, availability of inputs, quality seeds. Although dry zones ecosystems provide services to the local farming community and rural economy. This project is commenced in collaboration with Bahauddin Zakariya University (Multan). Experiments on different wild medicinal was carried out in Lakki Marwat and Mutlan arid region during Sep-Oct 2023 whereas, plantation of three experiments can be completed in November 2023 in both the locations respectively. Students from both institutions actively participated in the projects. The present study highlight the importance of preserving native wild plants with significant economic uses to fight water scarcity in the arid area. The present study was commenced with the aim to determine drought tolerant species for fodder, medicinal and other economic uses and to aware the indigenous community of arid region about the cultivation of these plants. Based the findings of field survey following plant

species; *Moringa oleifera*, *Nannorrhops ritchiana*, *Cymbopogon citratus*, *Aloe vera*, *Caralluma tuberculata*, *Plantago ovata*, *Medicago sativa*, *Chloris gayana*, *Saccharum spontaneum*, *Cassia alexandria*, *Salvadora persica*, *Fagonia critica* and *Citrullus colocynthis* were selected for cultivated in the arid region of both the localities. Economically feasible and socially acceptable practices for the cultivation of wild plant need to introduce and cultivated these plants in the dry zones of Pakistan. Different lab and field experiments on wild plants of the arid region, subjecting to diverse irrigation regimes, fertilizer amendments and agronomic practices were evaluated. The research aligns with national priorities by addressing the demanding situations confronted in arid zone, imparting sustainable solutions, and contributing to the agricultural productivity in arid zones of Khyber Pakhtunkhwa and Punjab. The present initiative will empower rural communities to sustainably utilize their local resources to improve their livelihoods. The research will considerably make a contribution to sustainable agricultural practices and biodiversity conservation in the arid zones of Pakistan.

**Keywords:** Arid zone, wild flora, medicinal plants, irrigation regimes, plant conservation.

### **EXPLORING ETHNOMEDICINAL APPLICATIONS OF WEEDS IN AGROECOSYSTEMS OF KABAL VALLEY, SWAT, PAKISTAN**

*Muhammad Ilyas, Rahmatullah Qureshi*

#### **Abstract:**

The proliferation of weeds in agroecosystems can be viewed as a multifaceted phenomenon. Farmers in remote areas of Pakistan, such as Kabal valley in Swat, face a significant challenge in managing weeds to support crop growth. However, instead of discarding these weeds, utilizing them in traditional herbal medicine could offer an additional income source for farmers and help mitigate the risk of these plants facing extinction. This study aims to offer an understanding of the medicinal potential of weeds, raise awareness about the importance of preserving and conserving biological resources, advocate for sustainable utilization, and enhance the social and economic well-being of farming communities. Some weeds identified in the study area have the potential to significantly contribute to the treatment of diseases and improvements in the health of the local population. The undervaluation and continuous depletion of endemic medicinal weeds within agro-ecosystems could adversely affect the preservation of undocumented local wisdom pertaining to these invaluable weeds in the times ahead.

**Key words:** Agroecosystem, ethnomedicine, weeds, traditional knowledge, biological resources, biodiversity conservation.

### **IN VITRO CLONING OF ENDANGERED MEDICINAL PLANTS: A GATEWAY FOR THE CONSERVATION AND PROTECTION OF BIODIVERSITY**

*Dr. Nyla Jabeen*

*Associate Professor*

*Applied Biotechnology and genetic Engineering labs, Department of Biotechnology, Female Campus, International Islamic University, Islamabad*



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**Abstract:**

*In vitro* propagation has been exploited to create genetic variability from which crop plants can be improved, to improve the state of health of the planted material and to increase the number of desirable germplasm available to the plant breeders. *Berberis lycium* Royle is one of the endangered medicinal plant species in Pakistan. There is only a little published information on the *in vitro* and cutting propagation of *Berberis* species. This is the first study in Pakistan reporting a rapid and an efficient method for the *in vitro* callus genesis and AgNO<sub>3</sub> mediated direct shoot regeneration of an endangered medicinal plant *Berberis lycium* Royle using nodal explants. The explants were cultured on MS (Murashige and Skoog's) medium supplemented with different concentrations and combinations of plant growth regulators. For callogenesis different combinations of 2, 4-D were used. The plant showed best callus induction in media having 2, 4-D at the concentration of 1.0 mg/L. High frequency direct shoot proliferation was also induced in nodal explants cultured on MS medium supplemented with different concentrations and combinations of cytokinins. The cytokinins used were BAP and kinetin. Amongst the various concentrations tested, 0.1 mg/L kinetin proved to be the most effective. A proliferating shoot culture was established by repeatedly sub culturing the original nodal explants on shoot multiplication medium. This study concluded that protocol for *in vitro* propagation of threatened medicinal plants will provide a gateway for the conservation and protection of biodiversity.

**ANTI-AUSTERITY STRATEGY: A NOVEL APPROACH FOR ANTICANCER  
DRUG DISCOVERY USING MEDICINAL PLANTS**

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**Abstract:**

In the last four decades, the research of natural products has continued to play an important role in the discovery and development of new drugs. One of the advances is currently seen in anticancer research, with the discovery of new drugs from natural sources have still importance, exemplified by paclitaxel (Taxol®) and etoposide (VePesid®). However, despite technological advancements, complete treatment of some cancers remains a difficult challenge in drug development. One of these is the survival of tumor cells among healthy cells. Most anticancer drugs inhibit cell division and the growth of tissue, but is not selective – i.e., the drug could be harmful to healthy tissue. How to identify and discover compounds that could kill only tumor cells while normal cells remain intact? Compared with normal cells, tumor cells grow faster and the oxygen as well as essential nutrition demand always exceeds their supply due to their unregulated growth caused by genetic and epigenetic alterations. Nevertheless, regardless of the adverse condition, cancer cells have an inbuilt urge to survive under the extreme conditions of austerity characterized by low nutrition and oxygen supply. This is particularly true for

highly aggressive tumors like pancreatic cancers that have hypovascular characteristics. In this regard, we hypothesized that tolerance to nutrient starvation might be part of the biological response to an insufficient blood supply and targeting cancer cells under nutrition deprivation (preferential cytotoxicity) may be a novel approach in anticancer drug discovery. Here, we demonstrate that medicinal plants can help kill cells only under nutrient-deprived conditions as a novel candidate for an anti-austerity strategy.

**Keywords:** Pancreatic cancer; Medicinal plants; Austerity; Anti-Austerity strategy; Nutritiondeprived conditions; preferential cytotoxic activity

### **ETHNO-MEDICINAL PLANTS OF DISTRICT MUZAFFARABAD, AZAD JAMMU AND KASHMIR, PAKISTAN**

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*Department of Botany*

*PMAS-Arid Agriculture University, Rawalpindi, Pakistan.*

#### **Abstract:**

In all, 293 medicinal plant species were used to cure a total of 163 different minor ailments or particular minor use categories in the study area (Table 3.4). These ailments were further grouped into their respective body systems like circulatory, dermal, digestive, ENT/mouth troubles, excretory, general disorders, neuro-muscular, reproductive, respiratory, skeletal and livestock disorders etc. Out of 293 medicinal plant species, majority of them (174 species) were used as herbal remedies to cure different minor use categories/ailments of digestive system disorders with 5928 use reports. It was followed by general disorder treatments (130 species, 3078 use reports) and dermal system disorders (116 species, 2279 use reports). The least herbal remedies (28 species) were recorded to cure different livestock disorders whereas least use reports (771) were reported for excretory system troubles (Fig. 3.4). The highest informant consensus factor (Fic) values of one (1) for different minor use categories/ailments was recorded for haematoma issues, immune system improvement, cholera, lipiduria, fat burn, dengue fever, hallucination, heatstroke, hydrophobia and rabies, catalepsy, aspermia, galactagogue/to increase milk flow, hematospermia, premature ejaculation, semen hypoviscosity, jaw swelling and ostalgia or osteodynia troubles amongst the human population and anorexia, chest troubles, hepatitis and liver troubles, mouth/foot troubles, perspiration, for pregnancy promotion, respiratory troubles, scurvy, skin irritations, snake bites, stomach, intestinal and vomiting issues in the livestock in the study area. This was simply because, all these issues were treated by using only single herbal remedy in the study area.

### **MAXIMIZING LIVELIHOOD OPPORTUNITIES THROUGH INTRODUCTION OF HIGH VALUE MEDICINAL PLANTS IN DISTRICT SWAT, PAKISTAN; STUDY FOR SUSTAINABLE DEVELOPMENT AND TO MEET SDGS**

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**Abstract:**

This study examined opportunities to maximize farm income through introduction of high value medicinal plants in the war-stricken district of Swat. The tested hypothesis was the establishment of *ex-situ* experimental production plots which has supposedly provided theoretical frame work for the development of skills in horticultural production and marketing among people in the valley and helps rebuild commercial connections between this region and the rest of Pakistan. This project was aligned with the overall attainment of the *Millennium Development Goals, Sustainable Development Goals* of the Government of Pakistan and the *Global Strategy for Plant Conservation* agreed in 2002 under the *United Nation Convention on Biological Diversity*. The project involves a substantial agricultural extension component with farmers in three villages of District Swat. The project has covered a range of interventions such as local awareness campaigns, capacity-building training, and community mobilization for conservation of threatened species, formation of “medicinal and aromatic plants (MAPs) Producer Associations who are directly linked to big buyers for maximizing their net income. Moreover, the project also established demonstration plots of the selected high value MAPs for economic analysis/feasibility (in terms of cost comparisons/opportunity cost between cultivation of cereal/cash crops and the selected high value MAPs and regular monitoring and evaluation of the adoption by farmers of improved agricultural practices. Additional emphases have been placed on developing reliable marketing channels. In this context, and also in order to address different aspects of biodiversity uses for economic growth, the project has also worked to adapt appropriate strategies and technology recommended in Sustainable Development Goals by Government of Pakistan (<https://www.cbd.int/doc/world/pk/pk-nbsap-v2-en.pdf>). The study has also incorporate evaluation of its performance in introducing standardized production technology and appropriate post-harvest management, which represent the prime ‘engines of growth’ for the local economy. These strategic economic development areas are entirely based upon, and closely interlinked, with the management and conservation practices of high value MAPs, and intact landscapes.

**UNLOCKING THE POWER OF ORGANIC FARMING: PROTECTING  
BIODIVERSITY AND ECOSYSTEMS**

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**Abstract:**

Organic farming is a holistic approach to agriculture that emphasizes the use of natural processes and materials to promote soil health, plant and animal well-being, and environmental sustainability. It avoids the use of synthetic pesticides, herbicides, fertilizers, and genetically modified organisms (GMOs). Organic farming has a number of benefits for biodiversity and

ecosystems. It helps to create and maintain habitats for a wide variety of plants and animals, including pollinators, beneficial insects, and birds. It also helps to improve soil health and water quality. Organic farming is a powerful tool for protecting biodiversity and ecosystems. By avoiding the use of synthetic pesticides, promoting soil health, and providing habitat for wildlife, organic farming helps to create a sustainable future for agriculture and the environment. Besides, organic farming can also help to mitigate climate change. Organic soils store more carbon than conventional soils, and organic farming practices such as cover cropping and crop rotation help to sequester carbon from the atmosphere. This paper shall describe the usefulness of organic farming for biodiversity, ecosystems, and the climate which is a sustainable way to produce food that is good for people and the planet.

### **IMPACT OF CLIMATE CHANGE ON THE ALTITUDINAL SHIFT OF VEGETATION IN THE ALPINE REGION OF PAKISTAN: A CASE STUDY OF *BETULA UTILIS***

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#### **Abstract:**

Climate change is a pressing global issue that has far-reaching consequences for ecosystems and biodiversity. The alpine region of Pakistan, characterized by its high altitude and harsh climate, is particularly vulnerable to the effects of climate change. This research paper aims to investigate the impact of climate change on the vegetation of the alpine region of Pakistan, with a focus on the *Betula utilis*, a species of particular interest due to its ecological significance and adaptation to harsh conditions. *Betula utilis* is the timber line species. It is predominantly susceptible to the adverse effects of climate change because of its occurrence on the border line of alpine and subalpine regions. Altitudinal shift has been observed in 75% (13 out of 26) of the localities. To predict future changes in *Betula utilis* distribution and abundance, ecological niche modeling techniques were employed. Geographic Information Systems (GIS) was used to map the current and future distribution of *Betula utilis* based on climatic variables such as temperature, precipitation, and elevation. Climate data for the alpine region of Pakistan was obtained from World Climate Research Program (CRU) and the Intergovernmental Panel on Climate Change (IPCC). Species distribution models were used to project the potential distribution of *Betula utilis* under different climate scenarios. Maxent software was used for analyzing the species occurrence data and climate variables to generate distribution models. The accuracy of the models was validated using field data and other species distribution models to ensure reliability and robustness of the predictions. Based on the modeled distribution of *Betula utilis* and climate change scenarios, future projections were made to assess the potential changes in the species' distribution and abundance. The results of the modeling were used to advise the development of conservation strategies and update decision-makers on the need for protected areas and habitat management in the alpine region of Pakistan. The study's findings highlight the urgent need for mitigation and adaptation strategies to be implemented in order to preserve the biodiversity and ecosystem services of this critical region. By raising awareness

about the issue, this paper aims to contribute to the global effort to combat climate change and ensure the resilience of alpine ecosystems.

**Key words:** Climate change, altitudinal shift, vegetation, alpine region Pakistan, *Betula utilis*.

## **PHYTODIVERSITY CONSERVATION AND ETHNOMEDICAL EVALUATION OF PLANTS OF ALPINE PEATLAND BROGHIL VALLEY, CHITRAL**

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### **Abstract:**

The plant resources of Broghil was evaluated during 2022-23. The study aimed to explore the phytodiversity and ethnobotanical importance of plant resources of this remote area. A total of 100 plant species belonging to 60 families were enlisted. Asteraceae was the leading family with 27 species followed by anacardiaceae with 18 species. The remaining had fewer number of species. Growing was of short duration starting from May to mid of August where herbs contributed the highest number of species. Therophytes and geophytes were dominated with 40.78% followed by Hemicryptophytes with (15.96%). Phytosociological studies recognized a total of 3 communities at three different sites at different altitude. The study also provided detailed information on the ethnobotanical uses of different plant species, including their frequency citation (FC), relative frequency citation (RFC), family importance values (FIV), use reports (UR), and use values (UV). Based on FIV, the most prominent families were Asteraceae with (73.43) FIV and Moraceae with (83.59) FIV. The highest Relative Frequency of Citation was found for *Malva neglecta* (0.28), followed by *Pyrus pashia* with (0.27). Similarly, some 10 different species were recorded as part of conservation. The result shared this a large percentage of the species are currently classified as Vulnerable (87.74%), and 4 species critical endangered, showing extrem threat toward extension. All the collected information about specific plant species, including their population sizes, area of occupancy (AOO) and extent of occurrence (EOO), related to 17 families of vascular plants. Each family contains multiple species with their respective population sizes range from 6 to 18 and EOO, and AOO ranges from 3.4 to 11.3 values. The vegetation in the area suffered greatly due to erosion and snow fall. The people are living poor life with very short season of availability to normal life activities. Yalk is the key stone species in the area

**Key word:** Brohil, ethnomedicinal, conservation, Pakistan

## **ROLE OF MULTI-OMICS TECHNOLOGIES FOR CROP IMPROVEMENT: A CASE STUDY OF PALM CROP SPECIES UNDER STRESS CONDITIONS**

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### **Abstract:**

Multi-omics technologies are a powerful tool for crop improvement. They allow researchers to

study the genome, transcriptome, proteome, and metabolome of plants, which can provide valuable insights into how plants respond to stress conditions. Palm crop species are particularly vulnerable to stress conditions, such as drought, salinity, and pests and diseases. Multi-omics technologies can be used to identify genes and pathways that are involved in stress tolerance, which can then be used to develop new and improved crop varieties. These technologies such as improving tolerance for drought and salinity and pest and disease resistance have been popularly used for improving palm crops. In addition to improving stress tolerance, multi-omics technologies can also be used to improve other important traits in palm crop species, such as yield, quality, and nutritional value. Multi-omics technologies have the potential to revolutionize crop improvement and help to ensure a sustainable food supply for the future.

### **DECODING THE IMPACTS OF SCIENTIFIC FOREST MANAGEMENT ON FOREST BIOLOGICAL DIVERSITY IN FORESTS OF PAKISTAN**

*Syed Mahmood Nasir<sup>1</sup> , Bilal Muhammad<sup>2</sup>*

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#### **Abstract:**

This paper provides an insight between the gap in knowledge of the forestry professionals in Pakistan versus the local traditional knowledge of the ‘natives’ who had been symbiotically with the natural forests. As a result of colonial history in the Indian sub-continent the shape, composition and the process of plant succession and evolution in natural ecosystems has been changed in the name of ‘Scientific Forest Management’. The paper delves into the roots of this concept and how it is applied today by the application of postmodern anthropological theories. This paper opens up a new debate on the impacts of the colonial era forest science and its relevance in the contemporary era of environmentalism.

### **THE ROLE OF PLANT DIVERSITY IN ECOSYSTEM SERVICES:**

#### **A STUDY OF THE THAR DESERT ECOSYSTEM**

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#### **Abstract:**

Tharparkar District is a part of the Thar Desert, situated within Sindh Province, Pakistan. More than 1.64 million people live in the area, the majority of whom are rural residents who rely on rainfed agriculture and livestock rearing for their livelihoods. The purpose of this study was to

investigate the plant diversity present in Tharparkar District, its ecological connections, and the major threats to its biodiversity. The research area was subjected to extensive surveys carried out over repeated field visits across various habitats within the district in the years 2020 and 2021. The research catalogued a total of 149 plant species. There were identified forty-two plant families, with grasses (Poaceae) being the most prevalent, followed by Fabaceae and Malvaceae. Perennial species accounted for about 62% of the total community in the Tharparkar Desert's vegetation, with trees and shrubs making up less than 25%. There are two globally endangered plant species in the study area. The IUCN red list classifies *Commiphora wightii* (Gugar) and *Tecomella undulata* (Desert Teak) as critically endangered (CR) and endangered (EN), respectively.

In the harsh ecosystem of the Thar Desert, these plants serve as a beacon of hope, providing invaluable services that sustain life in the region and support the livelihoods of the people of Thar. These plants play a vital role as basic fodder for a vast livestock population, estimated at 6.5 million. Even though, the rangeland's carrying capacity, approximately 21.8 ( $\pm 7.8$ ) hectares per animal unit, is sufficient to sustain 0.92 million livestock units. Research conducted in the desert involved evaluating the palatability of the 30 most prevalent plant species. The study revealed that 43% of these plants were highly palatable, with species like Gum Arabic tree (*Acacia senegal*) and Ghaf (*Prosopis cineraria*) being particularly enticing to herbivores. Goats exhibited a broad dietary range, consuming over 95% of the plant species, while cattle showed a preference for approximately 68% of the palatable plants. Several plant species, such as Rattlebox (*Crotalaria burhia*), Kapok bush (*Aerva javanica*), and *Leptadenia pyrotechnica* (Khip), as well as *Tecomella undulata*, act as soil binders in the desert ecosystem. They make the land habitable for succeeding plants, animals, and humans, ensuring the continuity of life in the region. Furthermore, the plants of Thar contribute significantly to local biodiversity. For instance, *Prosopis cineraria* provides nesting sites for globally endangered vultures, highlighting the intricate ecological balance facilitated by these plants. The Thar region faces challenges, including limited healthcare facilities and the overexploitation of medicinal plants. More than 90 plant species in Tharparkar District are traditionally used for medicinal purposes. However, our surveys recorded less than 40% of these species, many of which were rare. Additionally, these plants are commercially traded to other regions of the country, with tons of plant materials consumed annually. This overexploitation has severely impacted the distribution and existence of these species. Another significant threat to the Thar Desert ecosystem is the proliferation of invasive species. Mesquite (*Prosopis juliflora*, locally named Devi) has become a core tree species in this desert and poses a significant threat to native plants. Sadly, its population continues to increase, exacerbating the challenges faced by the native flora. There are significant challenges in the way of this natural desert ecosystem's sustainability. These challenges include habitat loss caused by the conversion of rangelands to agricultural areas, deforestation, livestock pressure, invasive species and the exploitation of plant resources for medicinal purposes. The findings emphasize the urgent need to implement a comprehensive conservation plan to protect species of special concern in the study area. Community-based strategies for managing livestock, finding biodiversity hotspots, and using modern, environmentally friendly farming methods are some of the most important things that need to be done to help the natural ecosystem. Moreover, ecotourism could play a significant

role in the socioeconomic development of arid communities while promoting conservation efforts.

lected through questionnaire by interviewing 50 local inhabitants. Total of 43 plant species, that belongs to 27 families and 40 genera had been reported from area. The inhabitants utilized numerous plant parts, including rhizomes, roots, stems, leaves, flowers, and fruits, for a variety of reasons in their daily lives. Throughout the research, it was discovered that the family Asteraceae contributed the most of the plant species (05) to indigenous uses, following family Solanaceae (04), Fabaceae (03), while the remaining families possess one or two species each. The assembled species were identified, preserved and voucher specimens were submitted in the herbarium of the University of Haripur. The analysis of the data revealed that the stem, entire plant, and leaves are the most often used parts. To get a comprehensive image of the usage and significance of particular plant species ethnobotanical indicators (Relative Frequency Citation, Use value, and Jaccard index) were calculated. The RFC value ranges from 0.1 to 0.8 for the recorded species, where *Olea ferruginea* (0.8) shows highest value and least for *Artemisia scoparia* (0.3). The UV value ranges from 0.17 to 0.87, which showed that locals exploited them more or less. Correlation analysis ( $p = 0.756$ ) between RFC and UV was done using Pearson's correlation with the help of SPSS. Folk remedies were mostly used by the local population because of their wide availability, cheap price, and superior effectiveness against ailments. Unfortunately, this valuable traditional knowledge is quickly vanishing, and numerous therapeutic plants are in grave danger.

**Key words:** Ethnobotany, Conservation, Folk Remedies, Relative frequency, Jaccard index, Pearson's correlation.

### **MEDICINAL MUSHROOM DIVERSITY IN PAKISTAN**

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#### **Abstract**

Medicinal mushrooms are a valuable resource for human health and well-being. The diversity of medicinal mushrooms in Pakistan is a testament to the country's rich natural heritage. Pakistan has a rich diversity of medicinal mushrooms, with over 100 species identified so far. These mushrooms are found in a variety of habitats, including forests, grasslands, and agricultural areas. Some of important medicinal mushrooms in Pakistan include: *Agaricus blazei murill*, *Auricularia auricula-judae*, *Ganoderma lucidum*, *Grifola frondosa*, *Hericium erinaceus*, *Lentinus edodes*, *Pleurotus ostreatus* and *Trametes versicolor*. These mushrooms have been used in traditional medicine for centuries to treat a variety of conditions, including cancer, heart disease, diabetes, and immune system disorders. In recent years, there has been a growing interest in the scientific study of medicinal mushrooms. Researchers have found that medicinal mushrooms contain a variety of bioactive compounds with potential health benefits. The research on medicinal mushrooms is still in its early stages, but the potential health benefits of these mushrooms are promising. With its rich diversity of medicinal mushrooms, Pakistan



is well-positioned to contribute to the growing body of research on these valuable natural products.

## **MEDICINAL PLANTS BIODIVERSITY USING INTERDISCIPLINARY APPROACH TOWARDS HEALTH AND FOOD SECURITY**

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### **Abstract:**

Medicinal plants biodiversity is important towards health and food security. In current era due to fast climatic changes the, food and health security are important topics of discussion around the world and Pakistan particularly. Scientists in the World exploring alternative food and health resources for sustainable development. Innovations and emerging technologies are the solution to find out sustainable utilization of plant diversity. Pakistan is host to three of the world's biggest and most spectacular mountain ranges, the Himalaya, the Karakoram and the Hindukush (HKH). This project confined to explore the commercial products obtained from plant diversity which play an important role in socio-economic welfare and sustainable development of livelihood in Pakistan. This area is endowed with a great diversity of flora and fauna due to variations in altitude, rainfall and climate. The native communities have centuries old knowledge about the plant resources utilization and depends upon directly or indirectly on these resources to meet their daily needs in the form of biomass energy, biofuels, nutraceuticlas, pharmaceuticlas, vegetables, fruits, medicines, wood, timber, fodder, nuts, honey, spices, food and many other NTFPs. Currently, biodiversity in this region is strongly influenced by dynamic climatic changes like rise in global temperature, pollution, fluctuation in rainfall, population pressure, agricultural expansion, deforestation, extensive livestock grazing, resource demand, and commercial timber extraction that intensify the rates of habitat loss, habitat degradation, and wildlife exploitation. Species richness and threats suggest that this area needs strong and prompt conservatory management of biodiversity. The study recommend the development of national parks, wild life sanctuaries, botanical gardens and herbaria based on in -situ and ex-situ conservation strategies in in Northern areas of Pakistan to protect regional biodiversity for global acceptance. Indeed, conservation of biodiversity is fundamental to achieving sustainable development in this area particularly and world generally. Maintaining biodiversity is not only crucial for the sustainability in agriculture, energy, forestry, fisheries, wildlife, tourism, health, irrigation and power sectors Pakistan, but is also life line for the downstream people in other parts of Pakistan.

**EXPLORING THE *BETULA UTILIS* ENIGMA: INSIGHTS INTO DISTRIBUTION  
PATTERN, ECOSYSTEM FUNCTIONS AND PRESERVATION EFFORTS IN  
AZAD JAMMU AND KASHMIR'S SUBALPINE RANGES**

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**Abstract**

*Betula utilis*, also known as the Himalayan birch, is a high-altitude tree species that is native to the Himalayas and other mountain ranges in Central Asia. It is a hardy tree that can withstand harsh winters and poor soils. In Azad Jammu and Kashmir (AJK), *Betula utilis* is found in the subalpine ranges, at altitudes of 2,500 to 4,000 meters. The distribution pattern of *Betula utilis* in AJK is influenced by a number of factors, including altitude, climate, and soil type. The tree is most common in the northern and western parts of AJK, where the elevation is higher and the climate is cooler, but few isolated pockets are found in some of the eastern and southern parts. The species provides food and shelter for a variety of animals, including birds, mammals, and insects coupled with its role in regulating the water cycle and protecting the soil from erosion. There is enigmatic distribution in isolated populations throughout the Himalayas and other mountain ranges in Central Asia. The species was widespread in the past, but its range has been reduced by climate change and other factors.

## **AGRICULTURE**

## **EFFECT OF DIFFERENT MANAGEMENT INTERVENTIONS ON PRODUCTION OF ROYAL JELLY BY *APIS MELLIFERA***

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### **Abstract:**

The honeybee (*Apis mellifera* L.) is a very important insect for humans as a pollinator and provides valuable products such as honey, pollen, bee venom, royal jelly, propolis, and wax. Royal jelly (RJ) is a yellowish-white creamy substance consisting of protein, carbohydrates, lipids, and minerals. It is an acidic, glandular secretion of nurse bee glands. Worker bees feed larvae of the queen for their whole life, worker larvae for three days, and drones until pupation. Current research was conducted at University Research Farm Koont, PMAS-Arid Agriculture University Rawalpindi during 2021-22 to assess different royal jelly production parameters in queenright colonies. In Queen-right colonies, the acceptance of queen cells was 75% at the seventh position. White Queen Cells have 16 grams of royal jelly per cycle compared to beeswax and brown cells 8 and 9 grams respectively. When we increase grafted cells, the royal jelly frame placed in the lower and upper chambers increases the production up to 30% as compared to grafting in the lower chamber. Optimal results in RJ production were achieved by providing a pollen frame. The royal jelly production from a single colony, average yield of fifteen (45 days), was 92.85 grams. In Pakistan, the use of queen-right colonies and plastic queen cells will help beekeepers to get not only RJ but also to get honey in extra quantity. These experiments encourage them to produce RJ at a commercial scale.

**Keywords:** Royal jelly; Plastic queen cells; Queen right colony; Pakistan

## **ESTABLISHING QUALITY STANDARDS FOR PROCESSED DATE FRUITS OF THE ASEEL VARIETY IN THE SINDH, PAKISTAN**

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### **Abstract:**

Although, Pakistan ranked 6<sup>th</sup> in terms of production and 2<sup>nd</sup> in terms of Export (quantity wise) in the World. But due to the lack of advanced dates processing factories and poor standards, 565 \$/ton is not even enlisted/ranked among the top 20 dates exporting countries in terms of Unit value (\$/ton). Pakistani dates are thrown abroad at throw away prices to European countries where they are re-exporting Pakistani dates, after quality enhancement and

preparation of by-products, at a price that is 6 to 10 times higher than their import price. The aim of the current study was to set the standards of Pakistani processed dates to compete with other recognized dates of developed countries in the international market. This study was based on a collection of preliminary data from a survey of Date palm producers, market intermediaries, processing factories, and fruit markets. It was noted that among 400 varieties found in Pakistan only a few varieties e.g. vars. Aseel, Begum Jangi, Karblian, Rabai, Muzawati, and Dhakki are processed in date's factories of Khairpur, Sindh. The dates processing factories located in the Khairpur region mostly processing the var. Aseel fruits. The fruit samples were brought from dates processing factories & markets and evaluated for making quality standards to divide them into grades from grade A to industrial grade. Uniformity in color and size, weight of different grades of dates per kg, percentage of discolored, deformed, mashed, mechanically injured dates, scars, and other defects, organoleptic test, and storage quality of the dates were some of the factors taken in account for determining the grades.

**Keywords:** Aseel variety, date palm, export, grades, processing, standards

## **ORGANIC AMENDMENTS AND CONSERVATION TILLAGE IMPROVES COTTON PRODUCTIVITY AND SOIL HEALTH INDICES UNDER ARID CLIMATE**

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### **Abstract:**

Long-term different tillage system field trials can provide vital knowledge about sustainable changes in soil health indices and crop productivity. This study examined cotton productivity and soil health indices under different tillage systems and organic materials. The present study was carried out at MNS University of Agriculture, Multan to explore the effect of different tillage systems: conventional tillage ( $T_1$ ), conservation tillage ( $T_2$ ), and organic materials: control (recommended dose of synthetic fertilizers; 160:90:60 kg ha<sup>-1</sup> NPK), poultry manure (10 t ha<sup>-1</sup> PM), compost (10 t ha<sup>-1</sup> CM), farmyard manure (20 t ha<sup>-1</sup> FYM), and biochar (7 t ha<sup>-1</sup> BC) on cotton productivity and soil health indices. Two years field trials showed that different tillage systems and organic materials significantly improved the growth, morphological, and yield attributes of cotton and soil health indices. The cotton showed highest seed cotton yield (3692–3736 kg ha<sup>-1</sup>), and soil organic matter (0.809–0.815%), soil available nitrogen (74.3–74.6 mg kg<sup>-1</sup>), phosphorus (7.29–7.43 mg kg<sup>-1</sup>), and potassium (213–216 mg kg<sup>-1</sup>) under  $T_2$  in comparison to  $T_1$  system during both years of field experiments, respectively. Similarly, PM (10 t ha<sup>-1</sup>) showed highest seed cotton yield (3888–3933 kg ha<sup>-1</sup>), and soil organic matter (0.794–0.797%), nitrogen (74.7–75.0 mg kg<sup>-1</sup>), phosphorus (7.39–7.55 mg kg<sup>-1</sup>), and potassium (221–223 mg kg<sup>-1</sup>) when these are compared to FYM (20 t ha<sup>-1</sup>), CM (10 t ha<sup>-1</sup>), and BC (7 t ha<sup>-1</sup>) during both years of field experiment, respectively. These findings indicate that conservation tillage system with application of 10 t ha<sup>-1</sup> PM are the best climate

smart strategy for the sustainable cotton production and to ensure improvement in the soil health indices under arid climatic conditions.

**Keywords:** Cotton, climate smart agriculture, climate change, organic agriculture, sustainability

### **BIODEGRADATION OF PAHS BY BACILLUS MARSIFLAVI, GENOME ANALYSIS AND ITS PLANT GROWTH PROMOTING POTENTIAL**

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#### **Abstract:**

The biodegradation of hazardous petroleum hydrocarbons has recently received a lot of attention because of its many possible applications. *Bacillus marsiflavi* strain was isolated from oil contaminated soil of Rawalpindi, Pakistan. Initial sequencing was done by 16s rRNA sequencing technique. Bac 144 had shown 78% emulsification index and 72% hydrophobicity content. Further the strain displayed production of 15.5 mg/L phosphate solubilization and 30.25 µg/ml indole acetic acid (IAA) in vitro assay. The strain showed 65% biodegradation of crude oil within 5 days by using Gas Chromatography-Mass Spectrometry (GC-MS) analysis. Whole Genome analysis of Bac 144 was performed by PacBio sequencing and results indicated that *Bacillus marsiflavi* Bac144 strain consisted of size of 4,417,505bp with closest neighbor *Bacillus cereus* ATCC 14579. The number of the coding sequence was 4662 and number of RNAs was 141. The GC content comprised 48.1%. Various genes were detected in genome for responsible of hydrocarbon degradation and plant defense mechanism. The toxic effect of petroleum hydrocarbons in soil and its mitigation with Bac 144 was tested by soil experiment with three levels of oil contamination (5%, 10% and 15%). Soil enzymatic activity such as dehydrogenase and fluorescein diacetate (FDA) increased up to 49% and 40% with inoculation of Bac 144 which was considered to be correlated with hydrocarbon degradation recorded as 46%. An increase of 20%, 14% and 9% in shoot length of plant at 5%, 10% and 15% level of oil was recorded treated with Bac 144 as compared to untreated plants. A percent increase of 14.89%, 16.85%, and 13.87% in chlorophyll, carotenoid, and proline content of plant was observed by inoculation with Bac 144 under oil stress. Significant reduction of 14% and 18%, 21% was recorded in the malondialdehyde content of plant due to inoculation of Bac 144. A considerable increase of 21.33%, 19.5%, and 24.5% in superoxide dismutase, catalase, and peroxidase dismutase activity was also observed in plants inoculated with strain Bac 144. These findings suggested that Bac-144 can be considered an efficient candidate for bioremediation of hydrocarbons.

**IMPACT OF EIGHT YEARS-LONG TERM RESIDUE MANAGEMENT AND  
CONSERVATION TILLAGE ON DYNAMICS OF SOIL ORGANIC CARBON  
FRACTIONS IN RICE-WHEAT CROPPING SYSTEM**

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**Abstract:**

Intensive cultivation system has deteriorated soil health and diminished organic carbon in the soil in South Asia. Subsequently, lowered the yield capacity of rice-wheat cropping system (RWCS) of this region. For more sustainable way of production, a nine-year field experiment was carried out at Rice Research Institute (RRI), Kala Shah Kaku to assess the impact of conservation and conventional farming practices on crop productivity, soil tilth, and SOC. Current study was comprised of T-1: conventional tillage; T-2: residue incorporation; T-3: straw management practices; T-4: straw management practices; T-5: conservation tillage. T-5 demonstrated significantly higher results over T-1 for all aggregate sizes at each soil depth for TOC, carbon fractions, LI, CPI, and CMI. The outcomes for T-5 at 15cm were 1.09%, 1.42%, 1.31% for **TOC**; 0.79%, 1.01%, 1.15% for **CF1**; 0.14%, 0.20%, 0.06% for **CF2**; 0.08%, 0.11%, 0.11% for **CF3**; 0.32%, 0.35%, 0.71% for **CF4**; 2.87%, 2.52%, 2.75% at 0.053mm, 0.5mm, and 2mm aggregates respectively. At 30cm the results recorded for T-5 were 0.84%, 1.07%, 1.34% for **TOC**; 0.71%, 0.76%, 1.02% for **CF1**; 0.06%, 0.11%, 0.07% for **CF2**; 0.06%, 0.09%, 0.15% for **CF3**; 0.05%, 0.11%, 0.19% for **CF4**; 2.78%, 3.03%, 2.91% at 0.053mm, 0.5mm, and 2mm respectively. Greater values of CF1 and CF2 for T-5 demonstrate the presence of an active carbon pool while that of CF3 and CF4 indicate the presence of passive carbon pool. Based on our results, conservation practices can surge the soil quality, OC, and yield potential for RWCS in SA.

**ECOLOGICAL DIVERSITY OF PLANT GROWTH PROMOTING  
RHIZOBACTERIA (PGPRS) AND THEIR EFFECT ON PLANT GROWTH USED  
AS BIOFERTILIZERS.**

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**Abstract:**

Biofertilizers are the microbial inoculant consisting of living microorganisms that can enhance effectively crop production and soil fertility through nitrogen fixation, phosphorous solubilization and/or by production of plant growth hormones. (*Brady*) *rhizobium* are root nodule forming bacteria having symbiotic association with leguminous plants. However, in non-leguminous plants, Plant Growth Promoting Rhizobacteria (PGPR), with similar growth promoting properties are present in the rhizosphere. The present study was associated with the development of cost effective biofertilizers for leguminous and non-leguminous crops. Total

fifteen (20) soil bacteria were isolated and purified from root nodules of groundnut and rhizosphere of groundnut, lucerne and tomato. Out of which seven (12) were (*Bradyrhizobium*) and eight (8) were PGPRs, from plant and soil samples collected from tropical rainfed arid region of Punjab Province mainly Sukka, Talagang (32.9166° N, 72.0666° E) and temperate rainfed region of Azad Jammu & Kashmir, Rawalakot (33.8533°N, 73.7513°E). The soil texture of Talagang was determined as sandy loam, pH is 8.0 and saline in nature, while that of Rawalakot silt loam, pH 7.9 and ECe of 341 $\mu$ S/cm. The *Rhizobium* and PGPRS isolates were characterized for colony & cellular morphology, their biochemical characterization for catalase, starch hydrolysis and plant growth promoting traits, i.e., phosphorous solubilization, indole acetic acid production, nitrogen fixation and zinc solubilization. It was found that out of initial twenty, ten (10) isolates from Talagang soil were nitrogen fixers, indicated by color change on nitrogen free media. Phosphorous solubilization was shown by fifteen isolates, with thirteen from Talagang and two from Rawalakot. Maximum phosphorous solubilization was shown by isolate from Rawalakot, RS1 (503.1  $\mu$ g mL<sup>-1</sup>) and Talagang isolate TS8 (479  $\mu$ g mL<sup>-1</sup>). Six (6) isolates were screened positive for phytohormone (Indole acetic acid) production, with maximum indole acetic production by Rawalakot isolate, RS1 (70.14  $\mu$ g mL<sup>-1</sup>) and Talagang isolate, TS8 (50.16  $\mu$ g mL<sup>-1</sup>) & TR2 (40.36  $\mu$ g mL<sup>-1</sup>). Zinc solubilization index were determined maximum in two isolates (RS2 & RS1) from Rawalakot and one isolate (TS7) from Talagang. The four most efficient bacterial isolates from above were selected as potential biofertilizers and applied in a field experiment to determine their efficacy as inoculum on onion and tomato plants at Sukka, Talagang site. The experiment comprised of six treatments with three replicates. The growth/ yield parameters indicated a notable performance by two isolates, TS8 from Talagang and RS1 from Rawalakot. The experimental results have established the fact that bacterial isolated from soil and plant rhizosphere of diverse climatic regions, characterized on the basis of their growth promoting attributes can best be utilized as biofertilizers for crops grown under extreme environmental conditions of abiotic stresses.

### **MORINGA OLEIFERA LEAVES' EFFECT ON DOE MILK YIELD, BUTTER & PROTIEN CONTENT**

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#### **Abstract:**

*Moringa oleifera* (Mo) tree is fast growing, mutli-purpose and valuable tree carrying therapeutic and dietary benefits and referred as “Marvel tree”. To investigate different levels



of feeding *Mo* leaves on the milk production, milk composition, live weight gain and economic importance of feeding *Mo* as a replacer of commercial concentrate (CC) to reduce the cost of rearing expenses. A trial of 60-days research study was carried out with 12 mid lactation *Beetal* does. Does were randomly assigned a group and complete randomized design (CRD) used as model. There were four treatment groups and each group comprise of three *Beetal* goats. Group; A was control with zero *Mo* leaves :100 % CC, Group B; (*Mo*25% :CC75%), Group C; (*Mo*50% :CC50%) and Group D; (*Mo*75:CC 25%) in addition to their basal diet fed to all groups. Feed offered twice daily and Commercial concentrate fed at milking time. All does were dewormed, weighed and vaccinated before the start of experiment. A total of 96 Blood samples (4.00ml) were collected in EDTA tubes from study animal on weekly basis for analysis of White blood cells (WBC), Red blood cells (RBC), Hemoglobin (Hb), Packed cell volume (PCV) and blood glucose. Research findings revealed that milk yield, fat, lactose, solid not fat (SNF) and RBC's were significantly increased ( $P < 0.05$ ) in group D. Milk proteins and pH were found higher in group C. Highest milk yield ( $65.40 \pm 0.32$  L/45 days) was observed in group D, followed by group C ( $55.00 \pm 0.55$  L). Lowest was found in control group ( $45.20 \pm 0.58$  liters). Milk fat content ( $8.20 \pm 0.3\%$ ) was highest in group D while as lowest in group A ( $4.73 \pm 0.10\%$ ). Proteins content ( $3.40 \pm 0.05\%$ ) and pH level ( $6.60 \pm 0.04$ ) was found highest in group C. Group D have highest percentage of lactose ( $4.83 \pm 0.17\%$ ) and SNF ( $9.20 \pm 13\%$ ). In group D live weight of does was increased by ( $2.30$  kg/45 days) while as lowest was observed in group B ( $0.75$  kg/45 days/head. RBC were significantly ( $P < 0.05$ ) increased in group D ( $13.90 \pm 0.35 \times 10^{12}$  mg/L). Non-significant variation was observed in blood glucose of all groups. Replacement of concentrate with *Mo* leaves by 75% in diets of lactating does could enhance milk yield and give a benefit of Rs (PAK) 1570/ head/ 45 days) without any adverse effect on goat body. Goat farmers can cultivate Moringa tree and their twig and leaves could be sources of replacement 75% of their expenses on feeding concentrate.

**Keywords:** *Beetal Does*, *Moringa* leaves, Body weight gain, Hematology, Khyber Pakhtunkhwa

## **GROWTH PROFICIENCY OF MILK THISTLE AND SAFFLOWER IN NON-TRADITIONAL, ECOFRIENDLY CULTIVATION SYSTEMS**

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### **Abstract:**

Hydroponics and aquaponics are two eco-friendly soilless cultivation strategies used for growing crops. *Silybum marianum* (Milk thistle) and *Carthamus tinctorius* (Safflower) are two important medicinal herbs of Asteraceae family grown all over the world for their extensive therapeutic uses. This study was intended to link nutrient gain and ion balance with the growth of milk thistle and safflower cultivated in hydroponics, aquaponics systems along with traditional cultivation of these plants in soil. The experiment was performed at the Aquaponic

set up maintained at Government College Women University, Faisalabad under TDF02-178. Coconut husk was used to raise healthy seedlings of both medicinal plants. After first germination, seedlings were transplanted into three distinct environments: soil (T0), hydroponic (T1), and aquaponic (T2). The pots were filled with sandy loam soil in (T0). The Hoagland solution (pH=5.6 to 7.0) was applied in the hydroponics system. The Nile tilapia (*Oreochromis niloticus* L.) was integrated into an aquaponics system (T2) in which water was completely circulated from the fish tank to the grow beds every two hours throughout the day. Growth attributes including shoot length, root length, fresh and dry shoot weight, fresh and dry root weight, number of leaves were recorded. Data were also collected and evaluated for a nutrient content and ion analysis (sodium, potassium, and calcium). The statistical analysis of the data was done using R studio. The comparison of eco-friendly cultivation systems with soil concluded that hydroponically grown plants showed a vigorous growth. While root length in soil (T0) was recorded to be higher. Results of ion analysis revealed higher concentration of sodium and potassium in hydroponically grown plants while significant calcium levels were found in plants cultivated in aquaponic set up.

## **IDENTIFICATION OF FUNGAL DISEASES FROM LOCAL FRUITS OF DISTRICT POONCH AND THEIR INVITRO BIOLOGICAL MANAGEMENT**

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### **Abstract:**

The current research work was focused on the identification of fungal diseases from four selected wild fruit plants grown in District Poonch Rawalakot, Azad Jammu and Kashmir (AJK) during year 2023. The culturing of fungi was managed on different media like Potato dextrose agar (PDA), Malt extract agar (MEA), Nutrient agar (NA) and Water agar (WA) for diverse exploration and identification. The incidence rate of identified diseases from fruits, leaves and seeds samples of wild fruits were also documented. A total 25 fungal pathogens were isolated from apples, 17 fungal pathogenic species were diagnosed from pear plants, 15 fungal pathogenic species were identified from peach fruit plants and 17 fungal pathogenic species were detected from different collected parts of apricot fruit plants. It was observed that two apple fruit diseases soft rot and frog eye leaf spot were showed maximum incidence. Pear ring rot identified from pear fruit and brown rot disease isolated from peach were also shown maximum disease incidence (DI). The biomanagement of most dominant fruit fungal diseases via medicinal plants extracts (MP), beneficial microbes (BM) and biofungicides (BF) were also under consideration. It was indicated that the zone of inhibition (ZI) significantly increased after all treatments but maximum diseases inhibition was measured after treatment with *Silene conoidea* MP extracts that indicated maximum ZI 33.33 mm against apple scab disease as compared with the control (Neomycin). The treatment with *Silene conoidea* leaf extracts also

indicated highest inhibition with 29.60 mm ZI as comparison to the control treatment with antibiotic (Tetracycline) against pear ring rot disease. The *Silene conoidea* MP stem extracts treatment indicated highest zone of inhibition 29.00 mm against pear ring rot disease. The similar treatment with *Silene conoidea* leaf extracts explored maximum ZI 27.67 mm against peach pink fruit rot. The second biomanagement technique BM as antagonistic activity was applied against dominant fruit diseases and observed that all BM were effective against selected diseases. Although the MB *Trichoderma asperellum* indicated highest antifungal activity with ZI 28.33 mm against apple scab disease while lowest antagonistic response with ZI 18.67 mm was measured against apricot fruit spot disease after treatment with BM *Clonostachys divergens*. The most effective third biological management technique was five biofungicides (BF) which were tested against four dominant fruit diseases. Hence, the five selected biofungicides (BF) indicated very effective control of fruit diseases. It was estimated that the BF Trialones indicated maximum apple scab disease inhibition with ZI 38.33 mm. Finally, it was concluded that the effective biomanagement study during invitro experimental trails was compiled against four selected diseases named as; apple scab, pear ring rot, peach pink rot and apricot fruit spot. Although, BF treatments indicated best control but these BF were influenced negative impact on surrounding environment and increased pollution. Hence, it was recommended the very effective biomanagement potential of selected medicinal plants (MP), *Silene conoidea* extracts indicated best management against three diseases. Therefore, we recommend it a safe and environment friendly alternative to chemical pesticides for management of fruit fungal diseases. The diseases will be targeted through separation of bioactive compounds from the medicinal plants (MP), beneficial microbes (BM) and bio fungicides (BF). It should also be suggested and to target the specific fungal diseases of fruits in future.

**Keywords:** Fruit diseases, Medicinal plants, Beneficial microbes, Bio-fungicides, Fungi.

## **CURRENT UNDERSTANDING AND INTERFACE BETWEEN MICRO AND MACRONUTRIENTS IN THE PLANT-SOIL SYSTEM**

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### **Abstract:**

Plants can attain proper growth, development and transformation with micro (Zn, Cu, Fe, B and Mo) and macronutrients (NPK) in soils, that can be governed by different factors viz. pH, EC, soil organic matters etc. Soil organic matter is identified to adjust different physiological and chemical reactions that influence the availability of micronutrient components. Globally, Agricultural productivity has been improved, hence use of micronutrients nitrogen (N), phosphorus (P) and potassium (K) comprising fertilizer effects and essential for optimal

growth, development, and productivity of plants. But limited investigations are available on two by two or multi-level nutrients interactions in crops. This review emphasizes in improvements, understanding and interface in coordination between micro and macronutrients N, P, S, Fe and Zn useful for the agriculturists to improve nutrient use efficiency and yield of crops, especially for the changing climatic conditions.

### **OIL AND FRUIT ATTRIBUTES OF THREE OLIVE (OLEA EUROPAEA) CULTIVARS GROWN UNDER VARIOUS LOCATIONS OF DISTRICT CHAMAN BALUCHISTAN**

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#### **Abstract:**

The impact of locality and variety significantly affect the various oil and fruit quality characteristics including oil attributes of olive. Therefore, present study was planned to evaluate the oil and fruit physico-chemical attributes of three olive cultivars grown under various locations of district chaman. For this purpose, three locations (Location I= Kuch Amakzai, Location II = Katwi agriculture farm and Location III= Makhtar) were selected. In each location three mature olive plants of cv. Arbequina, Leccino, Frantoio were tagged for fruit sampling. In addition to that orchard soil sample and leaf sample of the plants were also collected for the study. Results revealed that olive cultivars and harvest locations had significant influence on oil and fruit quality characteristics. Among physical fruit quality parameters, maximum fruit length (1.86 cm) and fruit weight (2.38g) was recorded in fruit harvested from location II (Katwi agriculture farm). While among cultivars, fruit weight, fruit length and fruit width were found to be minimum in arbequina cultivar sourced from Location II (Katwi Agriculture farm). Similarly, total phenolic content (592.37 mg GAE 100g<sup>-1</sup>) was found to be higher in fruit harvested from location II (Katwi agriculture farm) as compared to other locations. As for as oil physico-chemical parameters are concerned, iodine value (78.33), refractive index (1.62), were found to be higher in fruit harvested from location II (Katwi agriculture farm) as compared to other locations. However, higher values for fatty acid ((0.43%) and peroxidase value (6.56) were recorded in fruit harvested from location I (Kuch amakazi). Results regarding organoleptic Attributes showed that higher fruit fruitiness (7.58) was recorded in arbequina cultivar as compared to Leccino and frantoio. Moreover, the results showed olive fruit harvested from location III showed higher value (7.75) of oil color as compared to location I and location II.

### **SELECTION OF CHICKPEA GENOTYPES FOR YIELD AND QUALITY TRAITS UNDER RAINFED CONDITIONS**

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**Abstract:**

Chickpea (*Cicer arietinum* L.) ranks third among pulses and fifth among grain legumes. Drought is a significant factor in the cultivation of chickpeas, affecting yield by impairing photosynthetic apparatus, limiting photosynthesis, CO<sub>2</sub> fixation, and chlorophyll content. This research study aimed to identify the best-performing lines for yield and grain quality under rainfed conditions. An experiment on chickpea genotypes was conducted under rainfed conditions using an augmented design. Genotypes were randomly divided into six blocks, and three checks were repeated in each block with a single row of each genotype in the whole experiment. The data were collected at different stages for physiological traits (chlorophyll content and canopy temperature depression); morphological traits (plant height, number of pods per plant, number of seeds per pod, dry matter weight per plant, 100-seed weight, seed yield per plant); and biochemical traits of selected genotypes. The data collected for all characteristics were subjected to variance analysis (ANOVA), and the significance of the results was interpreted. Results show a variable pattern of genotypic performance in Rabi 2020-21 and 2021-22 due to variations in weather conditions. Less number of pod formations occurred during Rabi 2020-21 as compared to Rabi 2021-22 due to the high temperature and water scarcity effect at the flowering stage. The range values for the proximate composition of grain were for ash 2.74-5.31%, moisture 9.59-11.33%, fat 2.87-5.88%, protein 23.63- 28.88%, and fiber 2.2-6.6%. Punjab-2011 performed better from all genotypes for yield and yield related traits, followed by 1980 under rainfed conditions.

**Keywords:** Chickpea, Proximate analyses, Genetic diversity, Nutritional quality

**MLE30-BIO-PRIMING: A SMART AGRONOMIC APPROACH TO AMELIORATE THE ANTI-OXIDANT DEFENSE SYSTEM IN WHEAT CROP UNDER DRIP IRRIGATION WATER REGIMES**

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**Abstract:**

Burgeoning nutrient's malnutrition is one of the drastic factors for human health in many developing countries, including Pakistan. Biofortification via seed priming is emerged as a newly and sustainable agronomic approach, may have potential to enhance the tolerance for achieving the nutrients grains production under Cholistan Arid Zone environment. For this, two years of field trials were arranged by using a randomized complete block design with three factorial arrangements at the experimental research area, Cholistan Institute of Desert Studies, The Islamia University of Bahawalpur, Pakistan. The experiments consisted of the following

factors as seed biofortification: control, MLE30-priming, MLE30-Bio-priming, seed rate: conventional seed rate, sustainable seed rate, and drip irrigation regimes: normal irrigation, mild deficit irrigation, severe deficit irrigation. Ghazi-2019 wheat cultivar was used as a test crop species. MLE30-Bio-priming with sustainable seed rate ameliorated enzymatic antioxidants and physiological gas exchange behavior for compensating the grains yield under applied mild and severe drip deficit irrigation regimes during the both years of trials 2021-2022 and 2022-2023 respectively. Macro-nutrients and micro-nutrients concentrations in the grains were illustrated at the peak in the treated seeds with MLE30-Bio-priming followed by MLE30-priming planted by using the sustainable seed rate under mild and severe drip deficit irrigation after normal irrigation during the both years of trials. However, the average economic analysis showed a higher benefit-cost ratio in MLE30-Bio-priming than others with the sustainable seed rate in normal irrigation followed by mild and severe drip deficit irrigation. So, biofortification through MLE30-Bio-priming with sustainable seed rate is the most appropriate and cost-effective technique for obtaining the healthy nutrients grains wheat crop production during the unfavorable environmental condition.

**Keywords:** Biofortification, MLE30-Bio-priming, Antioxidants, Sustainable seed rate, Drip irrigation, Wheat grains.

## **CULTIVATION OF MEDICINAL HEMP IN PAKISTAN: OPPORTUNITIES, CHALLENGES, AND IMPLICATIONS**

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### **Abstract:**

The cultivation of medicinal hemp has gained worldwide attention due to its therapeutic properties and multipurpose applications. Hemp is known for its medicinal properties, including anti-inflammatory and analgesic effects. This abstract provides an overview of the potential for cultivating medicinal hemp in Pakistan, exploring the opportunities, challenges, and implications associated with this endeavor. The cultivation of medicinal hemp presents a favorable opportunity for economic growth in Pakistan with increasing global demand for hemp-derived products, such as CBD (cannabidiol) oil, fiber, and pharmaceuticals. The hemp industry has the potential to generate employment opportunities, especially in rural areas. From farming and processing to manufacturing and distribution, various stages of the hemp supply chain can contribute to job creation. The cultivation of medicinal hemp could contribute to the production of pharmaceuticals for treating conditions such as cancer, chronic pain, epilepsy, and depression. The legal status of hemp cultivation in Pakistan may pose challenges. Addressing regulatory obstacles and forming a clear legalized framework is necessary to ensure compliance with international standards and boost investment. Attitudes of society and misconceptions about hemp may hinder its widespread acceptance. Public awareness campaigns and education initiatives are essential to dispel myths and promote the empathetic of the plant's medicinal properties. Successful cultivation of hemp requires suitable infrastructure for processing and manufacturing. Research institute should be assisted with modern facilities keeping into current trends in hemp research to develop quality of hemp-

based products. Pakistan can become attractive global market by engaging in cultivation of medicinal hemp and increasing its competitiveness in the emerging hemp industry. The production of hemp-derived medicines can contribute to innovations in healthcare, offering new treatment preferences and potentially addressing unmet medical needs. Hemp cultivation is known for its eco-friendly characteristics, requiring fewer pesticides and fertilizers compared to traditional crops. The cultivation of medicinal hemp in Pakistan holds significant promise for economic growth, job creation, and healthcare advancements. However, overcoming legal and cultural challenges are some of challenges for the successful establishment of a thriving hemp industry in the country.

**IMPACT OF PLANTING DATES ON GROWTH AND GRAIN YIELD OF WHEAT  
(*Triticum aestivum* L) VARIETIES IN POT CULTURE**

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**Abstract:**

The cultivation of wheat holds significant importance in the realm of the country's agriculture, and the development of wheat plants is markedly influenced by the timing of sowing. Consequently, the objective of this research was to determine the optimal planting period for distinct wheat varieties within the climatic parameters of Khairpur and assess their yield potential. Four varieties—TD1, Sarang, Amber, and Khirman—acquired from the Nuclear Institute of Agriculture (NIA), Tandojam, were subjected to evaluation across three different planting dates (P1: November 25th, P2: December 10th, and P3: December 25th) through pot culture experiments. The study transpired at the greenhouse of the Botany Department, Shah Abdul Latif University Khairpur, Sindh, Pakistan, spanning from November 25th to December 25th in the year 2020. Employing a Completely Randomized Design (CRD) with three replications, loamy soil filled 12-inch clay pots, each hosting 10 seeds of the respective wheat variety sown at 15-day intervals on the specified dates. Regular irrigation and fertilization with DAP were applied, and data pertaining to plant height, number of tillers per plant, spike length, and 100-grain weight were meticulously recorded. Data analysis unveiled that November emerged as the most favourable sowing time for wheat varieties in the Khairpur climate. Early sowing resulted in shorter plants but with larger spikes and superior seed quality. Notably, sowing time exhibited no significant impact on seed germination rates and the number of tillers produced by different wheat varieties. Among the four varieties, TD1 showcased the highest yield, particularly thriving when sown early. The results provide practical implications for optimizing agricultural practices. Farmers can benefit from this knowledge by making informed choices regarding planting schedules and wheat varieties, ultimately contributing to enhanced productivity and sustainability in wheat cultivation in the region.

**TRANSGENERATIONAL SEED EXPOSURE TO ELEVATED CO<sub>2</sub> MEMORIZES THE DROUGHT RECOVERY METABOLIC PROCESSES IN *TRITICUM AESTIVUM* L.**

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**Abstract:**

Drought is the worst environmental stress constraint inflicts heavy losses to global production of staple food such as wheat. The metabolic responses of seeds produced over transgenerational exposure to  $e[\text{CO}_2]$  to recover drought effects in wheat, is still unexplored. The wheat seeds produced constantly for four generations (F1 to F4) under ambient CO<sub>2</sub> ( $a[\text{CO}_2]$ , 400  $\mu\text{mol L}^{-1}$ ) and elevated CO<sub>2</sub> ( $e[\text{CO}_2]$ , 800  $\mu\text{mol L}^{-1}$ ), were re-grown under natural CO<sub>2</sub> conditions to investigate the effects of transgenerational exposure to  $e[\text{CO}_2]$  on stress memory metabolic processes liable for an increased drought tolerance in next generation (F5). At anthesis stage, plants were subjected to normal (100% FC, field capacity) and drought stress (60% FC) conditions. Drought instigated a remarkable increase in superoxide dismutase (SOD), catalase (CAT), peroxidase (POD), total antioxidants (TA), proline, hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and malondialdehyde (MDA) contents in plants raised with transgenerational seeds exposed to  $a[\text{CO}_2]$ . Under drought stress, plants of transgenerational  $e[\text{CO}_2]$  exposed seeds further increased the SOD, CAT, POD, TA activities and proline content that helped the plants to sustain normal growth through scavenging of H<sub>2</sub>O<sub>2</sub> and MDA. The carbohydrate metabolic enzymes like aldolase (Ald), phosphoglucumutase (PGM), UDP-glucose pyrophosphorylase (UGPase), vacuolar invertase (vacInv), glucose-6-phosphate-dehydrogenase (G<sub>6</sub>PDH), and cell wall invertase (cwInv) were decreased significantly; however, transgenerational seeds produced under  $e[\text{CO}_2]$  showed a considerable increase in Ald, PGM, UGPase, vacInv, G<sub>6</sub>PDH, SuSy, and AGPase activities in drought-stressed plants. Moreover, transgenerational  $e[\text{CO}_2]$  exposed seeds under drought stress caused a marked increase in leaf  $\Psi_w$ , chlorophyll *a* (Chl *a*), chlorophyll *b* (Chl *b*), carotenoids (Car), grains spike (G/S), hundred grain weight (HGW), and grain yield (GY). The transgenerational seeds exposed to  $e[\text{CO}_2]$  memorize the drought recovery metabolic processes to improve the grain yield of wheat under drought stress.

**Keywords:** Elevated CO<sub>2</sub>; Transgenerational seeds; Drought; Metabolic enzymes; Yield; *Triticum aestivum*



## **BIOTECHNOLOGY**

## **UTILIZATION OF CARBOHYDRATES TECHNOLOGY FOR IMPROVEMENT OF HUMAN SOCIAL LIFE**

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### **Abstract:**

Carbohydrates are probably the most abundant and widespread organic substances in nature, and they are essential constituents of all living things. Carbohydrates are formed by green plants from carbon dioxide and water during the process of photosynthesis. Carbohydrates serve as energy sources and as essential structural components in organisms; in addition, part of the structure of nucleic acids, which contain genetic information, consists of carbohydrate. Sugars, starches, plant and animal fibers are carbohydrates. These molecules are important for health because they provide energy in the form of sugar (fast release) and starch (slower release), and fibers. Due to advancement of technology and speedy progress of industries all over the world food scientists and chemists attempt to improve current carbohydrate engineering and processing technologies. Carbohydrates are the main source of energy for most people in the world. There is no absolute requirement for dietary carbohydrates, although the brain, red blood cells, lungs, nerves and cells in the kidneys use glucose as a preferred source of energy. Carbohydrates are the cheapest way to supply energy to the human body. Carbohydrates can serve as bulking agents, emulsifiers, stabilizers and sweeteners. A number of dietary carbohydrates have the ability to fulfill roles as prebiotics or fat replacers. Based on their ability to enhance the nutritional profile of foods, carbohydrates can be non-digestible oligosaccharides, resistant starches and carbohydrate-based fat replacers. In Africa, Asia and the Middle East, about 70% to 80% of calories are supplied by carbohydrates, while the intake of calories from sugar sources is higher in more in developed world. Therefore, considering carbohydrates as main compound being utilized in different industries as ingredient of different technologies a new document was formulated to highlight its importance

**Keywords;** Carbohydrates, energy, fiber, polymer, technology.

## **MICROBIAL BIOTECHNOLOGY FOR SUSTAINABLE FOOD PRODUCTION**

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### **Abstract:**

The demand for food worldwide is on the rise, pushing for a new and sustainable ways to feed our growing population. Entering the microbial biotechnology into the food security, is a game-changer in shaping the future that how we can produce food. Microbial biotechnology taps into the power of tiny organisms to improve different stages of food productions. From making soil more nutritious to fine-tuning for the purpose that how can plants interact with microbes, these microbial interventions lead to better crop yields and stronger resilience. Through advanced genetic engineering, we can create microbial strains with improved traits like nutrient absorption, stress resistance and defense against diseases for improvement in food production for growing population. This will not only help our crops but also reduces the environmental impact of traditional farming methods. Another breakthrough comes from microbial fermentation process that has transformed the process and preservation of food. By using microbes, we can produce bioactive compounds, enzymes and probiotics, for not only boosting the nutritional value of our food but also extending its shelf life, which is a win against food waste. This summary takes a closer look at the innovative biotechnological methods driving microbial applications in sustainable food production. The focus will be on how these methods can tackle global challenges like climate change, soil degradation, and limited resources. This summary explores the various aspects of microbial biotechnology, highlighting its crucial role in promoting sustainable food productions. In conclusion, microbial biotechnology is taking the lead in sustainable food production, offering a wide range of solutions to improve food production while lessening our impact on the environment. Recognizing and utilizing the potential of the microbial biotechnology in world is key to creating food systems that are sturdy, efficient with resources and environmentally friendly.

**Keywords:** Biotechnology, genetic engineering, microbial interventions, nutrient absorption.

## **ETHNOBOTANY**

**QUANTITATIVE ETHNOBOTANICAL APPRAISAL OF TRADED MEDICINAL PLANTS AND THEIR SOCI-ECONOMIC IMPACT ON LOCAL COMMUNITIES OF DISTRICT ASTORE, GILGIT BALTISTAN, PAKISTAN**

*Lubna Ansari, Iftikhar Hussain, Rehmatullah Qureshi*

**Abstract:**

Background: Medicinal plants are used by the local people of the study area for the treatment of numerous ailments. The study was conducted for quantitative ethnobotanical appraisal of traded medicinal plants and to assess their status and availability for local and national demand. Secondly, to identify the traded medicinal plants and their socioeconomic impact on local community of Astore district, Gilgit Baltistan. Methods: Total 26 traded medicinal plants were collected from various villages of study area by random sampling method. The collected traded medicinal plants were pasted on herbarium sheets for identification purpose. Ethanomedicinal uses were also documented and the collected data was analyzed by using ethnobotanical indices i.e. Use value, Relative frequency citation, Fidelity level and Pearson correlation coefficient. Questionnaire survey was conducted to access the socioeconomic impact of traded medicinal plants, their current status, and availability for local and national demand. 80 respondents were interviewed consisting 66 men and 14 women. SPSS software was used to find out percentage and frequency of respective medicinal plants after field survey. Results: About 26 traded medicinal plants were identified from the study area and their ethanomedicinal uses were also documented. The RFC was recorded highest for *Thymus linearis* with 0.88 followed by *Bergenia ciliata* (RFC: 0.86) and *Carum carvi* (RFC: 0.85). Whereas the UV was reported highest for *Thymus linearis* with 0.98 followed by *Bergenia ciliata* and *Aconitum heterophyllum* with (UV: 0.9) and (UV: 0.89). The value of Pearson correlation coefficient is 0.94. It indicates a strong relationship between RFC and UV. Survey results showed that the traded medicinal plants played pivotal role by enhancing socio-economic condition of local communities and they earned stipulated amount of income from sale of traded medicinal plants. Overall survey findings indicated that the traded medicinal plants are easily available for local demand but their availability is low to meet national demand. Because currently the traded medicinal plants are gradually decreasing due to anthropogenic activities like improper method of collection, uprooting, illegal trade, unsustainable use and lack of protection and conservation measures. Conclusion: The study divulged different uses of therapeutic plants by the local people of district Astore for the treatment of various kinds of diseases. Habitants of the respective area have knowledge about few traded medicinal plants which have high use value and are more economical. So such plants are mostly traded in the area. The plants are gradually decreasing so there is pressing need to create awareness among local people for the conservation and sustainable of medicinal plants.

**Keywords:** Ailments, Astore, Medicinal plants, SPSS, Socioeconomic impact, Sustainable use

**CULTIVATION OF *LAVANDULA X INTERMEDIA* AND CHEMICAL CHARACTERIZATION (GC-MS) OF ITS ESSENTIAL OIL, A PLANT EXOTIC TO POONCH AZAD JAMMU KASHMIR AND PAKISTAN**

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**Abstract:**

*Lavandula x intermedia* is an important medicinal plant indigenous to Mediterranean region. There is little information about cultivation of exotic lavender in Azad Kashmir. The main theme of this research is to investigate growth patterns of *L. x intermedia* in different types of soil in local area and to check chemical composition of its essential oil. Few plants were acquired from Bio-resources Conservation Institute (BCI) Islamabad. These plants were planted and propagated in Botanical Repository at Govt. Boys Post Graduate College Abbaspur AJK. Essential oil was distilled from flowers of plants by hydro distillation method. After that essential oil was analyzed by GC-MS assay. Sixteen compounds were identified. Three major compounds including Linalool, Bicyclo [2.2.1] heptan-2-one, 1,7,7-trimethyle, and Eucalyptol were observed while other were also reported in significant quantities. Up till now it is first investigation reporting about cultivation and chemical screening of essential oil of exotic lavender which has been cultivated locally in Azad state of Jammu and Kashmir.

**Key words:** Azad Kashmir, Exotic, Essential oil, Medicinal and Aromatic Plants, MAPs.

**ETHNOBOTANY OF MEDICINAL PLANTS USED BY THE HINDU COMMUNITY INHABITING DAFFAR FOREST, DISTRICT MANDI BAHAUDDIN, PUNJAB, PAKISTAN**

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Considerable medicinal plant research in Pakistan has focused on indigenous and mixed-race communities. The aim of this study was to document the knowledge and practices of Hindu community residing in Daffar Forest (Mandi Bahauddin, Punjab, Pakistan) with no previous exploration. For this purpose and ethnobotanical study was carried out from September 2021 to August 2022. A total of 75 informants were interviewed by using semi-structured questioners and interviews. For all reported medicinal plants the herbal remedies, part used, mode of utilization and administration was recorded according to the informants. Plant species recorded by inhabitants were collected and identified by the specialists and Flora of Pakistan. A total of 80 medicinal plant species belonging to 31 families were recorded to treat various kinds of ailments. The most predominant family was Fabaceae followed by Lamiaceae. Among the reported plant species *Ceratonia siliqua*, *Butea monosperma*, *Tecomella undulata*, *Ehretia*

*laevis*, *Albizia procera*, *Capparis decidua*, *Aegle mermelos*, *Morus macroura*, *Salvadora oleoides* and *Canabis sativus* were not only the highly cited plant species but also have unique medicinal herbal recipes. The most common disease category was gastrointestinal disorders followed by respiratory problems. Two loft trees of *Taxodium mucronatum* are the matchless figure of the biodiversity of the Daffar Forest. **Conclusion:** Hindu community of Daffar Forest maintains considerable knowledge of the medicinal value of the Forest Flora. Due to the high dependency of the locals on the medicinal plants for medicinal and other ethnobotanical uses sustainable harvesting methods should be introduced for conservation of forest plants. There is a dire need to explore the traditional practices from remotes and unexplored areas of country. The baseline data will provide the opportunity for phytochemical screening of reported medicinal plants species for various therapeutic purposes.

### **PRELIMINARY SCREENING OF ANTI-ARTHRITIC POTENTIAL OF DIFFERENT SPECIES OF TEA. AN ETHNO BOTANICAL REVIEW**

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#### **Abstract:**

Arthritis is about inflammation and it is a type of auto-immune disease followed by pain, stiffness and gets worse with time. The purpose of this review was to study some ethnobotanical plants to treat arthritis and its types which are easy to use in daily routine.

Extensive and comprehensive literature search was conducted using about different articles obtained via electronic scientific databases such as Google, Google Scholar, PubMed, Science Direct, and Web of Science as well as journals obtained through citations or directly from their website. The keywords used during the search included distribution, morphology, ethnobotanical, phytochemistry, nutritional composition, toxicology, and pharmacological activities. In this article we have studied different varieties of tea for their antiarthritic potential. Antioxidant properties of different forms of tea are important for the their antiarthritic activity that include catechin, epicatchin, gallocatechin, epicatechin gallate and several other similar antioxidants.

Tea also contains several bioactive components such as astea polysachharides, thianin and polyphenols like theaflavins which help in the prevention of various chronic diseases like arthritis.

**Keywords:** Anti-arthritis, Rheumatoid arthritis, Polyphenols.

**CROSS-CULTURAL COMPARISON OF LOCAL KNOWLEDGE ON WILD FOOD AND MEDICINAL PLANT USES AMONG DIFFERENT LINGUISTIC GROUPS IN DISTRICT MIANWALI, PUNJAB**

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**Abstract:**

The use of food and medicinal plants has been inextricably linked with each human culture. The knowledge linked to these natural resources have always been dynamic and changed with space and time. Cross-cultural interactions have played a significant role in reshaping the knowledge within a given community. In the current study, we have planned to cross culturally compare the use of wild food and medicinal plants among four different ethno linguistic groups i.e. Muhajir, Pathans, Punjabi and Saraiki residing in the Mianwali district, Punjab Province of Pakistan. The study was conducted to research the cross-cultural similarities and differences on the use of these natural resources to see the adaptation of these communities to the plant use. Data were taken through semi-structured interviews. A total of 59 plants were recorded in which most of the plants were used as cooked vegetables and snacks. Cross-cultural comparisons have revealed one fourth of the quoted plants were commonly used by all the groups. High similarity was found among Muhajir, Punjabi, and Saraiki while Punjabi reported higher numbers of plants and Pathans quoted comparatively lesser number of plants. Particularly, higher heterogeneity on the food uses was noticed among the studied groups and only one fifth of the food uses were commonly shared among them. In food uses, Pathans reported a comparatively high number of idiosyncratic uses followed by Muhajir. Pathans have their peculiar historical stratification in the context post-migration from other areas might have impacted their traditional knowledge on the local wild resources. Plants and their respective uses that were reported by more than 50% participants among each of the individual groups, it was observed that Muhajir, Punjabi, Saraiki have very close affinity and have comparatively rich knowledge and especially Punjabi frequently reported some plant uses which were rarely reported by the other groups. For medicinal uses, a close affinity on the use of the quote plants was found between Muhajir and Punjabi and also, they reported a high number of uses as compared to other two groups. Pathans reported the least number of medicinal uses. It is important to note that all the groups have reported idiosyncratic medicinal uses in which the Muhajir and Punjabi show higher than the other two groups. It is concluded that linguistic diversity has been a main indicator of the local plant knowledge in the study area. One of the important contributions of this study is the cross-cultural analysis on folk food-medicine which is the first study in Pakistan. The current study thus, made a baseline for more in depth studies in the field of food and medical ethnobotany to research and preserve the eroding local ethnobotanical heritage.

**Keywords:** Medicinal and Food plants; Food-Medicine; Mianwali; Ethnobotany; Local Knowledge, Cross cultural ethnobotany



**ETHNOECOLOGICAL DIVERSITY OF MEDICINAL PLANTS WITH  
CONSERBATION STATUS FROM ARID RANGELANDS OF CHOLISTAN  
DESERT PAKISTAN**

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**Abstract:**

The Cholistan desert is located in South-West of Punjab province (Pakistan) between latitudes 27° 42' and 29° 45' North and longitudes 69° 52' and 75° 24' east covering an area of about 2.6 million hectares. Based on topography, soil and vegetation, this desert can be divided into two geomorphic regions lesser Cholistan covers about 7770 km<sup>2</sup> and Greater Cholistan is comprised of 18130 km<sup>2</sup> areas. The climate is sub-tropical hot, arid and influenced by seasonal monsoon rains. The range vegetation of Cholistan desert includes many plant species out of them many are of highly medicinal value which are used since prehistoric period for the cure of various diseases. A lot of people are engaged in the trade of important medicinal herbs throughout the world and traditional healthcare knowledge has been passed on verbally over generations rather than a written document due to which the knowledge is gradually diminishing. Additionally, urbanization, growing population, habitat loss, improper documentation, and exploitation of species are contributing to the loss of this heritage. In Cholistan desert, there are numerous plants which are used medicinally by local peoples however; wild populations are vanishing at a high speed due to destructive harvesting and habitat loss. The range plants reported in this manuscript were collected in different seasons from the different areas of Cholistan desert. Based on this study it was observed that total 180 plants belonging to 43 families and 120 genera out of which 83 were herbs, 22 shrubs, 14 subshrubs, 10 climbers, 11 trees, 04 sedge, and 36 grass species were recorded. The life span of plants showed that 124 species were annuals, similarly 55 perennial species and 01 biennial species were found. The life form spectrum showed that 89 therophyte, 36 chamaphyte, 29 phanarophyte, 19 hemicryptophyte, whereas 05 Cryptophyte/Geophytes and 02 parasites species were recorded from the study area. Result showed that spring season has 14 plant species, monsoon 63 species, 01 winter, spring, 69 monsoon, spring, 01 monsoon, winter, spring and 32 species were found whole the year. It was investigated that out of total species the flowering period of 29 plant species was from February-April, 65 species July-September,

03 species October-December, whereas 04 species was from November-January, and 79 species in both from July-September, and February-April were observed. Based on economic use classification results revealed that there were 152 species to be used as forage/ fodder, 126 species has medicinal properties, 56 plants were used indigenously as food, 48 plant species as fire wood, 23 species for thatching purposes and 13 plant species were used as timber wood. However 126 species are acclaimed to be efficacious in various ailments which are used by the local community as traditional treatments. Plants as whole, different parts and in different formations are commonly used to cure different diseases in the study area by local community. The reported number of medicinal plants from Cholistan rangelands are used as folklore remedies seems very significant considering the vegetation cover as very sparse. The IUCN data revealed that 11 plant species were critically endangered, 37 species endangered, 51 species vulnerable, 53 species near threatened, 17 species least concern, whereas 11 species were found data deficient. The findings of this study indicate that Cholistan rangelands were rich in floristic composition but unfortunately, this range ecosystem is degrading gradually due to overgrazing, destructive harvesting of flora, and agriculture expansion on desert landscape. Therefore, they need proper protection, management, and rehabilitation through ecological approaches. This would be possible by devising policy and with the participation of government and local peoples to make these range medicinal plants sustainable.

## **FLORISTIC DIVERSITY AND ECOLOGY**

## **ECOLOGICAL INSIGHTS INTO WEED FLORA VARIABILITY IN WHEAT CROP UNDER DIFFERENT EDAPHIC AND FARMING PRACTICES**

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### **Abstract:**

Wheat is staple food crop in Pakistan, dominating all other crops in terms of cultivation area and productivity. Its role is central in ensures food security in country. Weeds pose a significant challenge to the productivity of wheat crops that significantly decline in yield. We aim to understand the dynamics of weed variability in varying farming practices and edaphic factors. The frequent field trips were arranged in February-March 2023 to determine the diversity of weeds in the *Triticum aestivum* L. fields in District Bhakkar, Punjab. A total of 100 crop fields were sampled from four different localities including Kallur Kot, Mankera, Bhakkar, and Darya Khan of district Bhakkar. At each sampling field 3 quadrats of 1m × 1m size were placed randomly. The phytosociological attributes were recorded at each quadrat. Soil was collected to record various edaphic factors and questionnaire data on farming practices was also collected. Regression analysis and Perason analysis were performed to evaluate interrelationship of weeds with farming practices and edaphic factors. We reported 82 weed species among which *Anagallis arvensis* L. were dominant species followed by *Rumex dentatus* L and *Chenopodium album* L. The regression analysis reveals significant relationship among weeds variability and farming practices. Our findings could be used in managing the weeds and promote practices that help to reduce weeds diversity.

## **FLORISTIC DIVERSITY ASSESSMENT AND PHYTOSOCIOLOGICAL STUDIES ALONG KARAKORAM HIGHWAY DISTRICT NAGAR, GILGIT-BALTISTAN.**

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### **Abstract:**

Floristic diversity assessment and phytosociological studies along the Karakoram Highway (KKH) Pakistani section of One Belt One Road (OBOR) District Nagar were conducted for the

first time in the year 2020-2022 in District Nagar, Gilgit-Baltistan. The current study conducted to record the flora along with the KKH yielded 145 plant species in 108 genera and 47 families. Out of these 145 plant species, Pteridophytes have reported 03 species, Gymnospermic 03 species, and Angiospermic species reported 139. The habit categories of the collected flora were 24 species were trees, 10 were shrubs, 30 were subshrubs, and about 81 were herbs. While the Life form classes of species in the examination zone, were; Therophytes (32 species), Phanerophytes (39 species), Hemicryptophyte (41 species), Chamaephyte (32 species), Epiphytes (1 species), and Geophytes (2 species) are the life frame classes. The Asteraceae family was considered the most dominant family with 12 species, followed by the family Papilionaceae with 10 species, the Poaceae family encompassed 09 species, and the Rosaceae family has seven species, followed by the Lamiaceae and Brassicaceae families have five species each while other families have fewer species than 05. The second part of this study was the inventorying of weed flora in the potato fields weeds were comprised of 17 species 15 genera 10 families. Standard protocols were followed for vegetation sampling and data analysis was based on the important value index. *Chenopodium album*, *Amaranthus retrofractus*, *fagopyrum esculentum*, *Persicaria amaculosa*, *Rumex dentatus*, *Phragmites australis*, *Setaria viridis*, and *Plantago major* were the dominant species among weed communities. According to the important value index (IVI), the most dominating species were *Phragmites australis*, which were an IVI of 76.004, followed by *Persicaria maculosa*, which were 63.009, and *Setaria viridis*, which were 58.84. The area is under pressure due to anthropogenic activities, natural disasters, deforestation, and overgrazing.

**Key Words:** Floristic diversity, Phytosociology, Karakoram Highway (KKH).

## **ETHNOMEDICINAL PROFILING AND BIOLOGICAL EVALUATION OF MEDICINAL PLANTS USED FOR TYPHOID FEVER IN POONCH REGION OF AZAD JAMMU & KASHMIR**

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### **Abstract:**

Typhoid fever affects millions of people every year all over the world. The risk of extensively drug-resistant (XDR) typhoid is high in Pakistan, owing to lack of clean drinking water, unsatisfactory hygiene, and indiscriminate use of antibiotics. The current study was aimed at: 1- Quantitative ethnobotanical inquiry aimed at authentication of folk knowledge and, 2- Biological evaluation of screened medicinal plants against pathogenic isolates. A medicobotanical survey was conducted in the study area during 2021. A total of 19 medicinal plants were reported by 47 informants for the treatment of typhoid/ enteric fevers. Based on frequency of citation (FC), informant consensus (ICF) and Fidelity (FD) for the treatment of typhoid top six plants were selected, 4 out of which viz. *Berberis lyceum* Royle, *Thalictrum*

*minus* L. , *Swertia elata* D. Don, and *Dioscorea bulbifera* L. were tested against *Salmonella typhi*, *Escherichia coli* and methicillin resistant *Staphylococcus aureus* (MRSA) at a concentration range of 100, 150 and 200 mg/mL. *B. lyceum* exhibited very significant activity against *S. typhi* (zone of inhibition  $34.00 \pm 1.63$ ,  $31.00 \pm 2.94$ ,  $29.00 \pm 2.16$ ); against MRSA ( $34.67 \pm 2.05$ ,  $31.00 \pm 2.94$  and  $29.00 \pm 2.16$  and *E.coli*  $33.67 \pm 2.87$ ,  $31.00 \pm 2.94$ ,  $30.33 \pm 1.25$  at concentrations 100, 150 and 100 mg/mL. Other significant activity was expressed by *D. bulbifera* with inhibition zone of  $23.67 \pm 1.25$  against *S. typhi* and  $22.00 \pm 1.63$  against MRSA at 200 mg/mL. During phytochemical screening *B. lyceum* was found to have phenolic, alkaloids and flavonoids as potential phytochemicals for observed bioactivities. Extensive follow up and bioassay-guided fractionation is highly merited.

## **ETHNO-MEDICINAL SURVEY OF LOCAL HERBALIST AT DIFFERENT AGRO ECOLOGICAL ZONES OF KHYBER PAKHTUNKHWA PAKISTAN**

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### **Abstract:**

The use of plants and herbal products has long traditional use in the treatment of various ailments in different regions. Khyber Pakhtunkhwa (KP) in general and Northern parts in Particular is a rich source of various floras that have been in used in traditional folk remedies treatment of various diseases. The current ethno-medicinal survey was carried out in various regions of Khyber Pakhtunkhwa with particular focus in Northern area of Khyber Pakhtunkhwa, Pakistan. Data was collected from rural elders, herbalist practioner, herbalist dealer and traditional user of plants to gather information regarding the plants that have been in use for the treatment of Hepatic diseases (Hepatitis C, B and Jaundice) through distribution of structure questionnaire followed by interviews with rural elders, herbalist, pansari (herbal dealer), hakeem (herbal practioner) and general public to gather information regarding the plants used for hepatic diseases in various districts and regions of Khyber Pakhtunkhwa including Kohat, Hangu, Peshawar, Nowshera, Malakand, Mingora, Madyan, Bahrain, and Upper Swat valley. About 32 different plants species have been identified for it use in hepatic diseases belonging 7 families and included 11 genera. The most dominants family (Asteraceae) and the most dominants plants of region that are used in the treatment of hepatic diseases are reported. The most widely plant form was observed as herbs while leaves use as parts in herbal medicine was reported by 70 % followed by seeds (20 %) and roots (10 %). The result from the survey further indicate that majority of the traditional drug prescription are taken orally (80%). The most common method for traditional drug preparation was decoction (boiling with water) followed by preparation of powder (15%). Quantitative ethno-medicinal data on relative frequency of citation, (RFC), fidelity level, use value, family importance index. The quantitative ethno-medicinal data indicate high use vale of 0.1, 0.02, 0.03, 0.04, 0.04 for

*Curcuma longa*, *Silybum marianum*, *Artemisia vulgaris*, *Berberus lycium*, *Ajoga Bracteosa*, *Ajoga parviflora* and low use value 0.006 lowest was recorded for *Conyza Canadensis* and *Conyza Bunerensis* respectively. The relative frequency of citation (RFC) indicating the local prominence specie was in the range of 0.1 to 0.9 where as the lowest 0.1 was noted for *peganum harmala* and the highest value of 0.9 RFC was recorded for *Berberus lycium*. Fidelity Level (FL) show the particular plant use for an ailments which was noted highest for *Berberus Lycium* (100 %), *Silybum marianum* (100%) and lowest 30% was found for *Conyza Bunerensis*. Similarly family importance value was recorded highest (37.5) for *Asteraceae*, *Berberidaceae* and lowest for 6.25 for *Taxaceae* and *Poaceae*. The plants reported from these regions are not only potential source of new drug development and the bioactive compound isolations for the treatment of hepatic diseases particularly hepatitis C which is serious health concern nationally and globally moreover, due to excessive use of these plants in herbal industry most of these are endanger to be extinct from it natural wild habitat there is need to be conserved these for the future generation.

### **DIVERSITY OF POISONOUS PLANTS OF PAKISTAN & THEIR IMPACT ON LIVE STOCK**

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#### **Abstract:**

Plants are the major source of feed for live stock. Poisonous plants cause tremendous economic losses to the livestock industry. These economic losses are deterioration in their health, decreased productivity, deformed offspring, and reduced longevity. Among the factors that expose the livestock to the poisonous plants; shortage of feed, nutritional deficiency and sudden exposure were the major problems. Feed shortage can force animals to browse perennial shrubs and bushes while most of these perennial plants have been known to contain toxic secondary metabolites. These plant poisoning cause health problems in livestock with huge economic loss to the pastoralists due to production loss, morbidity and mortality of their animals. Hence, it is imperative to bring the attention of professionals to the effects of poisonous plants on animal health and productivity. As we know that livestock sector is considered a subsector of agriculture. Livestock is contributing approximately 61.9 percent of agriculture value added and 14.0 percent to the national GDP during 2021-22 and employs approximately 35 million people. Animal husbandry is the most significant economic activity of the dwellers of rural areas of Pakistan. More than 8 million rural families are engaged in livestock production and are deriving around 35- 40 percent of their income from this sector. Livestock are natural factories to convert roughage (grasses, shrubs, etc) into quality-food i.e. milk and meat. It is an established nutritional fact that animal proteins are superior to vegetable proteins for the supply of essential amino acids. Livestock also provide raw material for industries and create markets and capital. For the poor in the villages, it is a form of social security, cashing it at the time of need. Livestock are also used in sports and entertainment and are also considered a symbol of

prestige in certain areas of Pakistan. The main aim of the project is to upgrade the current knowledge of poisonous plants in our country along with their economic importance & their impact on live stock. The findings of the project will be helpful to rural agro-ecological regions of Pakistan as well as the scientific community and researchers around the world. So there is a need of research work that could be used by health care professionals, veterinarians, farmers, homeowners, as well as botanically curious individuals.

**Key words:** Identification of poisonous plants, live stock, awareness, veterinary importance, health problems, economic loss.

**FLORISTIC INVENTORY OF UCHALI LAND RAMSAR SITE OF THE SALT  
RANGE WETLAND COMPLEX  
VALLEY SOON SAKESAR DISTRICT KUSHAB, PUNJAB**

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**Abstract**

Uchali wetland an international Ramsar site is located in the Valley Soon Sakesar which is part of salt range ecosystem. Uchali wetland is spread over an area of 943 ha and has been declared Game reserve under Punjab wildlife Act, 1974. It is shallow and brackish wetland. This wetland is located 13 Km west of the Naushera Village and 42 Km Kilometer north west of Khushab district between 32° 33' N latitude and 72° 01 E latitude. The lake is fed by 16 hill torrents and two natural water springs. The climate of the area is humid sub-tropical continental type with hot to moderate summer and severe winter. The annual rainfall at Uchali wetland is 300 to 600mm. The objective of the study was to document the existing botanical inventory of the Uchali wetland. A floristic survey of the Uchali wetland was carried out in the 2021-2022. Summer and winter season flora was studied separately. Survey of adjoining agricultural lands, rangelands, hills, forest, graveyards and wetland aquatic flora was carried out. Survey revealed that 70 herbs, 38 shrubs, 01 Sedge, 15 grasses and 28 trees exist at Uchali wetland. Flora of the Uchali wetland was also studied form ethnobotanical point of view and it was noted that 30 plants are used as medical plants, 25 as fodder, 04 wild vegetables, 06 wild fruit, 10 as fuel wood. Major threat to the floral diversity include forest fire, developmental activities, deforestation, drought, and fuel wood. There is deterioration of habitat due to overgrazing, deforestation and use of the land for agriculture.

**Keywords:** Ramsar Site, Uchali Wetland, Salt Range



**FLORAL WEALTH OF KARAKORAM NATIONAL PARK (KARAKORAM RANGE) GILGIT-BALTISTAN, PAKISTAN**

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**Abstract:**

The Central Karakoram National Pakistan is one of the largest National Park in Pakistan, covering an area of 10,000 km<sup>2</sup>. The current study was conducted to understand the floristic diversity along an altitudinal gradient with elevations varying from 1200m to 4000m in different habitats of CKNP region. Plant specimens were collected during the springs of 2001-2020 from various habitats of the selected valleys of this region. In the course of the present inventory, 190 taxa of Spermatophytes from 48 families were found in different habitats of the study area. The largest group was Dicot with 172 species and 122 genera from 44 families. Monocots are represented by 13 species and 12 genera from 2 families followed by Gymnosperms 5 species, 2 genera from 2 families. There were 44 shrubs 9 trees 27 annuals and 110 perennials were classified according to their life forms. Out of these 190 plant species, 116 were ranked as common, 34 were very common, 7 rare 2 very rare and 31 were infrequent. It was observed that family Compositae was the largest family containing 38 species followed by Fabaceae with 19 species, Labiatae, 11 species, Poaceae with 11 species, Rosaceae 8 species, Chenopodiaceae 7 species, Boraginaceae 6 species and the remaining families represent less than 5 species. In general, the vegetation was composed of perennial herbs and a few shrubs which form the permanent framework of the area. The Index of similarity for shrub and herb species between different altitudes was low which indicates a remarkable degree of dissimilarity in plant species between different altitudes. The medicinally important plant species of the study area were observed under threat due to commercial exploitation by the locals which needs proper management for conservation. The abundance of these commercially exploited species has declined in their abundance during the last decades.

**Key words:** Floristic diversity, Desert area, CKNP, Gilgit-Baltistan, Pakistan.

## **MEDICINAL PLANTS AND NATURAL PRODUCTS**

**EXPLORATION AND THERAPEUTIC POTENTIAL: INVESTIGATING THE HEALTH BENEFITS OF ORGANICALLY CULTIVATED HERBAL TEAS FROM THE QARSHI BOTANICAL GARDEN AT THE QARSHI HERB RESEARCH CENTRE IN HATTAR, PAKISTAN**

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**Abstract:**

In the year 2023, a scientific investigation was conducted within the premises of the Qarshi Botanical Garden (QBG) with the primary objective of taxonomically identifying herbal teas, elucidating their associated health benefits and medicinal properties, and introducing them to the QBG and Qarshi Herb Research Centre (QHRC) ecosystems. The study unveiled 13 medicinal herbal teas, namely *Cymbopogon citratus* (DC.) Stapf, *Ginkgo biloba* L, *Hibiscus sabdariffa* L, *Linum usitatissimum* L, *Matricaria chamomilla* L, *Mentha arvensis* L, *Mentha longifolia* L, *Mentha x piperita* L, *Mentha spicata* L, *Mentha suaveolens* Ehrh, *Salvia rosmarinus* Spenn. Syn. *Rosemarinus officinalis* L., *Stevia rebaudiana* (Bertoni) Bertoni, and *Thymus linearis* Benth., which were systematically collected and organically cultivated or introduced to QBG. These botanical entities, spanning 6 families and 9 genera, exhibited a taxonomic distribution characterized by the representation of Gymnosperms through a single species in the Ginkgoaceae family, and Angiosperms comprising 12 species across 8 genera in 5 families. The herbaceous layer, encompassing 8 species, emerged as the predominant life form, succeeded by the shrubby layer with 4 species, and the arboreal layer featuring a solitary species, ranked in descending order of abundance. Lamiaceae, with 7 species, emerged as the most significant family in terms of species diversity, whereas the remaining 9 families (Anacardiaceae, Araceae, Araliaceae, Asteraceae, Berberidaceae, Colchicaceae, Dioscoreaceae, Ebenaceae, Ephedraceae, Geraniaceae, Guttiferae, Melianthaceae, Paeoniaceae, Podophyllaceae, Rutaceae, Saxifragaceae, and Valerianaceae) contributed a singular species each. The findings underscored the successful cultivation and growth of the majority of medicinal plants along established trails within QBG, thereby presenting a viable alternative for ex situ conservation in the Hattar area. Moreover, the cultivation success of these medicinal plants in QBG presents multifaceted opportunities for Qarshi Industries, including mass cultivation, income generation, strategic marketing, and utilization within the pharmaceutical industry.

**Keywords:** Herbal teas, Qarshi Botanical Garden, Medicinal plants, Cultivation, Health benefits

**EVALUATION OF ANTIFUNGAL ACTIVITY OF *CHARA VULGARIS* AGAINST AFLATOXIN B1 PRODUCED BY *ASPERGILLUS FLAVUS* ISOLATED FROM TOTAL MIXED RATION**

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**Abstract:**

*Aspergillus flavus* is a aflatoxin producing fungi and commonly present in animal feeds. Aflatoxins are harmful for animal and human being consuming animal meat and milk. The current study was conducted to evaluate the antifungal activity of methanolic extract of *Chara vulgaris* against *A. flavus* isolated from total mixed ration. Total mixed ration (TMR) samples (n= 12) were collected from Pattoki, Kasur Pakistan. Conventional methods were used to identify the fungal species isolated from TMR. Spread plate technique was used to determine the fungal load of TMR and the highest CFU was  $9 \times 10^2$ . The production of aflatoxins by *A. flavus* was confirmed by thin layer chromatography. To analyze the antifungal and anti-aflatoxigenic activity of *C. vulgaris*, methanolic extract was prepared. Proximate analysis of *Chara* extract was performed by Infra-red Spectroscopy that showed moisture content 31.36%, crude protein 9.76%, fat 27.26%, ash 6.55%, carbohydrate 23.13% and fiber 1.03%. The HPLC results of *Chara* extract determined the quantity of Myricetin (0.2591 µg/ml), Quercetin (0.1314 µg/ml) and Kaempferol (1.178 µg/ml). Micro broth dilution method was used to analyze the antifungal activity of methanolic extracts of *Chara* against three fungal strains. The minimum inhibitory concentration MIC of *Chara* extract was 75g. *In vitro* antifungal activity was observed after 30 days. The greatest fungal load of TMR was 29 CFU/g in isolate-1 and isolate-2 with extract. Without extract the highest fungal load was 63 CFU/g in isolate-1. The lowest CFU was 17 in isolate-3 with extract. The methanolic extract of *C. vulgaris* can be used as an effective antifungal agent to inhibit the growth of *A. flavus* in TMR.

**Keywords:** *Chara vulgaris*, *Aspergillus flavus*, aflatoxins, High Performance Liquid Chromatography (HPLC), Thin Layer Chromatography (TLC), Infra-red Spectroscopy (IR Spectroscopy), Minimum Inhibitory Concentration (MIC)

**CULTIVATION OF *LAVANDULA X INTERMEDIA* AND CHEMICAL CHARACTERIZATION ( GC-MS) OF ITS ESSENTIAL OIL , A PLANT EXOTIC TO POONCH AZAD JAMMU KASHMIR AND PAKISTAN**

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**Abstract:**

*Lavandula x intermedia* is an important medicinal plant indigenous to Mediterranean region. There is little information about cultivation of exotic lavender in Azad Kashmir. The main theme of this research is to investigate growth patterns of *L. x intermedia* in different types of soil in local area and to check chemical composition of its essential oil. Few plants were acquired from Bio-resources Conservation Institute (BCI) Islamabad. These plants were planted and propagated in Botanical Repository at Govt. Boys Post Graduate College Abbaspur AJK. Essential oil was distilled from flowers of plants by hydro distillation method. After that essential oil was analyzed by GC-MS assay. Sixteen compounds were identified. Three major compounds including Linalool, Bicyclo [2.2.1] heptan-2-one, 1,7,7-trimethyle, and Eucalyptol were observed while other were also reported in significant quantities. Up till now it is first investigation reporting about cultivation and chemical screening of essential oil of exotic lavender which has been cultivated locally in Azad state of Jammu and Kashmir.

**Key words:** Azad Kashmir, Exotic, Essential oil, Medicinal and Aromatic Plants, MAPs.

**ANTIOXIDANT AND ANTIBACTERIAL ACTIVITY OF PLANTS USED FOR MAKING HERBAL TEAS IN DISTRICT HAVELI, AZAD KASHMIR, PAKISTAN**

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**Abstract:**

Herbal tea has been consumed for centuries due to its health advantages and delicious flavor. Herbal tea is basically an herbal mixture prepared from leaves, seeds or roots of several plants. The objective of the study was to measure the antioxidant and antimicrobial activity of *Berginia ciliata*, *Calamus rotang*, *Mentha arvensis*, *Polygonum viviparum*, and *Thymus linearis*, commonly used herbal plants for making herbal tea in District Haveli, Azad Kashmir. Total phenolic content (TPC) and total flavonoid content (TFC) were calculated in phytochemical analysis. Antioxidant activity was measured using the 2, 2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay, hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) assay, and reducing power assay. The disc diffusion method was used to determine antibacterial activity against gram-positive and gram-negative microorganisms. The phytochemical analysis showed highest TPC in extract of *C. rotang* (354.12±1.65 mg GAE/g) followed by *B. ciliata*, *M. arvensis*, *T. linearis* and *P. viviparum*, respectively. Highest TFC were found in *M. arvensis* (162.8±1.50 mg QE/g) extract obtained by decoction. The extract obtained by decoction method of *P. viviparum* showed highest antioxidant activity with the lowest IC<sub>50</sub> value (27.19 µg/mL) against DPPH. Against H<sub>2</sub>O<sub>2</sub>, the extract obtained by maceration method of *Thymus linearis* showed highest antioxidant activity by the IC<sub>50</sub> value of 26.81 µg/mL. In reducing power assay, the extract obtained by maceration method of *Polygonum viviparum* showed highest activity with the IC<sub>50</sub> value of (62.70 µg/mL) as compared to decoction process. The maximum antibacterial activity (16.67±0.88 mm) was shown by extract of *M. arvensis* obtained through maceration process against *Pseudomonas aeruginosa* as compared to *Staphylococcus aureus*. The study established that the biological activity of herbal teas might be used for curing of various infectious diseases.

**Keywords:** Herbal teas; Antibacterial activity; Antioxidant activity

## **EVALUATION OF ANTIMICROBIAL ACTIVITY OF *ZYNTHOXYLUM ARMATUM* EXTRACT**

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### **Abstract:**

Medicinal plants contain anti-microbial characteristics which are used to treat a variety of ailments. Infectious diseases such as skin infections, cold and cough, tonsillitis, headaches, fevers, high elevation sickness, diarrhea and dysentery are caused by bacteria. The main aim of this research is plant extraction by using three solvents acetone, ethanol and water and to determine the anti-bacterial activity of selected medicinal plant *zynthoxylum armatum*. The plants *zynthoxylum armatum* was collected from different region of district Kotli AJK. The extraction of these plants was done by maceration process. Phytochemicals alkaloids, flavonoids, tannins, resins, phenols and terpenoids test were performed and antimicrobial action was checked by Agar well diffusion method. The extract obtained from *Zanthoxylum armatum* with water was 8 g, while the extract obtained from acetone and ethanol were less. Plants showed maximum zone of inhibition with water extract. *Zanthoxylum armatum* fruits extract prepared from water showed highest zone of inhibition of 30 mm against E.coli. MBC values varied from 11.9 mg/ml to 95.2 mg/ml. It is concluded that selected indigenous medicinal plants have anti-microbial properties. Therefore, awareness among local communities is necessary to conserve natural flora.

**Key Words:** Medicinal Plants, *Zanthoxylum armatum*, Antimicrobial activity, phytochemicals

## **NANOTECHNOLOGY**

## **BIOINSPIRED NIONPS FROM ASTRAGALUS ANISACANTHUS BOISS. AND THEIR IN VITRO BIOACTIVITIES**

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### **Abstract:**

An ecofriendly approach for the preparation of green nickel oxide nanoparticles (NiONPs) by reducing NiNO<sub>3</sub> salt with the aqueous extract of *Astragalus anisacanthus* (AA) is described. The purity, shape and size of AA- NiONPs were extensively studied via UV visible spectra obtained from UV-visible spectroscopy, X-rays diffraction spectral studies (XRD), SEM (scanning electron microscopy), Fourier transform-infrared spectroscopy (FT-IR), energy dispersive X-ray spectroscopy (EDX) and DLS. Different bioactivities; anti-leishmanial activity, anti-cancer activity, anti-microbial activity, bio-compatibility and anti-oxidant properties were studied. In current study, NiONPs have shown excellent anticancer activity (IC<sub>50</sub>: 16.1µg/mL). Further, potential anti-leishmanial activity (with IC<sub>50</sub>promastigotes: 18.88µg/mL, IC<sub>50</sub>amastigotes: 28.08 µg/mL) was also reported. The AA- NiONPs have shown significant antioxidant activities (DPPH: 86%, TRP: 82% and TAC: 90%). Also, the *Astragalus anisacanthus* - NiONPs were found to be bio-compatible in nature. Moreover, the greenly synthesized NiONPs was observed to have good antimicrobial potential. The future research work can focus on different *in vivo* studies of AA- NiONPs and diverse bio-activities for attaining modern biogenic medicine desideratum.

**Keywords:** Nanoparticles, anti-microbial, anti-leishmanial, anti-oxidant, Biocompatible

## **APPRAISAL OF IN VITRO AND IN VIVO WOUND HEALING POTENTIAL OF MELIA AZEDARACH L. EXTRACTS IN COMPARISON TO ITS BIOGENIC ZINC OXIDE NANOPARTICLES**

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Aroosa Zafar<sup>1</sup>, Haroon Ahmed<sup>1</sup>, Ihsan-ul-Haq<sup>1</sup>, Humaira Fatima<sup>1</sup>

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### **Abstract:**

Current research aims to evaluate the wound healing potential in comparison to its biogenic zinc oxide nanoparticles (ZnO Nps).

Organic and aqueous extracts of *M. azedarach* leaves (MA CME) were prepared using chloroform:methanol (1:1) and distilled water. Phytochemical evaluation and reverse phase high performance liquid chromatography (RP-HPLC) based polyphenolic quantification of extracts was performed. Biogenic ZnO Nps of each extract namely MA CME Nps and MA AqE Nps were prepared by precipitation method. Zeta sizer, UV-vis spectrophotometer and



FTIR were utilized for Nps characterization. *In vitro* antioxidant, antibacterial, cytotoxic and hemolytic potentials of extracts in comparison to their respective Nps were evaluated. The wound healing potential was monitored by measuring wound closure rate, histological analysis, and biochemical parameters.

Highest total phenolic and flavonoid content ( $45.3 \pm 0.63$   $\mu\text{g}$  gallic acid and  $32.1 \pm 0.35$   $\mu\text{g}$  quercetin, equivalent/mg extract) were depicted by MA CME. RP-HPLC revealed the presence of significant amount of gallic acid and myricetin i.e.,  $21.8 \pm 0.04$  and  $6.9 \pm 0.03$   $\mu\text{g}/\text{mg}$  of extract in MA CME. Characterization techniques confirmed the synthesis of Nps. Maximum free radical scavenging activity ( $27.3 \pm 0.29\%$ ), total antioxidant capacity and ferric reducing antioxidant power ( $209.1 \pm 0.32$  and  $156.3 \pm 0.61$   $\mu\text{g}$  ascorbic acid equivalent per milligram respectively) were recorded in the MA CME Nps. Substantial antibacterial activity against *Staphylococcus aureus*, *Bacillus subtilis*, *Klebsella pneumoniae*, and *Escherichia coli* was exhibited by MA CME Nps (MIC ranging between 12.5 to 100  $\mu\text{g}/\text{ml}$ ). All the test moieties were found to be noncytotoxic and hemocompatible. Based upon *in vitro* findings, MA CME Nps (2, 1 and 0.5% (w/w)) were chosen to be evaluated using excision wound model in rats. Accelerated wound closure, enhanced re-epithelialization, fibroblast proliferation, and revascularization was depicted by MA CME Nps (2%). Maximum hydroxyproline, glutathione, catalase, and peroxidase content was demonstrated by MA CME Nps (2%) i.e.,  $13.7 \pm 0.08$   $\mu\text{g}/\text{mg}$ ,  $9.7 \pm 0.34$   $\text{mmol}/\text{mg}$ ,  $3 \pm 0.02$  and  $7.4 \pm 0.4$   $\text{U}/\text{mg}$  tissue respectively. Restrained lipid peroxidation ( $0.91 \pm 0.14$   $\text{mmol}/\text{mg}$  tissue) was also observed at same concentration. In conclusion, current findings suggest the promising wound healing potential of MA CME Nps (2% w/w) and propose it to be a noteworthy candidate for further studies.

#### **PRECLINICAL ANTITUMOR EFFICACY ASSESSMENT OF GREEN SYNTHESIZED ZNNPS AGAINST CCL4 INDUCED HEPATOTOXICITY IN ALBINO RATS**

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#### **Abstract:**

The field of nanotechnology has drawn the attention of researchers from different scientific fields. There are greater advantages to developing NMs using plant-based green chemical techniques than using alternative techniques. Metallic green NMs are synthesized using plant biomolecules and metabolites as capping and reducing agents. Hepatocellular carcinoma (HCC), the prevailing liver cancer in adults, predominantly affects individuals with chronic liver diseases. This study investigates the therapeutic potential of *Berberis aristata*-induced Zinc nanoparticles (BrZnNPs) in a CCl<sub>4</sub>-induced hepatocellular carcinoma model in Albino rats.

To synthesize zinc nanoparticles using *Berberis aristata* root extract and characterize it using different characterization techniques. Then evaluate its *in vivo* therapeutic efficiency against CCl<sub>4</sub>-induced hepatocellular carcinoma using rat model.

BrZnNPs were successfully synthesized by using green synthesis method. Various

characterization techniques, including SEM, FTIR and XRD confirmed the effective synthesis of BrZnNPs. The study involved 42 male albino rats, divided into seven groups, to systematically evaluate the therapeutic effects of Berberis aristata-induced Zinc nanoparticles (BrZnNPs) at different doses.

Various characterization techniques, including SEM, FTIR and XRD confirmed the effective synthesis of BrZnNPs. Biochemical analyses demonstrated a significant reduction in liver enzymes (ALT, ALP, and AST) at a dose of 2.56 mg/kg, mitigating CCl<sub>4</sub>-induced liver damage. Histopathological examinations corroborated these findings, revealing enhanced liver health and minimal hepatocellular damage. Comparison with the standard drug Silymarine underscored the noteworthy protective activity of BrZnNPs on liver enzymes in albino rats.

The BrZnNPs were proven to have protective activity of enzymes and histopathology in the liver of Albino rats. This research establishes the potential of BrZnNPs as a promising therapeutic agent for hepatocellular carcinoma, offering a green and economically viable alternative in large-scale production.

**Key words:** *Berberis Aristata; Zn Nanoparticle; Liver Cancer; Nanoparticles Characterization*

### **THE EFFECTS OF SILICA NANOPARTICLES ON THE POST HARVEST QUALITY OF CHICKPEA**

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#### **Abstract:**

Phytopathogens damage the agricultural crops each year and due to this reason the usage of fungicides has been increased in modern days. The excessive use of fungicides is dangerous for both the environment as well as human health and its very crucial to find out eco-friendly alternative ways to treat post harvest damage. The aim of the study was to investigate the effect of silica nanoparticles to reduce post harvest disease of chickpea inoculated by *Fusarium oxysporium*. The results of *Vitro* experiments revealed that the silica nanoparticles (100 mg L<sup>-1</sup>) had a little impact on the spore germination rate and on the growth of mycelia of *Fusarium oxysporium*. The application of silica nanoparticles in *vivo* experiments demonstrates that it's reduced the post harvests decays in the chickpeas and activates the defense enzymes such as Catalase (CAT), superoxide dismutase (SOD), and Polyphenol oxidase (PPO) activities and enhanced the phenolic and flavonoids contents as well. Therefore, the results revealed that the silica nanoparticles can reduce the fungal disease in both *vivo* and *vitro* experiment by elevating the defense response of enzymes and improve the chickpea post harvest quality of crop and prove to be alternative strategy to control fusarium wilt.

**Keywords:** Chickpea, *Fusarium oxysporium*, Post harvest, silica nanoparticles.

## **SUSTAINABLE PURITY: UNVEILING THE PROMISE OF GREEN NANOTECHNOLOGY IN WATER PURIFICATION**

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### **Abstract:**

In the face of escalating global water issues, green nanotechnology emerges as a promising solution for water purification. This exploration delves into the realm of green nanotechnology, uncovering its potential to redefine how we treat water. Green nanotechnology, known for its eco-friendly methods, becomes a guiding light in the quest for cleaner water. At its core, various nanomaterials are engineered for water purification, with standouts like graphene oxide and chitosan nanoparticles showcasing an innovative blend of technology and environmental awareness. Examining how this transformation happens, the abstract reveals the versatility of green nanotechnology in addressing water contaminants. These nano-enabled systems, using methods like adsorption, photocatalysis and membrane filtration, efficiently cleanse pollutants with unmatched effectiveness. A thoughtful consideration arises as the abstract explores combining green nanotechnology with traditional water treatment. This holistic approach not only boosts efficiency but also emphasizes a commitment to minimizing environmental impact. Safety and scalability concerns are addressed as the exploration extends to the biocompatibility of green nanomaterials. Understanding the intricate relationship between these materials and water contaminants suggests advanced, sustainable and scalable solutions to combat urgent global water pollution challenges. In conclusion, the application of green nanotechnology in water purification goes beyond scientific innovation; it represents a significant step towards sustainable water management. This abstract highlight the brilliance in combining nanotechnology and environmental harmony, making a case for the widespread integration of green nanomaterials as the future architects of water purification technologies.

**Keywords:** Ecofriendly, Environmental impact, Innovative blend, pollutants.

## **SYNTHESIS AND CHARACTERIZATION OF AG@FE ALLOYS USING GREWIA OPTIVA LEAF EXTRACT AND THEIR BIOREMEDIATION APPLICATIONS**

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### **Abstract:**

Nanoparticles and plants play a crucial role in effectively removing heavy metals from polluted water and soil. The enhanced surface-to-volume ratio and unique chemistry of nanoparticle composites contribute to their ability to mitigate environmental pollutants. In this study, biofabricated silver iron composites (alloys) using *Grewia optiva* leaf extract was characterized for phytoremediation. Wastewater from sewage channels near Garden Campus, Abdul Wali Khan University Mardan, was collected, and various physiochemical parameters of collected waste water were measured. The hydroponic study investigated the impact of Ag@Fe alloys

on *Brassica campestris* regarding plant development, photosynthetic pigments, phytochemicals and lead (Pb) accumulation. Seedlings were grown in wastewater and Pb-polluted media supplemented with 50 mg L<sup>-1</sup> of Ag@Fe alloys. Atomic Absorption Spectrophotometry assessed Pb levels in plant tissues. Pb and wastewater negatively affected seedling development, but the introduction of bimetallic nanoparticles (alloys) alleviated stress, enhancing plant growth and chlorophyll and carotenoid levels.

Lead at a concentration of 50 mg L<sup>-1</sup> inhibited phytohormones, secondary metabolites, and overall plant growth. However, treatment with biofabricated bimetallic particles increased production of primary and secondary metabolites, reducing oxidative stress. While wastewater increased Pb levels, treating *B. campestris* roots and shoots with alloys reduced Pb concentrations. These findings highlighted the potential for nano-phytoremediation, demonstrating that plants can effectively remove heavy metals from contaminated water when exposed to appropriate concentrations of nanoparticles, alloys, and coreshells.

**Key Words:** Green synthesis, AgNPs, FeNPs, Alloys, Coreshell, characterization, Lead, *Brassica campestris*, Phytoremediation.

### **IMPACT OF GREEN-SYNTHEZED SILVER NANOPARTICLES ON GROWTH AND YIELD PARAMETERS OF MAIZE (*Zea mays* L.) GENOTYPES GROWN IN AZAD JAMMU & KASHMIR**

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#### **Abstract:**

The current study was carried out to determine the impact of green - synthesized silver nanoparticles on growth and yield attributes of maize genotypes grown in Azad Jammu and Kashmir. The green synthesis of silver nanoparticles was done through leaf powder of *Justicia adhatoda* L. The transition of silver nitrate solution from yellow to brown color confirmed the presence of nanoparticles in the colloidal solution which was further established through UV-visible spectroscopy. Scanning electron microscopy (SEM) revealed that these silver particles were spherical and nano in size. X-ray diffraction analysis (XRD), confirmed their crystalline nature. Presence of alkaloids and flavonoids which act as biomolecules for capping of silver nanoparticles was monitored through Fourier transmission infrared spectroscopy (FTIR). These green synthesized silver nanoparticles were applied to maize genotypes. Randomized Complete Block design (RCBD) was applied while performing field experiment with three replicates. Morphological characters of maize crop were determined at respective developmental stages through BBCH identification keys of maize. Ten maize genotypes were treated with four concentrations (0ppm, 5ppm, 15ppm and 25ppm) of silver nanoparticles by two modes of application (Seed priming and Foliar spray). Duncan's Multiple Range Test (DMRT) results were found to be significant with respect to growth and yield parameters such as plant height, leaves number, days to tasseling, silking and maturity, grains number in a row, thousand grain weight, grain and biological yield as well as harvest index. It was confirmed by present findings that silver nanoparticles at 5ppm enhanced the growth and yield parameters of maize. Among all genotypes, G5 (Genotype Azam) performance for morphological parameters was well enhanced under the treatment effect at 5 ppm. By applying UPGMA (Unweighted

Pair Group Method with Arithmetic mean) cluster examination of maize genotypes was done to generate dendrogram and bivariate data matrix. Dendrogram for SSR revealed two main groups A and B with maximum level of diversity. Group A contained two genotypes whereas major portion of dendrogram was comprised of Group B with four sub clusters. ISSR dendrogram revealed two major groups A and B. Group A contained two genotypes as compared to group B having four genotypes. The PIC values were calculated for each SSR and ISSR locus. As per cluster analysis, dendrogram results interpreted that great genetic variability exists among genotypes of maize and ISSR primers are best suited for its determination. Spanning tree analysis was done both for SSR and ISSR primers respectively and G5 (Genotype Azam) and G7 (Genotype MMRI) came out as most diverse genotypes among all. This study is a pioneer work on local maize genotypes and its results will be helpful in shaping the future research direction of nano-biotechnology in the studied area.

### **DEVELOPMENT AND EVALUATION OF METHOTREXATE AND BAICALIN LOADED NANO-LIPID CARRIERS FOR PSORIASIS TREATMENT**

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#### **Abstract:**

Psoriasis is a chronic inflammatory, T-lymphocytes immune-mediated skin disease. In this study skin-permeating nano lipid carriers (NLCs) of Methotrexate (MTX) and Baicalin was formulated. This further gave formulation scientists the possibility of encapsulating the existing potential drug moieties into nano-carriers, which when loaded into gels provided prolonged release and improved permeation.

Optimization of formulation of NLCs were prepared and characterized by determination of their particle size, drug permeation, skin irritation, drug loading capacity, stability, in vitro drug release behavior and in vitro cellular viability. Ex vivo skin permeation and in vivo psoriatic efficiency were also evaluated and compared.

Results revealed that dual drugs MTX amount permeating the skin was 2.4 to 4.4-times greater using single NLCs. The optimized dual drug-loaded NLCs had average particle size ( $150.20 \pm 3.57$  nm) and PDI ( $0.301 \pm 0.01$ ) and high entrapment ( $86.32 \pm 2.78\%$  w/w). The nanoparticles of MTX exhibiting a positive Zeta potential -38.6 mV. The PASI score obtained from skin irritation study revealed non-irritancy of the developed system. MT-BL NLCs was therefore able to inhibit the expression of inflammatory cytokines (TNF- $\alpha$ , and IL-17) to a greater extent. It can be concluded that newer targeting strategies NLCs of dual drug delivery of nano-Lipid carriers that could be administered topically for the treatment of Psoriasis. Furthermore, this approach opens newer avenues for continued and sustained research in pharmaceuticals with much more effective outcomes.

**Keywords:** Psoriasis, Baicalin, Methotrexate, Nano structured Lipid Carriers, Topical delivery.

## **PHYTOCHEMISTRY**

**SOLANUM NIGRIUM EXTRACTS AS POTENT ANTI-OXIDANT AND ANTI-TYROSINASE AGENTS: EXPLORING THE MECHANISM OF ENZYME INHIBITION, PHYTOCHEMICAL CONSTITUENTS, ANTI-BROWNING POTENTIAL *EX-VIVO* AND ANTI-MELANOGENIC EFFECT WITH TOXICITY EVALUATION *IN-VIVO***

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**Abstract:**

Hyper-pigmentation management is desired in both food and cosmetic industries. Therefore, nine extracts from different parts i.e., leaves, berries and stem of *Solanum nigrium* were prepared to assess their anti-oxidant, anti-tyrosinase, anti-browning and anti-melanogenic activities along with phytochemical analysis and toxicity assessment. Results confirmed that all the prepared extracts retain anti-oxidant and anti-tyrosinase activities with IC<sub>50</sub> range 0.4 - 4.0 mg/ml and 16.5- 54.8 µg/ml, respectively. Furthermore, all the prepared extracts exhibited excellent tyrosinase inhibitory activity, outperforming the standard hydroquinone. Among all, berries ETAC extract showed the highest anti-tyrosinase activity with irreversible and mixed type mode of tyrosinase inhibition. Its phytochemical analysis revealed the presence of bioactive components involved in observed biological activities. Additionally, berries ETAC showed noticeable anti-browning *ex-vivo* and anti-melanogenic effect *in-vivo* with no toxicity, pain or stress indicating behaviors in C57BL/6 mice. Thus, proposing berries ETAC extract as potential candidate to control undesired hyper-pigmentation in future.

**Key words:** *S. nigrium*, Anti-oxidant, Anti-tyrosinase, Anti-browning, Anti-melanogenic activity

**EFFICACY OF PHYTOGENIC FEED ADDITIVES ON RUMEN AND REPRODUCTIVE HEALTH OF DAIRY CATTLE**

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**Abstract:**

Efficiency of a dairy farm mainly depends upon the good productive and reproductive behavior of cows. There are several factors which reduce the productivity of cows e.g. imbalance nutrition, poor digestibility of nutrients, various diseases, stress, reproductive issues etc. Phytogetic feed additives (PFAs) are substances of plant origins that are added to animal feed

to enhance the performance and health of the animals. PFAs in the feed improve the digestibility of various nutrients, ruminal and reproductive health. These additives have also shown the ability to improve dry matter intake of animals. They also increase feed efficiency due to improved feed utilization, ruminal pH and volatile fatty acids production. Milk production and composition i.e. fat, total solid, protein and lactose are also improved by supplementation of herbal mixtures. Studies also show that mixture of condensed tannins, encapsulated cinnamaldehyde, curcumin, capsaicin, and piperine improves the fat corrected and energy corrected milk and also increases the milk production. Supplementing herbal mixtures also prevent the animal from subacute ruminal acidosis by improving ruminal fermentation. Several biologically active compounds have been isolated in the herbs which have antioxidant, antibacterial and anti-inflammatory activities. Several herbs have shown to have positive effects on ovarian cyclicity, uterine health, and augmentation of reproductive hormones. Herbs may also improve the conception rates and help in achieving the target of producing 1 calf in 12 months from each cow for the profitability of farm. Extracts of *Azadirachta indica* and *Achyranthes aspera* have shown to reduce subclinical endometritis in cattle. Supplementation of *Moringa oleifera* enhances the antioxidant activity, IgG and serum total proteins in cattle. *Yucca* has also improved the fertility in dairy animals. These phytocompounds need to be investigated further for their effects on cattle health.

## **MICROBIAL BIOTECHNOLOGY FOR SUSTAINABLE FOOD PRODUCTION**

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### **Abstract:**

The demand for food worldwide is on the rise, pushing for a new and sustainable ways to feed our growing population. Entering the microbial biotechnology into the food security, is a game-changer in shaping the future that how we can produce food. Microbial biotechnology taps into the power of tiny organisms to improve different stages of food productions. From making soil more nutritious to fine-tuning for the purpose that how can plants interact with microbes, these microbial interventions lead to better crop yields and stronger resilience. Through advanced genetic engineering, we can create microbial strains with improved traits like nutrient absorption, stress resistance and defense against diseases for improvement in food production for growing population. This will not only help our crops but also reduces the environmental impact of traditional farming methods. Another breakthrough comes from microbial fermentation process that has transformed the process and preservation of food. By using microbes, we can produce bioactive compounds, enzymes and probiotics, for not only boosting the nutritional value of our food but also extending its shelf life, which is a win against food



waste. This summary takes a closer look at the innovative biotechnological methods driving microbial applications in sustainable food production. The focus will be on how these methods can tackle global challenges like climate change, soil degradation, and limited resources. This summary explores the various aspects of microbial biotechnology, highlighting its crucial role in promoting sustainable food productions. In conclusion, microbial biotechnology is taking the lead in sustainable food production, offering a wide range of solutions to improve food production while lessening our impact on the environment. Recognizing and utilizing the potential of the microbial biotechnology in world is key to creating food systems that are sturdy, efficient with resources and environmentally friendly.

**Keywords:** Biotechnology, genetic engineering, microbial interventions, nutrient absorption.

### **MULTIPLE INTEGRATED COMPUTATIONAL APPROACH TO ANALYZE WOUND HEALING POTENTIAL OF SYMPLOCOS RACEMOSA BARK AS MATRIX METALLOPROTEINASE INHIBITORS**

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#### **Abstract:**

Matrix metalloproteinase are associated with widespread pathological ailments and the selective inhibitors for metalloproteinases can be of great interest in wound healing strategies. In the present research study, six constituents of *Symplocos racemosa* Roxb were evaluated for the docking aptitudes on human matrix metalloproteinase MMP 2 (PDB ID: 1QIB) and MMP 9 (PDB ID: 4H1Q) utilizing Autodock Vina followed by the visualization using Discovery studio (DS). The PyMOL was used to generate the poses and the best binding pose was chosen for the docking aptitudes. 2D interactions and the 3D poses of the docked complex were accomplished using DS and LigPlot+ software's respectively. The physicochemical characteristics, absorption; distribution, metabolism, excretion, molecular properties, bioactivity score, and toxicity predictions were also accomplished by SWISS ADME and OSIRIS software's. The molecule's physiochemical investigations discovered that all of the

ligands comply to Lipinski's rule of five except compound 6, which deviated with two violations. Docking studies against 4H1Q revealed that compounds 1, 3, 5 and 6 exhibited maximum interactions with the target protein, with the free binding energies of  $-8.3 \text{ kJ Mol}^{-1}$ ,  $-9.3 \text{ kJ Mol}^{-1}$ ,  $-7.2 \text{ kJ Mol}^{-1}$  and  $-11.0 \text{ kJ Mol}^{-1}$  respectively. In case of 1Q1B target, compounds 1, 3 and 6 displayed remarkable binding energies of  $-8.7 \text{ kJ mol}^{-1}$ ,  $-9.0 \text{ kJ mol}^{-1}$  and  $-8.8 \text{ kJ mol}^{-1}$ . Bioactivity prediction study revealed that all of the selected Phytoconstituents displayed incredible Bioactivity score. None of the selected chemical compound was found to be irritant to the skin as discovered by toxicity studies. The contacts of ligand-protein complex during the simulation studies revealed that the H-bond interactions of the ligands with LEU188, ALA189, GLN402, ARG420, MET422, PRO421, and ARG424 of 4H1Q were stable for more than 30% of the simulation time. It was, hence, concluded that the tested compounds rank among the vital supplementary lead drugs in chronic wounds and healing complexities. **Keywords:** Metalloproteinase, Simulation analysis, RMSD values, Docking scores, wound healing, *Symplocos racemose*.

### **EXPLORING MOSQUITO REPELLENCY POTENTIAL IN THREE BROWN SEAWEEDS FROM THE KARACHI COAST**

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#### **Abstract:**

Mosquito-borne diseases pose significant public health threat, especially in tropical regions. This research investigates the mosquito repellency of *Iyengaria stellata*, *Colpomenia sinuosa* and *Sargassum wightii* indigenous to the Karachi coast, aiming to identify natural and sustainable alternatives to synthetic repellents. Field surveys and laboratory experiments are conducted to assess the effectiveness of seaweed extracts against common mosquito species prevalent in the Karachi region. This study involves the collection of three brown seaweed species from the Karachi coast, followed by extraction and characterization of bioactive compounds. Subsequently, the mosquito repellent properties of these extracts are assessed through laboratory assays and field trials. The study also investigates the potential mechanisms underlying the observed repellency, providing insights into the biochemistry of seaweed-derived compounds against mosquitoes. Preliminary findings indicate maximum repellency and mortality rate in *Sargassum wightii* followed by *Iyengaria stellata*, *Colpomenia sinuosa* seaweed extracts, suggesting the presence of bioactive compounds that deter mosquito vectors. Furthermore, the study aims to elucidate the mechanisms underlying the observed repellency and evaluate the safety and longevity of these natural repellents. The outcomes of this research have the potential to contribute to the development of eco-friendly and locally sourced mosquito repellents, reducing reliance on synthetic alternatives and fostering sustainable practices. Additionally, the study may enhance our understanding of the ecological roles of seaweeds in coastal ecosystems and their relevance in public health initiatives.

## **GINSENOSIDE RG3 EXTRACTED FROM *PANAX GINSENG* ROOT INHIBITS NON-SMALL CELL LUNG CANCER GROWTH AND METASTASIS**

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### **Abstract:**

**Introduction:** Ginseng, the root of *Panax ginseng* has been widely used in East Asian countries for thousands years as a natural tonic. Ginsenosides Rg3, extracted from *Panax ginseng* root are the main active components among more than 100 other ginsenosides demonstrated a wide range of pharmacological activities such as hepatoprotection, neuroprotection, cardiovascular-protection, anti-fatigue, anti-oxidant and anti-cancer.

**Objectives:** This study demonstrated its efficacy against non-small cell lung cancer in mice.

**Methods:** Xenograft mice model of NCI-H1299 cells of lung cancer was established. The NCI-H1299 cells ( $5 \times 10^6$ ) in 0.5 ml of PBS were inoculated subcutaneously in the right flank of male Balb/c nude mice (n=12) under specific pathogen free (SPF) conditions. After tumor growth for 2 weeks, mice were randomly divided into 2 groups, control and ginsenoside Rg3 treated groups. The duration of ginsenoside Rg3 (100 µg/ml) administration (i.p) was 28 days and tumor volume and body weight were measured throughout this period. At the end of treatment mice were sacrificed and tumor weight and volume were measured.

**Results:** The ginsenoside Rg3 treatment significantly decreased tumor size, weight and volume as compared to control group. It was accompanied by reduction tumor proliferation using proliferating cell nuclear antigen (PCNA) expression. Gross metastasis of tumor was assessed in different mice organ tissues by hematoxylin and eosin (H and E) staining. In treated mice metastasis was attenuated than non-treated mice.

**Conclusion:** These results suggest that ginsenoside Rg3 will be an effective therapy for lung cancer growth and metastasis alone or in combination with low doses of conventional chemotherapy, thereby minimize the toxicity and morbidity associated with therapy.

## **EVALUATION OF KAOLIN, PLANT EXTRACTS AND THEIR SYNERGISTIC EFFECTS AGAINST FALL ARMYWORM, *SPODOPTERA FRUGIPERDA* (LEPIDOPTERA; NOCTUIDAE) LARVAE**

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**Abstract:**

Maize, *Zea mays*, is a significant cereal crop in Pakistan, ranking 3<sup>rd</sup> among cereals in terms of its production. It is one of the most important cereal crops in the country, grown for both human consumption and animal feed. Its production is adversely affected by various factors, particularly insect pests cause heavy economic damage to it. One of the most destructive and invasive pests of maize is the fall armyworm, *Spodoptera frugiperda*. Its infestation causes significant economic damage to the crop. Kaolin (5 and 2.5%) and plant extracts (10, 5, and 3%) including neem, tobacco and eucalyptus were used against 3<sup>rd</sup> instar larvae of *S. frugiperda* to observe their toxic effect. Different combinations of these plant extracts with kaolin (2.5%) were also evaluated. Mortality was recorded after 12 hours interval for 2 days. The results indicated that 10% neem extract showed the highest mortality ( $63.33 \pm 3.33$  %) while its lower concentrations (5 and 3%) showed  $40.0 \pm 5.77$  % and  $16.67 \pm 3.33$  % mortalities, respectively. The second highest mortality ( $53.33 \pm 3.33$  %) was recorded in case of kaolin (5%) application after 48 hours of the application. Kaolin (2.5%) alone showed 30% larval mortality and with the combination of neem (3%) it showed ( $26.67 \pm 6.67$  %) larval mortality. Tobacco (10%) showed ( $50.00 \pm 5.77$  %) mortality after 48 hours of application and at lower concentrations (5%) and (3%) it showed lower mortality rate ( $26.67 \pm 3.33$  %) and ( $20.00 \pm 15.28$  %), respectively. Eucalyptus (10%) caused a mortality of  $33.33 \pm 3.33$  %. The combinations of kaolin + tobacco (2.5% + 3%), kaolin + eucalyptus (2.5%+ 3%) showed (0.00 %) mortality even after 48 hours of application. According to the findings, neem and tobacco extracts and kaolin caused up to 60% larval mortalities. Neem combination with kaolin was effective while kaolin + tobacco extract and kaolin + eucalyptus extract did not show synergistic effect. So, kaolin, neem and tobacco extracts have the potential to be utilized in managing this pest using an environmentally-friendly strategy. These alternatives could be further evaluated for serving as viable options to conventional pesticides.

**Key words:** Fall armyworm, Kaolin, neem, tobacco, eucalyptus, mortality, *Spodoptera frugiperda*

**SPECIFIC EXAMPLES OF POLYSACCHARIDES AND THEIR VARIOUS APPLICATIONS IN NUTRITION AND MEDICINE**

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**Abstract:**

Polysaccharides comprise of a major part of our daily dietary routine due to their exceptional benefits to human health and wellbeing. Certain scientific elucidations done in this regard have proven the use of specific polysaccharides in the field of nutrition and in medicinal industry. Various polysaccharides and their derivatives will be conferred keeping in view the recently discovered nutritional and medicinal benefits of polysaccharides. In this review article, selected individualities of polysaccharides like fucoidans, chitosan, alginic acid, lentinan,

alginate and pectin etc. will be elaborated along with their numerous nutritional and health benefits and applications in the field of medicine and pharmaceuticals towards the wellbeing of humans. The significant data on different polysaccharides was piled up from scientific databases like Google Scholar, SciFinder Scholar, PubMed, Science Direct, Web of Science, Chinese Pharmacopeia and ethno-botanical books. Further scientific research and investigations are required to characterize the basic mechanism of actions of different medical activities of these polysaccharides. A wide-ranging study is required on this topic before the utilization of these polysaccharides in clinical setups as strong therapeutic agents.

**Keywords:** Polysaccharides, nutritional and medicinal benefits, fucoidans, chitosan, alginic acid, lentinan, alginate, pectin, therapeutic agents.

### **NEUROPROTECTIVE POTENTIAL OF *NASTURTIUM OFFICINALE* BY MITIGATING SEIZURE IN PTZ INDUCED MICE MODEL OF EPILEPSY.**

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#### **Abstract:**

Nature is blessed with tremendous number of pharmaceuticals effective in treating various disorders. Herbal remedies have been used for centuries to treat many neurodegenerative disorders including epilepsy. In recent decades due to advancement in modern medicines the natural sources are the most overlooked area, but the interest is renewed and reinvigorate towards natural remedies. Epilepsy is a chronic neurological disorder characterized by recurrent unprovoked *seizures*. Modern synthetic drugs possess severe side effects including toxicity and resistance. In order to mitigate these problems there is need to explore alternative source of drugs. Keeping in view this study was designed to evaluate the antioxidant and neuroprotective potential of *Nasturtium officinale*. The the methanolic extract of *N. officinale* possess high antioxidant activities. Phytochemical analysis through Fourier transform infrared spectrophotometer (FTIR) revealed the presence of important class of compound in methanolic plant extract. Antiepileptic activity of *N. officinale* was evaluated by employing PTZ induced mice model of epilepsy. The extract dosses (i.e. 50, 150 and 250 mg/kg) were orally given after 25 minutes of PTZ injection. The sub convulsive dose of PTZ (50 mg/kg) was injected intraperitoneally after 24 h for 4 consecutive days. *N. officinales* extract showed significant antiepileptic activity at dose 250mg/kg in terms of seizure score and survival rate as compared to PTZ group whereas diazepam was used as positive control. *N. officinale* presented high antiepileptic activity due to presence of polyphenols which are responsible for antioxidant potential. Further there is need to focus on screening and characterization of potent bioactive

compound from *N. officinale* and their application in treatment of other disorders. Our study presented a small contribution in exploring our native natural resources for treating neurological disorders.

**Keywords:** Neuroprotection, *N. officinale*, phytochemicals, antiepileptic activity, antioxidant activity.

### **BIOACTIVITY EVALUATION OF HYDROPONICALLY GROWN *CURCUMA LONGA* (TURMERIC) AND TWO VARIETIES OF *ZINGIBER OFFICINALE*-CHINESE GINGER AND THAI GINGER**

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#### **Abstract:**

The increasing global interest in medicinal plants has prompted comprehensive investigations into their biological activities and extraction techniques. The present work focuses on evaluating the biological activity of hydroponically grown medicinal herbs, *Curcuma longa* (turmeric) and two varieties of *Zingiber officinale* —Chinese ginger and Thai ginger. The activities under scrutiny encompass antioxidant potential, cytotoxicity effects, and DNA protection assays. To extract bioactive compounds, four distinct extraction techniques; Soxhlet extraction, sonication, maceration, and decoction were meticulously compared. For *Curcuma longa*, acetone and ethanol served as solvents, while methanol and ethanol were employed for both Chinese and Thai ginger extracts. The antioxidant activity assessment using DPPH and ABTS revealed that the acetone extract of *Curcuma longa* exhibited the highest antioxidant potential, with an IC<sub>50</sub> value of  $46.35 \pm 0.154$  in Soxhlet extraction and  $46.5628 \pm 0.86$  in sonication. Similarly, the methanol extract of both Chinese and Thai ginger displayed significant antioxidant activity, showcasing an IC<sub>50</sub> value of  $44.78 \pm 0.543$  in Soxhlet extraction. In the realm of cytotoxicity, the research unearthed that the acetone extract of *Curcuma longa* demonstrated heightened cytotoxicity, boasting an LC<sub>50</sub> value of  $32.44 \pm 1.056$  µg/ml compared to other extracts. This finding suggests the potential of turmeric as a potent cytotoxic agent. Furthermore, the DNA protection assay shed light on the nuanced impact of these extracts on DNA. Lower concentrations exhibited negligible effects on DNA integrity, whereas higher concentrations led to noticeable DNA damage. This duality in outcomes emphasizes the need for a nuanced approach when considering the concentration-dependent effects of these medicinal plant extracts on DNA. The research journey not only addressed the primary objectives of evaluating biological activities but also contributed to the optimization of extraction techniques for maximum bioactivity. The results generated provide valuable insights for the pharmaceutical and nutraceutical industries, indicating potential applications of these plant extracts in developing therapeutic agents. Looking ahead, the future prospects of this research include delving into the molecular mechanisms underlying the observed biological activities, exploring synergistic effects of combined extracts, and considering formulations that enhance bioavailability. This multifaceted approach is poised to deepen our

understanding of the medicinal potential inherent in these plant extracts and pave the way for innovative applications in healthcare and wellness.

**Keywords:** Antioxidant, DPPH, ABTS, Soxhlet, Sonication, Maceration, Decoction, DNA damage.

## **THE USE OF MEDICINAL PLANTS IN THE TREATMENT OF ANTICANCER & PREVENTIONS**

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### **Abstract:**

Cancer is a disease that affects people worldwide and is quite serious. Novel treatments are constantly needed to cure and prevent this fatal illness. Naturally-derived substances are attracting the attention of scientists and researchers since they are thought to have less harmful side effects than modern treatments like chemotherapy. Natural secondary metabolites from the kingdom of plants are being studied for their potential to treat cancer, with the goal of creating novel therapeutic agents. As a result of the effectiveness of these substances, which have been transformed into mainstay medications for the treatment of cancer, new technologies are emerging to advance the field. By regulating the compound's release, new technologies such as nanoparticles for nanomedicines seek to improve the anticancer properties of medications produced from plants.

The World Health Organization (WHO) reports that developing countries are making use of the advantages of naturally occurring substances for medicinal purposes, while some countries continue to rely mostly on plant-based medicine. Among the substances that have been found and isolated from terrestrial plants with anticancer potential are taxols, brassinosteroids, and polyphenols. High-value medicinal plants are under strain from an increasing demand for plant derived medications, compromising their biodiversity. Plant-derived anticancer agents are effective inhibitors of cancer cells lines making them in high demand. In order to meet demand and ensure sustainability, the exploitation of these agents must be controlled.

## **ASSESSING THE THERAPEUTIC POTENTIAL OF PLANT EXTRACTS AGAINST BOVINE MASTITIS: IN VITRO AND IN VIVO STUDY ON STAPHYLOCOCCUS AUREUS**

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## **Background**

In contemporary times, the application of naturally occurring botanical substances has gained notable traction in bolstering the immunity, biochemical, and hematological profile of animals. Natural products have also been identified to manifest potent antibacterial activity against pathogenic micro-organisms, thus positing a viable alternative to traditional antibacterial agents. In a country like Pakistan where livestock plays an important role in GDP, mastitis is responsible for huge economic losses. Typically induced by the pathogen *Staphylococcus aureus*, the hasty and prolonged utilization of antibiotics has contributed to the emergence of resistant strains of said bacteria. In this scenario, any advancement in alternate effective treatment of mastitis can prove to be a cornerstone.

## **Objectives:**

Current study aimed to assess in vitro antimicrobial properties of plant extracts derived from *Acacia modesta* (Phulaie), *Ziziphus nummularia* (Jangli beri) and *Calotropis procera* (Aak/Aakra) against field isolates of *Staphylococcus aureus* obtained from bovine mastitis and in vivo effectiveness of *Ziziphus nummularia* leaves in addressing bovine mastitis. It also investigates any potential sensitivity issues associated with its usage.

## **Materials and methods:**

Methanolic extracts of leaves from *Acacia modesta*, *Ziziphus nummularia*, and *Calotropis procera* were prepared individually. Five isolates of *Staphylococcus aureus*, previously isolated and characterized from mastitic cattle, were revived and identified via gram staining and various biochemical tests. The in-vitro antibacterial activities of all plant extracts were evaluated using the agar well diffusion method. Minimum inhibitory concentrations (MIC) of plant extracts showing zones of inhibition (ZOI) were determined using Broth Microdilution method. The phytochemical analysis of all the three plant extracts was conducted through HPLC (High performance liquid chromatography) to determine bioactive components (flavenols and phenols). Among the three plants investigated, the plant that demonstrated the largest zone of inhibition, lowest MIC, and the highest concentration of phytochemical constituents was chosen for cytotoxicity analysis. The objective of the analysis was to determine the suitability of the chosen plant for further in vivo trials. Cytotoxicity was evaluated using MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) assay. Subsequently, the efficacy of the plant was assessed in ten cattle with mastitis caused by *S. aureus*. Animals were divided into two groups, one receiving a placebo treatment (Control group G<sub>C</sub>) and a treatment group (C<sub>T</sub>) administered a calculated intramammary and oral dose of the plant extract and powder respectively. On day one and after seven days, california mastitis test (CMT) and somatic cell count (SCC) examinations were repeated to evaluate the effectiveness of the herbal plant. Moreover, CBC (Complete blood counting), LFT (Liver function test), and RFT (Renal function test) were performed on both groups at the beginning of the experiment (day zero) and at the conclusion of the study (eighth day) to determine any side effects of the herbal drug employed. Data obtained was statistically analyzed using mean,



standard error and ANOVA followed by Tukey multiple range test at significance level of  $P < 0.05$ .

**Results:**

Agar well diffusion method showed comparatively larger ZOI ( $14.6 \pm 0.7$  mm) by *Ziziphus nummularia* extract than *Calotropis procera* ( $5.2 \pm 1.4$  mm) and *Acacia modesta* ( $4.5 \pm 1.6$  mm). *Z. nummularia* showed a mean MIC value of 125 mg/mL, while the other plant extracts displayed rather higher values. HPLC analysis revealed highest levels of flavenols (Quercetin, Myricetin, Kaempferol) and phenols (Snaphic Acid, Gallic Acid, Caffeic Acid) in *Z. nummularia* leaves compared to the other two plants. These findings substantiated the selection of *Z. nummularia* for clinical trials. However, prior to initiating that, it was necessary to evaluate its safety level for live cells. MTT assay demonstrated that dilutions at or below 125mg/1000mL were non-toxic for the BHK-21 cell line, as recorded cell survival percentage was exceeding 50%.

In the clinical trial, *Ziziphus nummularia* was administered as intramammary infusion at a concentration of 125 mg/mL in normal saline for three days, and crude powder at a dosage of 125 mg/kg for a duration of seven days. The treatment group exhibited a significant reduction in SCC from  $1687.5 \pm 943.7 \times 1000$  cells/mL to  $100 \pm 0 \times 1000$  cells/mL, as well as a decrease in CMT value from  $3.6 \pm 0.2$  (curd formation) to  $0 \pm 0$  (clear milk) as shown in table. RFT results indicated non-significant changes in both the control and treatment groups before and after the trial. However, LFT values showed statistically significant decrease in alanine transaminase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase (ALP) levels as well as an increase in serum albumin levels on 8<sup>th</sup> day in the treatment group (GT). Hematological analysis revealed increase in lymphocyte percentage (LYMP %), monocyte percentage (MON %), red blood cells (RBCs), and hemoglobin (HGB) levels while a decrease was observed in white blood cells (WBCs), granulocyte percentage (GRA %) and platelet (PLT) count subsequent to the experimental procedure. It is noteworthy, however, that all of these observed values returned to within the normal range upon the subsidence of mastitis.

**Conclusion:**

Current research concludes that the use of *Ziziphus nummularia* plays a significant role in controlling mastitis in dairy cattle, making it a potentially invaluable asset in tackling antimicrobial resistance and even leading to the development of a patented drug for commercial use.

## **ROSEMARY INFUSED TEA FOR THE MANAGEMENT OF FUNCTIONAL GUT MOTILITY DISORDER.**

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### **Abstract:**

Up to 15% of the general population suffers from irritable bowel syndrome (IBS), a functional disorder of the gastrointestinal system. IBS is associated with episodes of abdominal pain or discomfort that are eased by defecation, and is linked to diarrhea, constipation, and other gastrointestinal disturbance. Rosemary (*Rosmarinus officinalis*) is a shrub found in the *Lamiaceae* family. It is a common household plant that is used for a variety of things, including flavoring food, drinks, and beverages, as well as for cosmetic purposes. In the past, it was employed to treat respiratory issues, dysmenorrhea, renal colic, and hair growth stimulation. This was caused by rosemary's antispasmodic qualities, which calm the smooth muscles of the trachea and the intestines, as well as its choleric activity (5). In the current study we aim to investigate the anti-diarrheal and antispasmodic effects of *Rosmarinus officinalis* in mice and jejunum of rabbit. The fresh leaves of rosemary were purchased from Kingdom of Saudi Arabia. 100 gms of leaves were infused with 200 ml of boiling distilled water and allowed to sit for 2 hours. The solution was filtered using whatmann filter paper. Filtrate was concentrated in rotavapor. The spasmolytic mechanism of rosemary infusion (Rs.Aq-inf) was assessed using isolated rabbit jejunum tissues mounted on tissue assembly set up coupled to Power lab. *In-vivo* assays were further used to confirm the antidiarrheal activity in BALB/c mice. All studies were approved by Animal Ethics committee of Aga Khan University 113-ECACU-BBS-22.PI–Dr. Amber Hanif Palla Aqueous infusion of Rosemary reduced the spontaneously contracting isolated rabbit jejunum tissues completely at 5 mg/mL (EC50: 3 mg± 0.5). The escalating doses of Rs.Aq-inf was able to completely relax the high K<sup>+</sup> (80mM)-induced contractions at 10 mg/ml, similar to verapamil, a standard Ca<sup>+2</sup> channel blocker (CCB). Low K<sup>+</sup>-mediated contraction was not relaxed at lower dose than high K<sup>+</sup>-induced contractions, indicating the strong CCB component of this infusion, rather than K<sup>+</sup> channel opening like effect that we observed in its ethanolic fraction reported elsewhere. This effect was further validated using in-vivo model of mice against castor oil-induced diarrhea. Rs.Aq-inf reduced diarrheal scores at 200, 400 and 600 mg/kg given orally (80%; p < 0.0001) which was not dose-dependent. The Rs.Aq-inf extract has a strong pharmacological foundation for its medical application in gut motility disorders like IBS thanks to its antidiarrheal and antispasmodic properties. CCB activity is predominant in aqueous infusion, whereas KCO like activity is predominant in Rosemary ethanolic aqueous extract. The effect in infusion of fresh leaves can be a promising alternate for IBS therapy to be used as tea.

**NEW BIOACTIVE ALKALOID FROM *PSAMMOGETON BITERNATUM* EDGEW.**

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**Abstract:**

With increasing resistance of bacteria, the need for new antibacterial therapies is more pressing than ever. Alkaloids are a large and structurally diverse group of compounds that have served as scaffolds for important antibacterial drugs such as metronidazole and the quinolones. Pakistan is rich in medicinal plants. *Psammogeton biternatum* Edgew. collected from District Bannu is rich in secondary metabolites. We were able to isolate a new antimicrobial alkaloid from this plant. The structure of the compound was determined by X ray crystallography. The alkaloid has shown good results against both Gram positive and Gram negative strains used in the study.

## **TAXONOMY**

## **STUDY OF MACROFUNGI DIVERSITY IN POONCH DISTRICT, AZAD JAMMU AND KASHMIR**

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### **Abstract:**

Ethnomycology is an emerging research area which makes human societies more mycophilic compared to mycophobic in past. Wild edible fungi (WEF) not only nutritious but also great source of income for the marginal communities. In present study, Poonch district of Azad Jammu and Kashmir was sought for the presence macrofungi. Poonch district being part of Himalayas offered a tailor made scenario for the growth of macrofungi due to organic matter richness, cooler climate with short summers. Macrofungi were collected both growing on soil and tree trunks with the help of trowel and pruner respectively. Cautious efforts were made to collect intact specimen in paper bags during sampling. Morphological parameters such as pileus/fruiting body size, spore size and colour of spore print of individual specimen were also observed. During studies 26 specimens of wild mushrooms belonging to 12 families, 18 genera, 5 orders were collected and examined. Current study showed that maximum (90%) wild mushrooms belonged to class basidiomycetes. Among basidiomycetes maximum species belonged to order agaricales followed by order pezizales of ascomycetes. Four species of morels viz., *Morchella esculenta*, *M. elata*, *M. deliciosa* and *M. semilibera* were also found. Twelve species were found edible while rest are poisonous. Except *Pleurotus ostreatus*, *Polyporus versicolor*, *Tramella foliaceae* which found on tree trunks the rest of species growing on soil. Most mushrooms were found at a temperature range between 21° C - 29° C except morels which were found at temperature below 10° C. Maximum pileus size was found 17cm in *Chlorophyllum rhacodes* while maximum spore size 14-8 × 12-9 µm was found in *Panaeolus campanulatus*. Variation in spore print (white, black, pale, yellow, brown) was also recorded. There is dire need to conserve these natural delicacies not only for biodiversity prospective but also to secure the livelihood for marginal communities.

**Key words:** Macrofungi, Morels, Poonch (AJK)

**FLORISTIC DIVERSITY ASSESSMENT AND PHYTOSOCIOLOGICAL STUDIES  
ALONG KARAKORAM HIGHWAY DISTRICT NAGAR, GILGIT-BALTISTAN.**

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**Abstract:**

Floristic diversity assessment and phytosociological studies along the Karakoram Highway (KKH) Pakistani section of One Belt One Road (OBOR) District Nagar were conducted for the first time in the year 2020-2022 in District Nagar, Gilgit-Baltistan. The current study conducted to record the flora along with the KKH yielded 145 plant species in 108 genera and 47 families. Out of these 145 plant species, Pteridophytes have reported 03 species, Gymnospermic 03 species, and Angiospermic species reported 139. The habit categories of the collected flora were 24 species were trees, 10 were shrubs, 30 were subshrubs, and about 81 were herbs. While the Life form classes of species in the examination zone, were; Therophytes (32 species), Phanerophytes (39 species), Hemicryptophyte (41 species), Chamaephyte (32 species), Epiphytes (1 species), and Geophytes (2 species) are the life frame classes. The Asteraceae family was considered the most dominant family with 12 species, followed by the family Papilionaceae with 10 species, the Poaceae family encompassed 09 species, and the Rosaceae family has seven species, followed by the Lamiaceae and Brassicaceae families have five species each while other families have fewer species than 05. The second part of this study was the inventorying of weed flora in the potato fields weeds were comprised of 17 species 15 genera 10 families. Standard protocols were followed for vegetation sampling and data analysis was based on the important value index. *Chenopodium album*, *Amaranthus retrofractus*, *Fagopyrum esculentum*, *Persicaria amaculosa*, *Rumex dentatus*, *Phragmites australis*, *Setaria viridis*, and *Plantago major* were the dominant species among weed communities. According to the important value index (IVI), the most dominating species were *Phragmites australis*, which were an IVI of 76.004, followed by *Persicaria maculosa*, which were 63.009, and *Setaria viridis*, which were 58.84. The area is under pressure due to anthropogenic activities, natural disasters, deforestation, and overgrazing.

**Key Words:** Floristic diversity, Phytosociology, Karakoram Highway (KKH)

## **WEED SCIENCES**

## **ECOLOGICAL INSIGHTS INTO WEED FLORA VARIABILITY IN WHEAT CROP UNDER DIFFERENT EDAPHIC AND FARMING PRACTICES**

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### **Abstract:**

Wheat is staple food crop in Pakistan, dominating all other crops in terms of cultivation area and productivity. Its role is central in ensures food security in country. Weeds pose a ALIZA significant challenge to the productivity of wheat crops that significantly decline in yield. We aim to understand the dynamics of weed variability in varying farming practices and edaphic factors. The frequent field trips were arranged in February-March 2023 to determine the diversity of weeds in the *Triticum aestivum* L. fields in District Bhakkar, Punjab. A total of 100 crop fields were sampled from four different localities including Kallur Kot, Mankera, Bhakkar, and Darya Khan of district Bhakkar. At each sampling field 3 quadrats of 1m × 1m size were placed randomly. The phytosociological attributes were recorded at each quadrat. Soil was collected to record various edaphic factors and questionnaire data on farming practices was also collected. Regression analysis and Perason analysis were performed to evaluate interrelationship of weeds with farming practices and edaphic factors. We reported 82 weed species among which *Anagallis arvensis* L. were dominant species followed by *Rumex dentatus* L and *Chenopodium album* L. The regression analysis reveals significant relationship among weeds variability and farming practices. Our findings could be used in managing the weeds and promote practices that help to reduce weeds diversity.

**Keyword:** *Triticum aestivum*, *Anagallis arvensis*, Edaphic factors, Bhakkar District, Farming practices

## **GENETIC DIVERGENCE AND SPATIAL CONFIGURATION OF COWPEA INFLUENCE THE WEED SPECTRUM UNDER TEMPERATE CONDITIONS OF AZAD KASHMIR**

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### **Abstract:**

Under changing climate scenario, the biologically viable management of weeds may become possible by the exploration of the genetic divergence of spreading and towering cultivars of forage cowpea in different row configuration systems which also hold the potential to boost sustainable supply of green forage for dairy animals. A field study was undertaken to sort out the most nutritive and high-biomass-producing cultivar (Cowpea–,2007 and Rawan–,2010) of



cowpea and optimize the row configuration ( $R \times R$  of 15, 30, 45 and 60 cm) to manage the weed spectrum. The results revealed that Rawan-2010 remained superior in the 15 cm row configuration by recording 39% lesser weed density (WD) than the corresponding value recorded by the same cultivar sown in the 60 cm row configuration. The same treatment combination recorded a 20% lesser fresh weed weight than Cowpea-2007 sown in the same row configuration, while it exhibited a  $5.6 \text{ g m}^{-2}$  lesser corresponding value of dry weed weight. These findings suggest that spreading type of cultivars sown in narrow row spacing might offer biologically viable option to keep weeds population below threshold level.

**Keywords:** weeds density, unwanted plants, cooler climate, threshold level, plant-weed interaction

### **IMPACT OF MULCHING PRACTICES ON WEED CONTROL AND KERNEL YIELD OF MAIZE (*Zea mays* L.)**

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#### **Abstract:**

The field experiment was carried out at the Student's Experimental Farm, Department of Agronomy, Sindh Agriculture University, Tandojam, during, 2022-23. The field experiment was comprised of five different mulching practices:  $T_1$  = Control (no mulch),  $T_2$  = Sorghum @  $4 \text{ t ha}^{-1}$ ,  $T_3$  = Sunflower @  $4 \text{ t ha}^{-1}$ ,  $T_4$  = Sorghum + Sunflower each @  $4 \text{ t ha}^{-1}$  and  $T_5$  = Hand weeding (15 and 30 DAS). The experiment was laid out in a randomized complete block design with three replications. The present study revealed that different mulching practices significantly ( $P < 0.05$ ) affected on weed control throughout growing seasons of maize crop. The highest weed density ( $209.00 \text{ m}^{-2}$ ) was found in control treatment (without mulch). The lowest weed density ( $39 \text{ m}^{-2}$ ) was found in Hand weeding (15 and 30 DAS) which was statistically identical to Sorghum+ Sunflower mulch each @  $4 \text{ t ha}^{-1}$ . The results further showed that the maximum plant height 215.00 cm, 13.34 leaves  $\text{plant}^{-1}$ , cob length (17.25 cm), 375.33 kernels  $\text{cob}^{-1}$ , kernel wt.  $\text{cob}^{-1}$  (94.00 g), seed index (1000-kernel wt., 218.33 g), biological yield ( $14.30 \text{ t ha}^{-1}$ ) and kernel yield ( $6.36 \text{ t ha}^{-1}$ ) were noted in Sorghum + Sunflower mulch each @  $4 \text{ t ha}^{-1}$ , which was the same as Hand weeding (15 and 30 DAS) followed by plant height 192.33 cm, 11.48 leaves  $\text{plant}^{-1}$ , cob length (15.53 cm), 346.23 kernels  $\text{cob}^{-1}$ , kernel wt.  $\text{cob}^{-1}$  (87.33 g), seed index (1000-kernel wt., 210.00 g), biological yield ( $12.43 \text{ t ha}^{-1}$ ) and kernel yield ( $5.23 \text{ t ha}^{-1}$ ) was noted in Sunflower mulch @  $4 \text{ t ha}^{-1}$ , whereas the minimum plant height 165.67 cm, 8.54 leaves  $\text{plant}^{-1}$ , cob length (11.19 cm), 286.67 kernels  $\text{cob}^{-1}$ , kernel wt.  $\text{cob}^{-1}$  (73.00 g), seed index (1000-kernel wt., 164.22g), biological yield ( $11.56 \text{ t ha}^{-1}$ ) and kernel yield ( $3.20 \text{ t ha}^{-1}$ ) was obtained from control plots (without mulch). Conclusion can be drawn from the present study that mulching play an important role in weed control in maize crop and thus positively affecting yield and yield components of maize. Sorghum + Sunflower each @  $4 \text{ t ha}^{-1}$  proved to be the most suitable mulching practices for controlling weeds in maize among the other mulching practices and also increase the growth and kernel yield. It is suggested that application of Sorghum + Sunflower each @  $4 \text{ t ha}^{-1}$  is useful for obtaining high maize yield, controlling weeds without

any herbicide application because it is feasible, less expensive and time saving than hand weeding.

**Key words:** Maize, Mulching, Sorghum, Sunflower, Kernel, Yield, Weeds

### **STUDY OF COMPETITION PERIOD OF BLESSED MILKTHISTLE (*Silybum marianum*) WITH WHEAT**

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#### **Abstract:**

Blessed milkthistle is considered to be a noxious weed in irrigated and rainfed areas of Pakistan due to its strong allelopathic effects on food crops. For sustainable wheat production, it is necessary to know the critical time for weed removal (CTWR) for blessed milkthistle to allow wheat growers to get maximum benefit from control of this weed. A field study was conducted in 2014 and 2015 at the College of Agriculture, University of Sargodha, Pakistan, to investigate the CTWR of blessed milkthistle in wheat. The field experiments were designed with seven treatments; weed free (control); 2, 3, 4, 5, and 6 weeks after emergence (WAE); and weedy check. At 6 WAE, a significant reduction was noted in plant height (8% and 17%), number of productive tillers per square meter (16% and 16%), spike length (23% and 54%), grains per spike (13% and 34%), 1,000-grain weight (14% and 37%), grain yield (20% and 21%), and biological yield (24% and 50%) compared with control (weed-free plots) during 2014 and 2015, respectively. The logistic model supports the field study results and suggests that blessed milkthistle's CTWR for wheat is 1 to 5 WAE based on acceptable yield losses of 5% to 15% during both years. The experimental results and logistic model indicate that blessed milkthistle should be controlled within 1 to 5 WAE to get better wheat crop harvests without compromising farmers' profits. To our knowledge, this is the first study ever in Pakistan regarding the CTWR in terms of WAE of blessed milkthistle and could help other scientists create weed control strategies for other areas of the country.

**Key words:** Weed emergence; weed competition; crop growth; grain yield; weed interference

## **OTHER THEMES**

## **EVALUATION OF *BACILLUS* SPP. AGAINST INCITANT OF CHILLI LEAF SPOT (*XANTHOMONAS* SP.)**

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### **Abstract:**

In current study, we sought to investigate the native soil antagonists as well exotic *Bacillus thuringiensis* (*Bt*) against chilli bacterial pathogens viz., *Pseudomonas syringae* and *Xanthomonas* sp. During the study, putative native soil antagonists were isolated by plating heat shocked (60°C) serial dilutions on nutrient agar plate. Among putative isolates, two (SK, CM) were further characterized on the basis of phenotypic and biochemical characteristics which revealed these were gram and catalase positive while urease, oxidase and arginine dihydrolase negative. In order to assess the efficacy of SK, CM and exotic *Bt* against *Pseudomonas syringae* and *Xanthomonas* sp., dual culture confrontational assay was performed. SK, CM and *Bt* were only able to restrict the growth of *Xanthomonas* sp. not *Pseudomonas syringae*. Therefore, further tests only performed containing *Xanthomonas* sp. Chemical compatibility with copper sulphate, topsin M, sodium benzoate was assessed by food poisoning method. Except, topsin M rest of chemicals showed inhibitory effect on microbial growth. Antibiotic sensitivity (erythromycin, streptomycin, tetracycline, penicillin) of *Xanthomonas* sp, SK, CM along *Bt* was performed by disc diffusion method. Results showed minimum zone (0mm) of inhibition was formed against penicillin while maximum (29 mm) against streptomycin. Antagonists' efficacy was also tested in planta by detached leaf and seedling inoculation method. Leaves of susceptible chilli cultivar were pre inoculated with antagonists and subsequently re-inoculated with *Xanthomonas* sp. along mock treatment with sterilized water. Leaves inoculated with *Xanthomonas* sp. only were considered as a positive control. Except positive control, leaves remained asymptomatic after 7 days of post inoculation. Pot experiment based upon soil drenching and foliar spray inoculation also showed that plant initially treated with antagonists showed resistance against subsequent application of pathogen in comparison to positive control. The result of this pilot study showed that native putative *Bacillus* spp. isolates (SK, CM) along commercial exotic *Bt* have potential to circumvent *Xanthomonas vesicatoria* both in local as well in distant tissue.

**Keywords:** *Bacillus* spp., *Xanthomonas* sp., Chilli Leaf Spot

## **THE EFFECTS OF FORMULATION BASED ON MEDICINAL PLANTS OF ARID REGION ON RENAL DISORDERS IN THALASSEMIA PATIENTS**

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**Abstract:**

Thalassemia is a major health problem, placing an immeasurable emotional, psychological and economic burden on millions of people around the World. The estimated prevalence is 16% in people from Cyprus, 1% in Thailand, and 3–8% in populations from Bangladesh, China, India, Malaysia and Pakistan. There are numerous factors that could contribute to renal disease in a patient with thalassemia. Among them are iron overload, chronic anemia, hypoxia, inappropriate use of iron chelation, nephrotoxic drugs, infectious agents, and nephrolithiasis. The objective of the study was to prepare herbal formulation for the management of renal disorders in transfusion dependent thalassemia patients. In this regard, a herbal medicine was formulated, comprises ethanolic extracts of two medicinal plants of arid region belongs to family zygophyllaceae; *Fagonia cretica* L., and *Tribulus terrestris* L. The randomized clinical trials were conducted in Faculty of Eastern Medicine, Hamdard University among children with thalassemia who received treatment in Hussaini Blood Bank. Already diagnosed 132 subjects male (n=77) and females (n=56) between 10-16 years of age were registered into two groups (n=66 in each) after taking consent. The test groups were treated with herbal formulation, whereas control group was already taking treatment with Deferoxamine for iron chelation. The history of renal system was taken and routine lab investigations such as Urea, Creatinine and Urinalysis were carried out before and after treatment. The results exhibited that, the renal disorders such as Urinary tract infections and renal calculi were treated in test group without taking any other medications. Comparably, in control group the results was not satisfactory. The parameters of Urinalysis such as pus cells, presence of RBCs, proteins, mucus, bacteria, crystals and calculi showed significant improvement in test group after treatment with natural product for three months. The mean and SD of serum urea and creatinine were in normal ranges before and after treatment. Thus, herbal formulation has significant efficacy for the management of renal disorders in thalassemia patients due to its antimicrobial, analgesic, anti-inflammatory and strong diuretic effects.

**ANTI-DENGUE POTENTIAL OF THE PAPAIN PROTEIN OF CARICA PAPAYA**

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**Abstract**

Dengue hemorrhagic fever (DHF) kills 390 million people yearly throughout the world, according to the WHO in 2019. The *Aedes aegypti* mosquito, which carries the dengue virus,

is the source of this illness. Thrombocytopenia and dehydration are two clinical signs of this illness to be concerned about. There are currently only two treatment approaches: fluid replacement and symptomatic therapy. Consequently, a therapeutic that can get around this restriction is needed. The thrombocyte count rises because the papain in *Carica papaya* L. can stimulate the release of thrombocytic cytokines including IL-6 and thrombopoietin. Megakaryocyte and thrombocyte production can both rise with the expression of ALOX 12, which papain can do. Using the aqueous two phase system and the TPP (Three Phase Partitioning) system for extraction process, papain, extracted from *Carica papaya* L. Papain may be effective in treating dengue fever and restoring normal platelet counts. Further in-depth studies can suggest the dosage and potential adverse effects of papain drug for treating dengue fever.

### **MEDICINAL PLANT USE IN NATURAL FOOD PRODUCTS, AN APPROACH TO HEALTH AND WELLBEING**

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#### **Abstract:**

Good food products are essential for a good health and wellbeing. Currently available foods in the market are focused on processed, with synthetic additives or preservatives. Majority food products contain revealed or hidden sugar. Beverages are flavored, intense sugary and carbonated. All these foods are health hazardous, causing heart, liver, kidney and metabolic disorders. Using medicinal plants in natural food products is a popular approach to promoting health and wellness. These plants, which have been used for centuries in Traditional Unani Medicine System, have various therapeutic properties that can support overall wellbeing. Incorporating them into food products provides an easy and convenient way to reap their benefits. For example: Nutrient density, Anti-inflammatory properties, Digestive health, Stress relief and relaxation, Detoxification support, Immune-boosting properties etc. Adopting a diet rich in natural food products can support a healthy lifestyle and contribute to overall wellness, support sustainable and environmentally-friendly food production practices.

To promote medicinal plant food products, faculty of Eastern Medicine, Hamdard University, Karachi is performing its duty. Many products have been developed there. Two of them are Aloe vera Beverage and Tamarind Pulp Candy. Both of these are experimentally developed by using the raw material available in the Herbal Garden, Hamdard University. Aloe vera and Tamarind Pulp are used since many years in medicine and food in various countries. Both are beneficial for the promotion of health and prevention of diseases.

As a result, the tamarind candy made was textured same as toffee with sweet, sour and slight hot in taste and is wrapped by colorful glossy paper, while the end product of Aloe vera pulp is a light green colored, sweet tangy taste drink in 250 ml bottle, which gives a very refreshing feelings on drinking. Further improvement and trials are recommended for the products.

**Key words:** Natural Product, Medicinal Plants, Aloe vera Beverage, Tamarind pulp,

Tamarind candy

**PREVALENCE OF PERCEPTION OF UNANI AND ALLOPATHIC MEDICINE  
REGARDING MANAGEMENT OF COMMUNICABLE AND NON-  
COMMUNICABLE DISEASES/AILMENTS**

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**Abstract:**

The research aimed to analyse the general perception of the public of Pakistan and specifically Karachi pertaining to Unani medicines against the use of Allopathic medicines for the management of communicable and non-communicable diseases. In this perspective, across sectional study was conducted in different hospitals operating in Karachi including Shifa-ul-Mulk Memorial Hospital, Naimat Begum, and Matab Hamdard, Aram Bagh. In this study, n= 400 participants of both gender (males = 48% and Females = 52%) comprises age group of 18 years to 56 plus were interviewed, and the techniques employed to attain the goal, incorporated frequency, chi-square testing and crosstabs on SPSS. The perception of Unani Medicine in comparison with allopathic medicine in association with age, gender, education, and household type for the management of communicable diseases/Ailments; Hepatitis, Diarrhoea, Flu and Sexual disorder where as in non-communicable diseases/Ailments; Jaundice, Hypertension, Pain, Infertility, Insomnia and Diabetes were analysed respectively. It was evaluated discretely whether the opinions are dependent on the age-groups or gender. The results revealed that some of the stances were dependent but most of them were not. 48% respondents realized Unani medicine works better for Jaundice and Infertility, 63% are of the viewpoint that it has effective result in the treatment of Hepatitis, 60% are of the opinion that it has excellent results for curing flu. In this regard, the chi square results with gender about affordability of medicine is found to be ( $p=0.006$ ). General perception was that people consider Unani medicine as affordable and safer yet not beneficial to treat every disease, especially chronic illness as the data suggest ( $p=0.527$ ). This study highlights avenues to effectively promote Unani medicine and findings the areas of improvement to better serve the masses. It was also concluded that the population viewpoint regarding treatment choice for communicable diseases is for Unani medicine (51.97%) as compared to non-communicable diseases (38.3%).

**Keywords:** Unani medicines, Allopathic medicine, general perception, Communicable diseases, non communicable diseases

**POTENTIAL OF RHIZOSPHERIC FUNGI TO REDUCE COPPER AND LEAD  
TOXICITY IN TRITICUM AESTIVUM L.**

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**Abstract:**

Plants have adapted to various heavy metals and environmental situations during anthropogenic evolution. The most common heavy metal contaminants are lead (Pb) and copper (Cu), which can be found in both natural and industrial settings. Microorganisms play a crucial role in the biotransformation of heavy metal-contaminated environments. In this study, four rhizospheric fungus strains were extracted from *Parthenium hysterophorus* and tested for their tolerance to lead and copper. These strains were selected for their ability to promote plant growth under heavy metal stress. When inoculated to *Triticum aestivum* L. under heavy metal stress, the fungal isolates NMG, Ng, N6, and NB showed promising results in the form of increased secondary metabolites.

Different concentrations of specific heavy metals (Pb25, Pb75, Cu100, Cu200, Pb25+Cu100, and Pb75+Cu200g/mL) were applied to wheat plants. The plants exposed to metal stress without microbial inoculation displayed a reduction in growth. However, when rhizospheric fungal inoculation restored plant growth and development, showed the symbiotic relationship between the fungus and the host plant roots under heavy metal stress conditions. The isolates have the ability to transform HMs, making them unavailable for plant uptake and accumulation, which prevents harm to plants. Apart from their bioremediation properties, some isolates can create secondary metabolites like IAA, GA, ABA, H<sub>2</sub>O<sub>2</sub>, Electrolytic leakage, SA, lipid, DPPH, flavonoids, phenols, and proteins, which can stimulate plant growth and make them suitable for use as bio-fertilizers and bio-remediating agents in areas with high levels of heavy metal contamination.

**THE EFFECTS OF SILICA NANOPARTICLES ON THE POST HARVEST QUALITY OF CHICKPEA**

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**Abstract:**

Phytopathogens damage the agricultural crops each year and due to this reason the usage of fungicides has been increased in modern days. The excessive use of fungicides is dangerous for both the environment as well as human health and its very crucial to find out eco-friendly alternative ways to treat post harvest damage. The aim of the study was to investigate the effect of silica nanoparticles to reduce post harvest disease of chickpea inoculated by *Fusarium oxysporium*. The results of *Vitro* experiments revealed that the silica nanoparticles (100 mg L<sup>-1</sup>) had a little impact on the spore germination rate and on the growth of mycelia of *Fusarium oxysporium*. The application of silica nanoparticles in *vivo* experiments demonstrates that it's reduced the post harvests decays in the chickpeas and activates the defense enzymes such as Catalase (CAT), superoxide dismutase (SOD), and Polyphenol oxidase (PPO) activities and enhanced the phenolic and flavonoids contents as well. Therefore, the results revealed that the silica nanopartices can reduce the fungal disease in both *vivo* and *vitro* experiment by elevating



the defense response of enzymes and improve the chickpea post harvest quality of crop and prove to be alternative strategy to control fusarium wilt.

**EFFECT OF GROWTH REGULATORS ON ROOTING AND SUBSEQUENT SALICYLIC ACID APPLICATION ON PERFORMANCE OF OLIVE (*Olea europaea*) CUTTINGS**

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**Abstract:**

The research was conducted at the Horticulture Department, University of Peshawar to study the effect of rooting agents and subsequent effect of different concentrations of salicylic acid on the rooting and growth of Olive cuttings. Size of olive cuttings were 15 cm and experiment was conducted in March 2022. The experiment was conducted using Randomized complete block design (RCBD) with two factors replicated thrice. Olive cuttings were treated with three different rooting agents (control, Aloe Vera, salicylic acid and paclobutrazol) subsequently treated with different concentration of salicylic acid (0, 20, 40, 60, 80 ppm) attained growth after five months. The experimental results showed that olive cuttings dipped in aloe vera recorded rooting/sprouting percentage (60%), least days to sprouting (31.20), stem length (4.66 mm), number of leaves (10.89), number of branches<sup>-1</sup> (4.93), stem diameter (0.65 mm), root diameter (2.31 mm), root length (7.41 cm), root number (5.39), root weight (0.87g) and it also enhanced the survival percentage (49.33%). Paclobutrazol does not initiate any rooting. Foliar application of salicylic acid at 60ppm showed the best results with maximum stem length (5.15 mm), number of leaves (14.10), number of branches<sup>-1</sup> (6.04), stem diameter (0.67 mm), root diameter (1.71 mm), root length (5.72 cm), root number (4.54), root weight (0.87 g) and survival percentage (45.56). The interaction of rooting agents and salicylic acid were found significant for stem length, number of leaves and number of branches<sup>-1</sup> whereas best results were observed when olive cuttings were dipped in aloe vera and treated with 60 ppm salicylic acid concentration. Therefore, it is concluded that olive cuttings should be dipped in Aloe Vera gel and subsequently application of salicylic acid at 60 ppm as a foliar spray for better rooting and growth of Olive propagated through cuttings.

**DELINEATING THE POTENTIAL OF HALOTOLERANT RHIZOBACTERIAL DIVERSITY ISOLATED FROM *SUAEDA FRUTICOSA* FOR GROWTH PROMOTION OF GLYCOPHYTIC PLANT *VIGNA RADIATA* (L.) UNDER SALINITY STRESS**

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**Abstract:**

This study was conducted to estimate the diversity of halotolerant bacteria associated with rhizosphere of halophytic plant *Suaeda fruticosa* (Forssk L.) and their potential for the plant growth promotion of *Vigna radiata*; a glycophytic plant; prone to damage under 40mM salinity stress. Bacterial strains isolated in this study were found to tolerate salt up to 1.5M (17.55% NaCl). 16S sequencing revealed their resemblance with *Kushneria avviceniae* R2S4 and *Halomonas elongate* S3W, *Brachybacterium paraconglomeratum* Ra11S4, *Staphylococcus equorum* (Rb8S4), *Rothia endophytica* (Rb2S6), *Oceanobacillus picturae* (Ra6S3), *Microbacterium indicum* (WS6) and *Halomonas creatinolyticus* (DO). These strains were found active in the production of indole-3 acetic acid (IAA), under salinity stress of 0.5M (2.92% NaCl) that ranged from 27.1 to 58.25 µg/ml with L-tryptophan supplementation as compare to the un-amended media that ranged between 8.3-25.5 µg/ml. GC-MS analysis revealed higher quantity of pure IAA in the bacterial extracts, in *K. avviceniae* R2S4 and *H. elongate* S3W it was 1.20 µg/ml and 1.22 µg/ml, respectively. UPLC Quantification of Gibberellic acid within bacterial extracts showed 12.61 µg/ml of production in *B. paraconglomeratum* Ra11S4. These strains also showed potential for HCN production, Cellulose activity, nitrate reduction and nitrogenase activity. These strains were further subjected to plant under salinity stress of 50mM-150mM in field. In field trials bacterial strains *Brachybacterium paraconglomeratum* (Ra11S4), *Staphylococcus equorum* (Rb8S4), *Rothia endophytica* (Rb2S6) were found to be best in increasing fresh biomass up to 2.4 folds and number of pods up to 211% for the plant *Vigna radiata*. Estimation of halotolerant bacterial diversity showed their potential to be useful for the production of biofertilizer.

**Keywords:** Auxin, rhizobacteria, *Vigna radiata*, biofertilizer, Gibberellic acid

**FRESH AND DRIED FRUIT PHYSIO-CHEMICAL, ANTIOXIDATIVE AND NUTRITIONAL ATTRIBUTES OF TWO PLUM CULTIVARS HARVESTED AT TWO MATURITY STAGES**

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**Abstract:**

Maturity stage at harvest and type of cultivar affect the postharvest quality and value added products developed from fresh fruit, so as that of plum (*Prunus silicina*) fruit. For this purpose, an integrated study was executed to check the effect of harvest maturity stage and cultivars on plum fruit quality at shelf period, two plum cultivars (cv. 'Santa Rosa' and 'Black Amber') were harvested at two maturity stages (Maturity-I: minimum mature [ for cv. Santa Rosa (red: 80%, black: 20%); for cv. Black Amber (yellow: 40%, black: 60%)] and Maturity-II: well mature [ for cv. Santa Rosa (red: 20%, black: 80%); for cv. Black Amber (yellow: 10%, black: 90%)] and were evaluated at ambient condition (25°C ± 2°C; RH 60-65%) for fresh fruit quality at shelf and nutrition of dried plum. These were investigated in two independent experiments. The results of 1<sup>st</sup> experiment showed that plum fruit of both cultivars harvested at maturity-I exhibited higher respiration rate, ethylene production however lower fruit weight loss as compared to fruit harvested at maturity-II. Moreover, relative higher vitamin C content, titratable acidity (TA), and higher enzymatic activities of superoxide dismutase (SOD), peroxidase (POD) and catalase (CAT) were noted in fresh plum fruit harvested at maturity-I in both plum cultivars. Better fruit color, higher total soluble solid (TSS), juice pH, total phenolic content (TPC), antioxidants, carotenoids, anthocyanin and organoleptic attributes were observed in plum fruits harvested at maturity-II in both cultivars. In the 2<sup>nd</sup> experiment, dried plum developed from fresh plum harvested at two maturity stages of two cultivars were evaluated for proximate and organoleptic attributes. The results showed that prunes of fresh plum harvested at maturity-II exhibited higher moisture content, protein, total calories and retained higher taste, aroma, texture, flavor as compared to prunes of fresh plum harvested at maturity-I. However, prunes of fresh plum fruits at maturity-I displayed higher ash content as compared to maturity-II. In plum cv. Santa Rosa, it was determined that the physiological and physical fruit quality parameters were greater than cv. Black Amber on both maturity stages. While, biochemical, phytochemicals, antioxidative enzymes, organoleptic and proximate attributes were greater in cv. Black Amber on both maturities. As a result, plum fruit of both cultivars harvested at maturity-I displayed higher physical, physiological and antioxidative enzymes. However, plum fruit harvested at maturity-II exhibited higher biochemical, phytochemical attributes of fresh plum, While, better proximate and organoleptic attributes of dried plum.

**Keywords:** Plum Fruit quality, cultivars, maturity stages, fresh, dried, days at shelf, Physico-chemical attributes, physiological, phytochemicals, antioxidative enzymes and proximate analysis.

**APPLICATION OF *BACILLUS CEREUS* ON GROWTH, YIELD AND SOME PHYSIOLOGICAL PARAMETERS OF *SOLANUM LYCOPERSICUM* L. CV. VELOZ TO AMELIORATE HARMFUL EFFECTS OF CHROMIUM**

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**Abstract:**

The current research was carried out to determine the impacts of chromium tolerant bacteria (*Bacillus cereus*) on germination, growth, yield and physiological parameters of *Solanum lycopersicum* L. cv. Veloz to protect the plants from toxic effects of chromium. The effects of isolated bacteria (*Bacillus cereus*) were tested for germination and growth of tomato plants by treating the plants with five varying concentrations of potassium chromate stock solutions (50ppm, 100ppm, 150ppm, 200ppm and 250ppm) respectively. With increase in chromium stress, there was delay in germination, growth, yield and other physiological parameters as level of stress increased. When plants were grown without chromium resistant bacteria (*Bacillus cereus*), there was delay in germination, growth, yield and physiological parameters. The plants which were grown with chromium resistant bacteria (*Bacillus cereus*) showed increased germination, growth, yield and physiological parameters. In case of growth, yield and physiological assessment, length of roots and shoots, fresh weight of roots and shoots, dry weight of roots and shoots, height, number of leaves, number of branches, number of flowers, number of fruits, rate of photosynthesis, transpiration rate, stomatal conductance, leaf area, fruit length, fruit weight, fruit diameter and ion contents under different concentrations of chromium decreased in plant seedlings without bacterial inoculum (*Bacillus cereus*) while increased in plants with bacterial inoculum (*Bacillus cereus*). The number of senescent leaves and heavy metal contents were increased under different chromium concentrations without bacterial inoculum (*Bacillus cereus*) while decreased with bacterial inoculum (*Bacillus cereus*). It was concluded that all studied parameters were greatly affected by increasing concentrations of chromium but their effect was ameliorated by using chromium tolerant bacteria (*Bacillus cereus*).

**Keywords:** Chromium, Isolated bacteria, Growth, Yield, Amelioration

**ERYSIPHE AUSTRALIANA: THE CAUSE OF POWDERY MILDEW ON CRAPE MYRTLE TREE**

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**Abstract:**

A comprehensive study of a powdery mildew observed on *Lagerstroemia indica* L. leaves was carried out in the present study. The symptoms appeared as white mycelia on leaves. Afterwards, poor growth and premature senescence of affected leaves were observed. Infected plants with a 90% disease severity were collected from District Bagh, Azad Jammu & Kashmir, Pakistan during phytopathogenic survey in October, 2021, resultantly reducing the yield up to 100%. Causal fungus was observed and identified on the basis of morphology. For further confirmation, rDNA was extracted from the mycelium of the specimen. Internal transcribed spacer (ITS1 and ITS2) genes of the rDNA were amplified using primer pairs PMITS1 as forward primer and PMITS2 as reverse primers, respectively which reveal that this fungus belongs to genus *Erysiphe*. Further investigation identified it as *Erysiphe australiana* which is

reported first time from Pakistan. This is the first record of powdery mildew caused by *Erysiphe australiana* in Pakistan. This work aims to explore the plant pathogens that are threat to crops, vegetables, fruits and trees.

### **EVALUATION OF ANTIFUNGAL ACTIVITY OF *CHARA VULGARIS* AGAINST AFLATOXIN B1 PRODUCED BY *ASPERGILLUS FLAVUS* ISOLATED FROM TOTAL MIXED RATION**

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#### **Abstract:**

*Aspergillus flavus* is a aflatoxin producing fungi and commonly present in animal feeds. Aflatoxins are harmful for animal and human being consuming animal meat and milk. The current study was conducted to evaluate the antifungal activity of methanolic extract of *Chara vulgaris* against *A. flavus* isolated from total mixed ration. Total mixed ration (TMR) samples (n= 12) were collected from Pattoki, Kasur Pakistan. Conventional methods were used to identify the fungal species isolated from TMR. Spread plate technique was used to determine the fungal load of TMR and the highest CFU was  $9 \times 10^2$ . The production of aflatoxins by *A. flavus* was confirmed by thin layer chromatography. To analyze the antifungal and anti-aflatoxigenic activity of *C. vulgaris*, methanolic extract was prepared. Proximate analysis of *Chara* extract was performed by Infra-red Spectroscopy that showed moisture content 31.36%, crude protein 9.76%, fat 27.26%, ash 6.55%, carbohydrate 23.13% and fiber 1.03%. The HPLC results of *Chara* extract determined the quantity of Myricetin (0.2591 µg/ml), Quercetin (0.1314 µg/ml) and Kaempferol (1.178 µg/ml). Micro broth dilution method was used to analyze the antifungal activity of methanolic extracts of *Chara* against three fungal strains. The minimum inhibitory concentration MIC of *Chara* extract was 75g. *In vitro* antifungal activity was observed after 30 days. The greatest fungal load of TMR was 29 CFU/g in isolate-1 and isolate-2 with extract. Without extract the highest fungal load was 63 CFU/g in isolate-1. The lowest CFU was 17 in isolate-3 with extract. The methanolic extract of *C. vulgaris* can be used as an effective antifungal agent to inhibit the growth of *A. flavus* in TMR.

**Keywords:** *Chara vulgaris*, *Aspergillus flavus*, aflatoxins, High Performance Liquid Chromatography (HPLC), Thin Layer Chromatography (TLC), Infra-red Spectroscopy (IR Spectroscopy), Minimum Inhibitory Concentration (MIC)

## **ABSTRACTS FOR POSTER PRESENTATION**

## **EFFECT OF VERMICOMPOST ON GROWTH AND QUALITY OF BUTTERCUP**

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### **Abstract:**

Buttercup is popular due to diversity in flower colors. The research was conducted at Ornamental Nursery, Department of Horticulture, The University of Agriculture, Peshawar, to study the effect of vermicompost on growth and quality of Buttercup, during 2021-2022. Three vermicompost concentrations (10%, 20% and 30%) along with control and seven Ranunculus cultivars (Tango red, Elegance rose, Elegance clementine, Delano yellow, Picotee pink, Tecolote white and Picotee orange) were investigated. The experiment was laid out in a randomized complete block design (RCBD) with two factors, replicated three times. Vermicompost concentrations significantly affected all the studied parameters. Maximum Number of leaves plant<sup>-1</sup> (18.5), number of branches (9.0), plant height (26.4 cm) chlorophyll content (32.2 SPAD), days to flowering (65.2), number of flowers (2.4), root length (12.3 cm), number of roots (15.0) and stem diameter (9.1 mm) were observed in plants that were treated with 30% of vermicompost, while maximum flower diameter (6.5cm) was observed in plants that were treated with 20% verimcompost. In case of buttercup cultivars, maximum Number of leaves plant<sup>-1</sup> (15.2), number of branches (8.5), plant height (26,4 cm) chlorophyll content (30.7 SPAD), number of flowers (2.4), root length (12.0 cm), number of roots (15.7) and stem diameter (10.2 mm), were observed in cultivar Delano yellow while it took maximum days to flowering (63.8) while maximum plant height (20.4 cm) and flower diameter (6.3 cm) were observed in Picotee orange cultivar. It is concluded from the experiment that the application of vermicompost at a concentration of 30% showed better results and cultivar Delano yellow performed well under agro-climatic conditions of Peshawar. Therefore, cultivar Delano yellow is recommended for cultivation under Peshawar conditions, and vermicompost at 30% concentration is recommended for better growth and yield of buttercup cultivars.

## **EVALUATION OF OYSTER MUSHROOM CULTIVARS ON WHEAT STRAW SUBSTRATE SUPPLEMENTED WITH DIFFERENT CONCENTRATION OF CHITOSAN**

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**Abstract:**

An experiment “Evaluation of oyster mushroom cultivars on wheat straw substrate supplemented with different concentration of chitosan” was conducted during December 2022. The experiment was laid out in Completely Randomised Design (CRD) and replicated three times. The experiment consisted of two factors: First factor was different concentrations of chitosan, control, 0.5, 1.0 and 1.5gL<sup>-1</sup>, while the other factor was oyster mushroom cultivars White oyster mushroom and Pink oyster mushroom were cultivated on wheat straw which were supplemented with chitosan. Different oyster mushroom cultivars and the application of chitosan had a significant impact on mushroom growth and yield. The weight of 1<sup>st</sup> flush (585g), weight of 2<sup>nd</sup> flush (485g), weight of 3<sup>rd</sup> flush (445g), yield per bag (1515g), determination of moisture (88.1%) and total soluble solids were all significantly increased by application of chitosan @1.5gL<sup>-1</sup>. Exceptionally days to pinhead initiation (18.2), days 1<sup>st</sup> flush completion (23.7), days to 2<sup>nd</sup> flush completion (31.7) and days to 3<sup>rd</sup> flush completion (39.7) was found minimum at chitosan @1.5gL<sup>-1</sup>. Similarly, among the oyster mushroom cultivars, the weight of 1<sup>st</sup> flush (535g), weight of 2<sup>nd</sup> flush (435g), weight of 3<sup>rd</sup> flush (395g), yield per bag (1365g), determination of moisture (85.5%) and total soluble solids were all significantly increased in cultivar White oyster mushroom. Exceptionally days to pinhead initiation (17.2), days 1<sup>st</sup> flush completion (22.2), days to 2<sup>nd</sup> flush completion (29.2) and days to 3<sup>rd</sup> flush completion (36.2) was found minimum in cultivar White oyster mushroom.. According to the research, application of chitosan should be applied at a rate of 1.5gL<sup>-1</sup> for better growth and production. White oyster mushroom cultivar should be grown under mushroom house.

**EFFECT OF VARIOUS TEMPERATURE ON POSTHARVEST QUALITY AND STORAGE LIFE OF PLUM (CV, FAZI-E-MANANI) FRUIT**

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**Abstract:**

A research was conducted to explore the effect of temperature and storage on life extension of plum fruit stored at temperature (10°C, 15°C and 20°C). An Experiment was designed Completely Randomized Design (CRD). In this study significant effect of temperature and storage intervals was observed on most of the parameters. Samples were analyzed for its firmness, acidity, total soluble solids, weight loss, color score, taste score and ascorbic acid. Highest mean values of weight loss (9.76%), total soluble solids (5.74 Brix) and titratable acidity (0.92%) were found in sample at 20°C while lowest mean values of weight loss



(4.98%), color score (3.26), total soluble solids (5.00°Brix) and titratable acidity (1.18%) were found at 10°C. Maximum ascorbic acid (0.98mg/100g) content was determined at 10°C while minimum ascorbic acid (0.76mg/100g) was recorded in 20°C. Firmness (2.32kg/cm<sup>2</sup>) of the sample was highest in 10°C and lowest firmness (1.52kg/cm) at 20°C. Sample were also studied for their sensory characteristics such as taste, color and overall acceptability. At 20°C obtained maximum mean score of judges for color (4.96), taste (4.85) while minimum taste score (4.02) was obtained at 10°C. The fruits which are retained maximum quality attributes and also got maximum score for organoleptic evaluation. Statistical analysis showed that temperature and storage intervals had a significant effect on storage life of plum fruits.

### **ROLE OF MORINGA SEED OIL IN AMELIORATING VARIOUS COMPLEX DISEASES**

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#### **Abstract:**

*Moringa oleifera* belongs to Moringaceae family and it is a fast growing tree. Moringa seed oil is extracted from the seeds of moringa tree. Moringa seed oil is a rich source of essential nutrients including vitamins, minerals and fatty acids. Its potential to treat a wide range of complex diseases has made it a focus of intense scientific research in recent years. Numerous investigations conducted in vivo and in vitro demonstrated that moringa seed oil has substantial prospect for treatment of a variety of cancers including ovarian, colon, gastric, cervical, prostate, leukemia, gastric, breast and kidney. Moringa oil is rich in various bioactive components including antioxidants (quercetin, chlorogenic acid and beta-carotene), anti-inflammatory agents (tocopherols, sterols and phenolic chemicals) and essential nutrients (Vitamin A, C and K). Seed oil is rich source of oleic acid that improves heart health by lowering LDL cholesterol and increasing HDL cholesterol. These bioactive components are used to mitigate various health disorders including diabetes, cardiovascular diseases, cancers and neurodegenerative diseases. Moringa oil is used in reducing cancer risk, inhibiting cancer proliferation, inducing apoptosis and impeding tumor growth. Due to presence of thymol, eugenol and butylated hydroxytoluene in moringa oil, it reduces cancer cell growth. These compounds collectively contribute to its potential in reducing oxidative stress, inflammation and cellular damage. Additionally its antimicrobial and immunomodulatory properties are used in combating infectious diseases and autoimmune disorders. The encouraging results from early studies on health benefits of moringa seed oil requires further research to fully understand the effects of this beneficial oil.

### **SERIPHIDIUM CHITRALENSE: A NEW SOURCE OF SANTONIN**

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**Abstract:**

Medicinal plants are the sources of large number of bioactive secondary metabolites. Bioautography is an easy and target-directed isolation of active secondary metabolites on chromatogram. Organic solvents used in the process of chromatographic separation can be completely removed before biological detection. *Seriphidium chitralense* is being extensively used by the local inhabitants of District Chitral, Pakistan for worm repellent, abdominal pain and stomach pain. By this method a bioactive compound was isolated. The isolated compound was analysed by X-ray crystallography and was found to be santonin. In our study this compound was found to be more active for gram negative bacteria. It is the first report on isolation of santonin from *Seriphidium chitralense*.

**BIOACTIVE PROPERTIES OF SMALL PEPTIDES FROM SOYBEAN FOR FUNCTIONAL FOOD APPLICATION: A COMPREHENSIVE REVIEW**

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**Abstract:**

Consuming soy has been linked to a number of possible health advantages, including a lower risk of developing chronic illnesses like obesity, cardiovascular disease, type II diabetes, insulin resistance, some types of cancer, and immune system problems. Soy proteins, whether in their intact form or, more frequently, as functional or bioactive peptides obtained from soybean processing, have been linked to several physiological functions. These results have prompted the USA to approve a health claim about soy proteins' potential to lessen the risk of coronary heart disease, and Canada to accept a health claim about soy proteins' potential to lower cholesterol. Numerous methods were employed to produce soy bioactive peptides with a range of physiological effects, including anti-inflammatory, antioxidant, hypolipidemic, anti-hypertensive, and anti-cancer qualities. Overall, knowledge of soy's bioactive and functional components has advanced. But before they can be utilized as functional meals or even medicines for the prevention or treatment of chronic illnesses, further research is needed to pinpoint their target organs and clarify their biological modes of action.

**Keywords:** soy protein, soy peptides, bioactives, functional property, chronic diseases, biomarkers

**ESTIMATION OF GENETIC VARIABILITY AMONG CHICKPEA GENOTYPES AT DIFFERENT ENVIRONMENTS OF POTOHAR REGION**

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**Abstract:**

Chickpea (*Cicer arietinum* L.), a major member of the leguminous family, needs more produce and sustainability, which impacts production limits and produces yield unpredictability due to climate change. Identifying stable genotypes with consistent production under different environmental conditions is an efficient strategy for increasing chickpea yield. The current study used 14 chickpea genotypes in three replications utilizing RCBD (Randomized Complete Block Design) in three districts (Attock, Jehlum, and Chakwal - Punjab) in Rabi 2021-22 and 2022-23. Morphological characteristics such as days to flowering, plant height, days to maturity, number of pods plant<sup>-1</sup>, 100-seed weight, and yield hectare<sup>-1</sup> were observed. The acquired data was then statistically analyzed to determine the significance of agronomic traits. The chickpea genotype "Fakhar-e-Thal" had the highest 100-seed weight (24.76 g), followed by Noor-2013 (23.24 g). The genotype DG-92 matured in the most days (176), followed by "Parbat" in 165 days, while genotype "Bittle-2016" had the highest yield hectare<sup>-1</sup> (2259.70 Kg/ha), followed by Noor-2013 (2219.31 Kg/ha). This study is useful for choosing high-yielding chickpea genotypes with greater stability for the Potohar region, which can be recommended for future breeding projects focused on improving chickpea yield in the Potohar region.

**Keywords:** Chickpea, yield, adoptability, potohar

**IDENTIFICATION AND CHARACTERIZATION OF INDIGENOUS GYNOECIOUS LINES OF BITTER GOURD (*Momordica charantia*)**

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**Abstract:**

*Momordica charantia* L. commonly known as bitter gourd, is a popular vegetable throughout the tropics and subtropics of the world. Although monoecy is the most common sex type in bitter gourd gynoecious traits have also been reported from different parts of the world. Gynoecious traits can be used to exploit heterosis in multiple hybrid breeding programs. In the current study, the core objective was to identify and characterize the gynoecious lines of bitter gourd (*Momordica charantia* L.). For this purpose, four gynoecious lines, namely Gy-1, Gy-2, Gy-3, and Gy-4, have been identified from farmer's field and the Vegetable Research Section, Barani Agricultural Research Institute, Chakwal. In first experiment, these gynoecious plants were analyzed for having the pistillate flowers on all nodes and maintained to produce self-seed by using silver nitrate treatment @300ppm. Results showed that identified plants were 100% gynoecious in nature, and silver nitrate treatment @300ppm was found to be most

effective for the maximum hermaphrodite flower production. Gynoecious lines were maintained using the pollen from induced hermaphrodite flowers to self-pollinate female flowers. In the second season, self-seed of these gynoecious plants was grown to characterise gynoecious lines on earliness and yield-related traits. Gy-4 line relatively performed better among all the lines.

**Keywords:** Bitter gourd; Flowering; Gy-4; Indigenous line

## **ASSESSMENT OF IRRIGATION RATES AND WEED MANAGEMENT STRATEGIES ON BROOMRAPE DEVELOPMENT AND TOMATO YIELD IN BALOCHISTAN**

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### **Abstract:**

Broomrape (*Orobanche ramosa* L.) is a problematic weed poses a significant threat to tomato production globally. Efficient management of broomrape is challenging because of its complicated parasitic nature. Despite the growing interest in implementing effective weed management practices; there is still a lack of strategies for broomrape control. Therefore, this study aims to address these gaps by integrating weed management approaches and irrigation schedules on broomrape control and tomato yield. The present study was conducted in District Qilla Saifullah. The experiment was carried out in a randomized complete block design (RCBD) with a split-plot arrangement having three replications. Three irrigation intervals (3, 6, and 9 days) were assigned to the main block, while sub-blocks including treatments and year were taken as the source of variance (year  $\times$  irrigation timing  $\times$  treatments). The experiment comprised sixteen treatments, including transparent polythene, black polythene, weedy check (Control), sole weeding of broomrape only, weeding of all weeds, weeding except broomrape, humic acid 25 kg ha<sup>-1</sup>+ copper oxychloride (COC) in single/split doses, COC single/split doses, ammonium sulphate 200 kg ha<sup>-1</sup> (single/split doses), copper sulfate 2 kg ha<sup>-1</sup> (single/split doses), and glyphosate 48 SL (1.5 kg a.i ha<sup>-1</sup>) and pendimethalin 33 EC (1.44 kg a.i ha<sup>-1</sup>). The results revealed that highest broomrape intensity (4.34 plant<sup>-1</sup>) was observed with 9-day irrigation interval which substantially reduced tomato yield. Whereas, 06 days irrigation interval considerably increased tomato yield by 30% with highest Cost benefit ratio (CBR): 1: 4.6. Likewise, among the weed management strategies black polyethylene decreased *Orobanche* intensity by 67%, and obtained a highest CBR (1: 4.60). The highest weed control efficiency (WCE 97 %) was obtained for black polyethylene and pendimethalin (90 %). It is concluded that the *Orobanche* infestation substantially decreased with increase in irrigation frequency. Furthermore, irrigation practices at 06 days interval together with black polyethylene and pendimethalin revealed the lowest broomrape incidence and produced an economic yield.

**Keywords:** Irrigation scheduling; parasitic weed; sustainable broomrape management; tomato yield; cost/benefit analysis.

**ALOE VERA: THE MIRACLE PLANT IT'S MEDICINAL AND TRADITIONAL  
USES IN PAKISTAN**

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**Abstract:**

Aloe Vera, a succulent plant known for its thick, fleshy leaves, has been revered for centuries across various cultures for its remarkable medicinal properties. This perennial plant, which has spread extensively over the world and thrives in dry regions, is native to the Arabian Peninsula. Aloe Vera has a multitude of health advantages because of the gel-like fluid that is found in the inner layers of its leaves. This substance is a treasure trove of bioactive substances, including vitamins, minerals, enzymes, and antioxidants. Since ancient times, medicinal plants have been utilized. Approximately 80% of the world's population is said to rely on traditional herbal therapy for their basic medical needs. In recent years, herbal remedies have become more popular for treating a wide range of illnesses, along with the advancement of contemporary medicine. These days, a lot of novel medications and therapies made from therapeutic plants have been invented and recommended. A combination of methodologies is employed to thoroughly study the traditional and therapeutic applications of Aloe Vera in Pakistan. The study began with a thorough examination of the literature to determine what was already known about the uses of aloe vera in traditional medicine and modern healthcare. Following this, field studies have been carried out in several parts of Pakistan to gather primary data about the traditional applications of aloe vera. These surveys involved speaking with local healers and community members. Additionally, research investigations and clinical trials exploring the therapeutic attributes of Aloe Vera have been reviewed to establish a connection between traditional practices and contemporary scientific findings. It is said to improve digestion, strengthen immunity, and enhance general well-being. Research has confirmed the anti-inflammatory, antibacterial, and antioxidant qualities of aloe vera in modern medical settings, supporting its traditional use. Therefore, in Pakistan, aloe vera functions as a versatile and culturally entrenched medicine that eloquently unites ancient customs with cutting-edge medical procedures. The abstract highlights the necessity of further investigation to fully comprehend aloe vera's potential in medicine, taking into account both the plant's numerous traditional uses and newly available scientific data. To incorporate aloe vera in contemporary medical practices in Pakistan, this study is a valuable resource for academics, policymakers, and healthcare professionals.

**Keywords:** dermatological disorders, herbal therapy, bioactive substances

**EXPLORING THE EFFICACY OF MILK THISTLE *SILYBUM MARIANUM* SEED  
EXTRACT AGAINST SELECTED BACTERIAL SPECIES AN IN VITRO STUDY**

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**Abstract:**

*Silybum marianum* is commonly known as 'Milk Thistle'. Milk thistle belongs to family *Asteraceae* and contains various flavonolignans most important of them is silybin. Two bacterial species *Staphylococcus aureus* and *Camomonas kerstersii* were tested for the antibacterial activity of the seed extract from the plant. Agar well diffusion method was used to test the antibacterial activity of the extract. Seed extract of the plant showed high antibacterial activity against gram positive bacteria *Staphylococcus aureus* with a zone of inhibition of 8.0 mm for the aqueous extract with a concentration of 100 mg/ml and 12.0 mm for the methanolic extract with a strength of 100 mg/ml while gram negative bacteria *Camomonas kerstersii* found to be resistant against the methanolic as well as aqueous extract. An antibiotic Gentamycin used as a control to check the effectiveness of the experiment which showed a zone inhibition of 18.0 mm for the *Staphylococcus aureus* and 17.0 mm zone of inhibition for *Camomonas kerstersii*. It is concluded that methanolic extract of the seed from the Milk Thistle plant proved to be more effective against the gram positive bacteria *Staphylococcus aureus* than gram negative bacteria *Camomonas kerstersii*.

**Keywords:** *Flavonolignans; Silybin; Antispasmodic; Antibacterial;*

**ESTIMATE THE EFFECT OF INDUSTRIAL EFFLUENTS FROM SIALKOT ON THE GROWTH CHARACTERISTICS OF RICE (ORYZA SATIVA L.)**

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**Abstract:**

*Oryza sativa* L. (Rice) belongs to family *Poaceae*. Rice is harvested as monsoon crop from June to November. Rice is versatile and affordable crop and used as a staple food in many countries. In Asia most people use rice as an energy source. Rice gives 21% of energy and 15% of protein to human. Nowadays industrial effluents are rapidly discharge in ecosystem. In this study a pot culture experiment was conducted to examine the effect of 50% diluted industrial waste water and control on growth characteristics of rice varieties (BS and B1509). The effluent samples were collected from Tannery and surgical industry of Sialkot. The pots were arranged in Complete Randomized Design. Tannery and industrial effluents have a severe effect on the growth of rice crop varieties Basmati Super (BS) and Basmati 1509 (B1509) but the rice plants irrigated with control show normal growth. However, rice plants irrigated with surgical effluent has shown lesser growth than the tannery. So, it is concluded that control show good results than industrial effluent and the rice plant BS has proved to be more resistant against tannery and industrial effluent water than BS1509.

**Keywords:** *Harvest; Basmati; Effluents; Randomized; Tannery; Resistant;*

## **NEW ADDITIONS TO POTENTIALLY INVASIVE FLORA OF PAKISTAN**

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### **Abstract:**

During an extensive field survey we have collected several interesting specimen from the various region of Pakistan. In phyto-geographical point of view, Pakistan is regarded as unique hotspot for the World flora. More than 6,000 native plant species (Stewart, 1972) have been described within 226 volumes of Flora of Pakistan. From last few years many native/endemic and non-native invasive plant species have been reported. Previous research has been demonstrated that the drastic and complex environmental impact of invasive species precisely local extinction and inequity in environmental procedures. Plant species invasions are considered global problem which impair biodiversity and disturbed natural ecosystems. Spread of invasive neophytes change ecosystem dynamics on large scale, which can significantly affect ecosystem. It is believed that the numerous human activities directly or indirectly involved in the transportation of exotic ornamental plants species. Lack of awareness and inappropriate initiatives are foremost barriers in management of alien invasive plants issue in Pakistan. Regular surveys, development of inventories and dissemination of information will be helpful in filling gap of information and formulating management strategies for alien invasive plants species. The current abstract intends to present systematic studies undertaken in past to record invasive neophytes. Six globally spreading invasive species are presented here as new records for flora of Pakistan. The newly records taxa belong to various plant families namely; *Anredera cordifolia* (Tenore) Steenis (Basellaceae), *Dentella repens* (L.) R. Forster & G. Forster (Rubiaceae), (*Oenothera laciniata* Hill (Onagraceae), *Alternanthera philoxeroides* (Mart.) Griseb., *Amaranthus albus* L. (Amaranthaceae) and *Galactia striata* (Jacq.) Urb. (Fabaceae). Macro- and micromorphological studied were conducted on the six taxa for proper identification. Descriptions and illustrations were provided for its taxonomic circumscription. Collected specimens of examined species were deposited to National Herbarium of Pakistan (RAW) for future studies.

**Key words:** Invasive neophytes, vascular flora, Flora of Pakistan, environmental practices

## **BIOFABRICATION AND EFFICACY OF BIO-INSPIRED NOVEL SE/FE NANOCOMPOSITE IMPROVES THE GROWTH OF WHEAT UNDER HEAT STRESS**

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### **Abstract**



Wheat (*Triticum aestivum* L.) being a staple food is severely affected by heat stress as it affects plant growth, and development and ultimately reduces their yield. Se/Fe nanocomposite synthesized from sodium selenite and Iron sulfate salts were reduced with *Buddleja asiatica* extract. Se/Fe nanocomposite was applied exogenously to wheat plants against heat stress. Se/Fe nanocomposite improved germination percentage (18% & 21%), germination index (0.48% & 0.43%), and seedling vigor index (55.7% & 47.9%). Noteworthy results of Se/Fe were recorded on the morphology of wheat in high-temperature conditions with a maximum increase of shoot length 12.5% & 14.5%, root length 1.38% & 1.63%, fresh weight of plant 0.43% & 0.475%, dry weight of plant 0.3% & 0.1%, leaf length 6% & 5.5%, leaf area 33.8% & 23% and leaf number 2.5% & 2%. In physiological parameters maximum increase of 17% & 19% in relative water content while 10.5% & 7.5% in membrane stability index, chlorophyll a content 5.44% & 4.69%, chlorophyll b content 8.28% & 6.91%, total chlorophyll contents 12.71% & 13.3% and carotenoid contents 0.27% & 0.26% was observed. Under heat stress conditions, Se/Fe nanocomposite also enhances the production of biochemical such as increase in proline contents (0.64% & 0.36%), total flavonoid contents (0.81% & 0.66%), phenolic contents (0.3% and 0.25%), SOD (0.25% & 0.26%) and POD (0.17% & 0.15%). This technique is helpful for the enhancement of crop germination, development, and growth of crops like wheat growing in stressful environments such as in high-temperature regions.

**Keywords:** Wheat, Heat stress; Nanotechnology; Se/Fe nanocomposite; Climate change

## **DESIGNING OF PRETREATMENT FILTER TECHNIQUE FOR REDUCTION OF PHENOLIC CONSTITUENTS FROM OLIVE-MILL WASTEWATER AND TESTING ITS IMPACT ON WHEAT GERMINATION**

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### **Abstract**

Olive oil extraction produces a great volume of olive mill wastewater (OMW), which is considered a serious ecological challenge. In this study, we have designed and tested a trickling filter consisting of seven different layers of natural material, including (coarse gravel, fine gravel, lime ( $\text{Ca}(\text{OH})_2$ ), sand ( $\text{SiO}_2$ ), carbon char, sponge/mesh), to treat OMW. The filter process involved physical separation, filtration, coagulation and adsorption with the removal of COD (69.8%), BOD (40.2%), Phenolic contents (90%), pH (41%), EC (41.6%) and total suspended solids (TSS) (69%). Our results have shown that treated OMW has a high potential oxidant activity. T7, Untreated OMW at 1:6 dilutions, had the strongest correlation (i.e. 0.97), while untreated OMW had the lowest IC<sub>50</sub> (7.62 g ml<sup>-1</sup>), which shown the best DPPH radical scavenging capabilities. While pure Untreated OMW has the maximum radical scavenging activity, 63%, treated (1:6) diluted OMW exhibits the lowest value i. e 9% when phosphomolybdate assay was done. HPLC analysis showed that the trickling filter removed the vanillic acid, caffeic acid and reduced the contents of phenolic components such as gallic acid,



hydroxytyrosol, vanillin, quercetin and catechol. Filtered OMW was also tested for its germination efficacy at various dilutions (1:0, 1:2, 1:4, 1:6). A remarkable improvement in germination percentage, germination index, seedling length, seedling vigor index, promptness index, stress tolerance index (76.7%, 68.4%, 51.7%, 82.1%, 54.8%, and 66.7%, respectively) has shown the efficiency of treated OMW at 1:6 dilutions. The results from this study show the efficiency of our filter design which can be further used.

## **THE ROLE OF MEDICINAL PLANTS IN TRADITIONAL HEALTHCARE SYSTEMS: INTEGRATING ETHNOBOTANICAL KNOWLEDGE WITH MODERN MEDICINE**

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### **Abstract:**

In the ever-changing world of healthcare, the traditional medicinal plants are deeply rooted in traditional healthcare which shows the interaction between modern and traditional medicines. The goal is to understand the possibilities and challenges of smooth blending of ethnobotanical knowledge into modern healthcare practices. Research shows that the traditional uses of medicinal plants across the world are way much different in different cultures. It also dives into the depths of indigenous knowledge, representing a wide range of proven remedies for various health issues or diseases. But the attention is now shifted to the idea that how can we use the traditional ways in the modern framework for advance medicines. Drawing examples from various regions, the research highlights successful collaborations between traditional healers and modern healthcare practitioners. It not only emphasizes the compatibility and effectiveness of traditional remedies but also examines the challenges of maintaining consistent quality in this complex era of intricate which is coming together. It also covers the ethical concerns, which are carefully considered and ensuring them thorough the evaluation of the complexities which is involved in the traditional medicines. The aim of research is to be the catalyst for changing the conversation about holistic healthcare and modern medicines. By making a strong case for integrating ethnobotanical wisdom into mainstream medical practices, this study also advocates that the shift towards a modern healthcare is more inclusive and culturally sensitive. It will also have the impact, which goes beyond the academic realm and aiming to inform and influence policymakers, healthcare professionals and researchers towards the approach which have more balanced and enlightened direction for healthcare delivery.

**Keywords:** Ethical concerns, Healthcare practices, Indigenous knowledge, Medicinal plants.

**DELINEATING THE POTENTIAL OF HALOTOLERANT RHIZOBACTERIAL DIVERSITY ISOLATED FROM *SUAEDA FRUTICOSA* FOR GROWTH PROMOTION OF GLYCOPHYTIC PLANT *VIGNA RADIATA* (L.) UNDER SALINITY STRESS**

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**Abstract:**

This study was conducted to estimate the diversity of halotolerant bacteria associated with rhizosphere of halophytic plant *Suaeda fruticosa* (Forssk L.) and their potential for the plant growth promotion of *Vigna radiata*; a glycophytic plant; prone to damage under 40mM salinity stress. Bacterial strains isolated in this study were found to tolerate salt up to 1.5M (17.55% NaCl). 16S sequencing revealed their resemblance with *Kushneria avviceniae* R2S4 and *Halomonas elongate* S3W, *Brachybacterium paraconglomeratum* Ra11S4, *Staphylococcus equorum* (Rb8S4), *Rothia endophytica* (Rb2S6), *Oceanobacillus picturae* (Ra6S3), *Microbacterium indicum* (WS6) and *Halomonas creatinolyticus* (DO). These strains were found active in the production of indole-3 acetic acid (IAA), under salinity stress of 0.5M (2.92% NaCl) that ranged from 27.1 to 58.25 µg/ml with L-tryptophan supplementation as compare to the un-amended media that ranged between 8.3-25.5 µg/ml. GC-MS analysis revealed higher quantity of pure IAA in the bacterial extracts, in *K. avviceniae* R2S4 and *H. elongate* S3W it was 1.20 µg/ml and 1.22 µg/ml, respectively. UPLC Quantification of Gibberellic acid within bacterial extracts showed 12.61 µg/ml of production in *B. paraconglomeratum* Ra11S4. These strains also showed potential for HCN production, Cellulose activity, nitrate reduction and nitrogenase activity. These strains were further subjected to plant under salinity stress of 50mM-150mM in field. In field trials bacterial strains *Brachybacterium paraconglomeratum* (Ra11S4), *Staphylococcus equorum* (Rb8S4), *Rothia endophytica* (Rb2S6) were found to be best in increasing fresh biomass up to 2.4 folds and number of pods up to 211% for the plant *Vigna radiata*. Estimation of halotolerant bacterial diversity showed their potential to be useful for the production of biofertilizer.

**Keywords:** Auxin, rhizobacteria, *Vigna radiata*, biofertilizer, Gibberellic acid

**AN ETHNOMEDICINAL APPRAISAL AND THEIR POTENTIAL USES FOR DIFFERENT AILMENTS IN DISTRICT KURRAM (TRIBAL AREA) PAKISTAN**

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**Abstract:**

The present work was conducted at the Pakistan-Afghanistan border in the agency of Kurram (33° 49' 07" N and 70° 10' 24" E), an administrative part of the late federally administered tribal area (FATA) of Pakistan. The study was aimed to document the medicinal flora based on local information i.e. local classification, part used, drug preparation and dosage. Ethno-medicinal data was obtained through semi structured interviews after obtaining the respondents' prior informed consent. During field visits 72 people were interviewed (56% men), (28% women)

and 16% “Hakeems” (local healers, all men). One hundred and fifty (150) plant species belonging to 131 genera in 86 families were documented. Asteraceae was the dominant family (16 species, 18.60%), followed by Solanaceae (6, 6.97%), Lamiaceae and Rosaceae contributed (5, 5.88%) each, while the remaining families were represented by less than 4 species. Biological spectrum showed herbaceous as leading habit with 77 species (52%) followed by shrubs 36 (24%) and trees 35 (23%), while parasite contributed 2 (1%) only. Leaves were the dominant utilized part with 70 species (35.71%). Other parts viz. fruits, whole plants, flowers, seeds and roots revealed their contribution by 22 (10.47%), 21 (10%), 20 (9.52%), 18(8.57%) and 16 (7.61%) respectively. The documented plants were found to be effective for 64 disorders, from simple to complicated health issues. In a quantitative analysis 31 plant species showed fidelity level ranges from 33 - 100% and relative frequency of citation from 0.03 to 0.28. The collection includes few endemic and sub endemic species e.g. *Podophyllum emodi*, *Seriphidium kuramense*, *Rhododendron afghanicum*, *Rhododendron collettianum*, *Hertia intermedia*, *Delphinium vestitum* and *Colchicum aitchisonii*. Conservation issues related to plant use need to be investigated.

#### **PERFORMANCE OF DIVERSE RAPESEED GERmplasm FOR SALT TOLERANCE UNDER FIELD CONDITIONS**

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#### **Abstract:**

Rapeseed is an important source of edible oil, and several developing countries mostly rely on its import, which consumes their foreign currency reserves. Production of rapeseed is confronted with various stresses, among which salinity is the most yield limiting significantly affecting its growth, development and decrease in yield and oil content. Current study was undertaken to assess 120 germplasm of different origin with the objectives to evaluate them for salt tolerance and to assess their adaptability level under saline conditions. For this purpose, 60 Pakistani domestic and 60 exotic genotypes with 3 standard check varieties were selected to check their potential for growing under saline field conditions. Original soil characteristics

were; pH 8.6, EC 3.32 dS m<sup>-1</sup>, SAR 14.6, total organic carbon 0.67%, mineral N 11.5 mg kg<sup>-1</sup>, Available-P 5.21 mg kg<sup>-1</sup>, and Extractable-K 56.7 mg kg<sup>-1</sup>. Principal component analysis was carried out to analyze the genetic variability among different genotypes. The results revealed that CBN30, CBN44, CBN1, CBN47, CBN43, CBN29, CBN48, CBN28, CBN16 CBN46, CBN58, Super canola, NARC Canola from domestic genotypes and ZJU966, ZJU964, ZJU983, ZJU975, ZJU970, ZJU1000, ZJU1003, ZJU1015, ZJU1058 from exotic genotypes have higher tolerance against salt stress. As better performing genotypes were more suitable for saline soil, so these genotypes can be used in further breeding programs to develop high yielding and salt tolerant varieties of rapeseed.

#### **PRELIMINARY SCREENING OF ANTI-ARTHRITIC POTENTIAL OF DIFFERENT SPECIES OF TEA. AN ETHNO BOTANICAL REVIEW**

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#### **Abstract:**

Arthritis is about inflammation and it is a type of auto-immune disease followed by pain, stiffness and gets worse with time. The purpose of this review was to study some ethnobotanical plants to treat arthritis and its types which are easy to use in daily routine.

Extensive and comprehensive literature search was conducted using about different articles obtained via electronic scientific databases such as Google, Google Scholar, PubMed, Science Direct, and Web of Science as well as journals obtained through citations or directly from their website. The keywords used during the search included distribution, morphology, ethnobotanical, phytochemistry, nutritional composition, toxicology, and pharmacological activities. In this article we have studied different varieties of tea for their antiarthritic potential. Antioxidant properties of different forms of tea are important for the their antiarthritic activity that include catechin, epicatechin, gallic acid, epigallocatechin gallate and several other similar antioxidants.

Tea also contains several bioactive components such as ascorbic acid, polysaccharides, theanine and polyphenols like theaflavins which help in the prevention of various chronic diseases like arthritis.

#### **LAVENDER OIL AROMATHERAPY: A REVIEW**

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Aromatherapy is one of the complementary therapies using essential oils as the major therapeutic agents to treat several diseases. Essential oils have been known for their medicinal properties in traditional medicine. Modern society is practicing aromatherapy, and studies show that lavender is the most worldwide purchased plant for essential oil extraction. Numerous techniques are used to extract the essential or volatile oils from the plant's fruits, stem, leaves, roots, flowers, and bark.

A systematic research was conducted using search engines including Medline, Pubmed, Google Scholar, and Scopus databases. Among the 1503 articles yielded, 18 met eligibility criteria.

Lavender essential oil is well-known to have medicinal properties like antimicrobial activity, anxiolytic, anti-inflammatory, antifungal properties, sleep quality and cognitive behavior enhancement. Most of the studies result in positive effects and bare minimum or no adverse effects.

Owing to the exceptional properties exhibited by Lavender it is speculated that lavender essential oil aromatherapy could become a hallmark in enhancing overall quality of life although further investigation is required to reach robust conclusions.

### **SYNTHESIS OF *LACTUCA ORIENTALIS* (BOISS.) BOISS. BASED AG<sub>2</sub>ONPS AND THEIR BIOLOGICAL APPLICATIONS**

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#### **Abstract:**

The current study is the attempts to obtain and study bio-activities of aqueous leaf broth from a medicinal plant of *Lactuca orientalis* (LO), when conjugated with silver oxide nanoparticles (Ag<sub>2</sub>ONPs). The integrity of plant extract-conjugated LO-Ag<sub>2</sub>ONPs was confirmed by different characterization methods, including Ultraviolet (UV)–visible spectroscopy, XRD (X-Ray Diffraction), Fourier Transform (FT) Infrared (IR) spectral studies, energy-dispersive spectral studies (EDS), SEM (scanning electron microscopy), and RS (Raman spectroscopy). The size of LO-Ag<sub>2</sub>ONPs was approximately 18 nm, which was measured through XRD. Moreover, the energy-dispersive spectral studies (EDS) confirmed that nano-sized particles have zinc in its purest form. The bioactivities of LO-Ag<sub>2</sub>ONPs; cytotoxicity, anti-leishmanial assay, anti-cancer activity, anti-radical capacities, inhibitory potentials against different enzymes and biocompatibility tests were intensively studied and confirmed. The potential cytotoxicity against brine-shrimps (IC<sub>50</sub>: 29.51 µg/mL), anti-cancer cells (HepG2 cancer cells IC<sub>50</sub>: 11.07 µg/mL) and anti-leishmanial parasites (Promastigotes: IC<sub>50</sub>: 15.09 µg/mL, Amastigotes: IC<sub>50</sub>: 41.14 µg/mL) was revealed. The excellent anti-radical capacities (TRP: 84%, DPPH: 82%, and TAC: 73%.) are reported. Further, the inhibitory potentials against

different enzymes (PK assay: 14 mm, alpha-amylase assay: 23%) is also confirmed. Further, our green nanoparticles have shown excellent activity against selected multidrug resistant clinical isolates of bacteria. Altogether, the results revealed that LO-Ag<sub>2</sub>ONPs are non-toxic, biocompatible, and have considerable potential in biological applications.

**BIOACTIVITIES OF ZIZIPHUS SPINA-CHRISTI FRUITS EXTRACTS  
CONJUGATED WITH COBALT OXIDE NANOPARTICLES**

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**Abstract:**

Cobalt oxide nanoparticles (NPs) has received the specific attention of scientific community due to their unique and fascinating properties; small size, shape, high surface area and high surface energy. Here, a nontoxic, eco-friendly, cost-efficient and green chemistry method has been established for the synthesis of cobalt oxide nanoparticles (CoONPs) using aqueous plant extract of *Ziziphus spina-christi* fruits. The fabrication of green CoONPs was determined by shift in the color of the reaction mixture from greenish brown to reddish brown. Different other physicochemical properties of CoONPs were studied using different analytical characterization tools (UV-Vis spectroscopy, SEM, FT-IR, DLS, EDX and XRD) to determine phase purity, morphology, crystalline nature and involvement of different functional groups. The Scherrer equation determined an average crystallite size of about 32.21 nm. FT-IR analysis revealed the presence of different functional groups involved in synthesis, capping and stabilizing of bio-inspired CoONPs. Antibacterial and antifungal potentials were evaluated using different concentrations of 1000–32 µg/mL which has revealed significant results. Moreover, cytotoxicity potential was examined using brine shrimps cytotoxicity assay with IC<sub>50</sub>: 37.09 µg/mL. Radical scavenging DPPH assay (87%) was determined to assess the antioxidant potential of CoONPs. Overall, CoONPs may be desirable and have shown potential *in vitro* biological activities, which calls for more *in vivo* research using a variety of animal models in order to identify possible leads for novel therapeutics for a variety of chronic diseases.

**BIOGENIC SYNTHESIS, CHARACTERIZATION, AND IN VITRO BIO-  
INVESTIGATIONS OF NICKLE OXIDE NANOPARTICLES (NIONPS) USING  
RHAMNUS VIRGATA FRUITS**

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**Abstract:**

The current research aimed to study the eco-friendly production of nickel oxide nanoparticles

(NiONPs) using *Rhamnus virgata* fruits extract as a potent reducing and stabilizing agent. Furthermore, characterization of the obtained RV-NiONPs was undertaken using UV, FT-IR, XRD, DLS, SEM, and EDX to investigate the morphology, size, and elemental composition. The size of the NiONPs was found to be ~19.53 nm with a spherical shape and an almost uniform distribution. Furthermore, in vitro studies were performed to reveal different biological potential. The NiONPs exhibited efficient DPPH free radical scavenging potential (82.3%), reducing power (65.3%), and total antioxidant capacity (81%) to estimate their antioxidative power. Furthermore, antibacterial and antifungal potentials were evaluated using the disc diffusion method against various bacterial and fungal strains, and minimum inhibitory concentration (MIC) values were also determined. Biosynthesized NiONPs showed enhanced antibacterial and antifungal activities. A brine shrimp cytotoxicity assay was conducted to measure the cytotoxicity potential (LC<sub>50</sub>: 7.26 µg/mL). In addition, biocompatibility tests were performed to evaluate the biocompatible nature of RV-NiONPs using red blood cells. An alpha-amylase inhibition assay was carried out with 59% inhibition. Overall, the current study demonstrated that NiONPs biosynthesized utilizing *Rhamnus virgata* fruits are cost-effective, environmentally friendly and straightforward alternative to conventional methods of silver nanoparticle synthesis. Furthermore, the obtained RV-NiONPs revealed significant bioactivities, making them promising candidates for various applications in medicine and other fields.

## **HONEY POLLEN: USING MICROSCOPIC TECHNIQUES TO UNDERSTAND THE MORPHOLOGY OF MELLIFEROUS PLANTS DIVERSITY IN TROPICAL AREAS OF PAKISTAN**

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### **Abstract:**

Tropical honey is a naturally sweet product produced by honey bees from pollen, honeydew, and nectar of various plants. Melliferous characteristics of both crops and weed plants indicate their valuable importance for honey production. Bee keeping is one of the most important profession of the Bannu district. This study aimed to investigate the morphology of foraging preferences of honey bees and systematic description of Bee floral diversity in the tropical environment of district Bannu (Pakistan). For this purpose, extensive field surveys were conducted from February to April to observe and collect flowers of melliferous flora. During field survey the melliferous plant were observed as frequently visited by honey bees. Slides for Light microscopic studies were prepared with the help of acetic acid, glycerin jelly, and anthers of flowers. Pollens of collected flowers were acetolyzed and described quantitatively and qualitatively using light microscopy. Exine sculpturing of each pollen was determined by scanning electron microscopy. Quantitative characteristics including P/E ratio, exine thickness, the number of colpi, the number of pores, equatorial diameter, polar diameter, colpus width, colpus length, spines number, length and width of spines were determined and analyzed statistically using software SPSS IBM statistics 20. A total of 10 melliferous plants species belonging to 10 different families were identified for the Foraging preferences of Bees namely *Cicer arietinum*, *Asphodelus tenuifolius*, *Euphorbia helioscopia*, *Parthenium hysterophorus*, *Sonchus asper*, *Datura innoxia*, *Eruca vesicaria*, *Acacia nilotica*, *Salvia mocroftiana*, and



*Anethum graveolens*. Pollen types shows variation from monocolpate to hexacolporate and psilate to echinate. The present study highlighted the significance, and morphology of the foraging preferences of bees which may lead to the identification of useful botanical potential and sources for beekeepers and to check the honey quality concerning pollen usage in the study area. The study explore the bee floral diversity to help bee keeper for managing the bee keeping profession to produce good quality for export.

**Keywords:** beekeeping, bees, foraging, honey, light microscopy, melliferous flora, pollen, scanning electron microscopy.

### **GREEN NANO SYNTHESIS OF ZIRCONIUM OXIDE VIA AQUEOUS LEAVE EXTRACT OF *ALTERNANTHERA PUNGENS***

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#### **Abstract:**

Sustainable chemistry has devoted a lot of attention to the green synthesis of Nanoparticles. The production of NPs using the plant-extract-mediated technique has the benefits of being affordable, environmentally friendly, non-toxic easily scaled up, all of which are very helpful for the advancement of sustainable nanoscience. Bio-mediated synthesis of metal oxide nanoparticles using plant extract is a promising alternative of traditional chemical synthesis. The production of Zirconium Oxide (ZrO<sub>2</sub>) nanoparticles via Biological method offer a potential avenue in nanotechnology. In this study, the reducing and capping abilities of a leaf extract are used for fabrication of ZrO<sub>2</sub> nanoparticles. Highly stable and tetragonal phase zirconium oxide nanoparticles were synthesized using *Alternanthera pungens* leaves extract and were characterized by using X-ray diffraction (XRD), transmission electron microscopy (TEM) scanning electron microscopy (SEM), Energy dispersive X-ray analysis (EDX), Thermo-gravimetric Analysis (TGA) and Fourier-transform infrared spectroscopy (FT-IR). In order to regulate the size, shape, and stability of the produced ZrO<sub>2</sub> nanoparticles, the study emphasized on optimizing synthesis parameters, such as pH, reaction time temperature, concentration. The synthesized zirconium oxide nanoparticles were confirmed by XRD and FTIR spectra. Morphology studies indicates spherical nature of the zirconium oxide NPs and EDX shows the highly pure zirconium oxide nanoparticles. Finally, the current study has clearly demonstrated that the zirconium oxide NPs are pure and nano in nature. Therefore, the study reveals the use of plant extract in green nanotechnology offers new opportunities for the production of efficient, ecofriendly multifunctional ZrO<sub>2</sub> nanoparticles with the desirable properties required for the development of biosensors, biomedicine, cosmetics, and nano-biotechnology.

### **EVALUATION OF *BACILLUS* SPP. AGAINST INCITANT OF CHILLI LEAF SPOT (*XANTHOMONAS* SP.)**

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**Abstract:**

In current study, we sought to investigate the native soil antagonists as well exotic *Bacillus thuringiensis* (Bt) against chilli bacterial pathogens viz., *Pseudomonas syringae* and *Xanthomonas* sp. During the study, putative native soil antagonists were isolated by plating heat shocked (60°C) serial dilutions on nutrient agar plate. Among putative isolates, two (SK, CM) were further characterized on the basis of phenotypic and biochemical characteristics which revealed these were gram and catalase positive while urease, oxidase and arginine dihydrolase negative. In order to assess the efficacy of SK, CM and exotic Bt against *Pseudomonas syringae* and *Xanthomonas* sp., dual culture confrontational assay was performed. SK, CM and Bt were only able to restrict the growth of *Xanthomonas* sp. not *Pseudomonas syringae*. Therefore, further tests only performed containing *Xanthomonas* sp. Chemical compatibility with copper sulphate, topsin M, sodium benzoate was assessed by food poisoning method. Except, topsin M rest of chemicals showed inhibitory effect on microbial growth. Antibiotic sensitivity (erythromycin, streptomycin, tetracycline, penicillin) of *Xanthomonas* sp, SK, CM along Bt was performed by disc diffusion method. Results showed minimum zone (0mm) of inhibition was formed against penicillin while maximum (29 mm) against streptomycin. Antagonists' efficacy was also tested in planta by detached leaf and seedling inoculation method. Leaves of susceptible chilli cultivar were pre inoculated with antagonists and subsequently re-inoculated with *Xanthomonas* sp. along mock treatment with sterilized water. Leaves inoculated with *Xanthomonas* sp. only were considered as a positive control. Except positive control, leaves remained asymptomatic after 7 days of post inoculation. Pot experiment based upon soil drenching and foliar spray inoculation also showed that plant initially treated with antagonists showed resistance against subsequent application of pathogen in comparison to positive control. The result of this pilot study showed that native putative *Bacillus* spp. isolates (SK, CM) along commercial exotic Bt have potential to circumvent *Xanthomonas vesicatoria* both in local as well in distant tissue.

**COMPREHENSIVE ANALYSIS OF PHYTOCHEMICAL COMPOSITION &  
QUANTITATIVE PHENOLIC PROFILING BY HPLC AND ASSESSMENT OF  
ANTIOXIDANT ACTIVITY IN BASSIA INDICA**

Muhammad Rashid<sup>1,2,3</sup>, Saleha Ashfaq<sup>1\*</sup>, Shafique Ur Rehman<sup>1</sup>, Aziz Ullah<sup>1</sup>, Siraj Khan<sup>2,3</sup>,  
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**Abstract:**

Medicinal plants have got the attention of researchers and scientists globally in the last few decade due to their therapeutic efficiency, low cost and minimal side-effects of the drugs derived from them. *Bassia Indica* is one of the most important herbs in traditional medicine, having a wide spectrum of biological activities. Prime objective of this research was to identify the phytochemical constituents and pharmacologically important compounds of this species . The plant extracts were prepared using ethanol, acetone and n-hexane. Various methods of phytochemical screening were used for this purpose and antioxidant activity was determined by using DPPH (2,2-diphenyl-1-picryl-hydrazyl-hydrate) free radical scavenging activity. Result of phytochemical revealed the presence of secondary metabolites including Alkaloid, Steroids, Flavonoids, Terpenoids, Tannins, Saponins, Glycosides, Amino acids, Phenolic, Carbohydrates and Iodine. The spectrophotometric analysis showed that ethanolic extract had higher amount of total phenolic ( $299.6 \pm 0.02$  µg/ml of plant extract) and acetone extract exhibited higher amount flavonoid compound ( $484.9 \pm 0.09$  µg/ml of plant extract). The HPLC analysis revealed the maximum percentage of phenolic compounds in methanol extract. (13.980 RT). DPPH assay showed that the ethanolic extracts of *Bassia indica* had the highest percentage inhibition (52.51%), while acetone had lowest value of percentage inhibition (48.05%). Qualitative and Quantitative phytochemical analysis showed that *Bassia indica* possessed a significant amount of phenolic and flavonoids compound. In conclusion *Bassia indica* is a potential source of bioactive compound which can further be exploited for pharmaceutical preparation.

#### **PHYTOCHEMICAL SCREENING, ANTI-DIABETIC AND ANTIOXIDANT ACTIVITIES OF *RHAMNUS PENTAPOMICA* LEAVES EXTRACT *IN VITRO***

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#### **Abstract:**

Medicinal plants are the main source of different phytochemicals and are used for the treatment of various diseases including cancer, inflammation, diabetes, and several others. *Rhamnus pentapomica*, phytochemicals and *in vitro* activities were limited explored. Hence, the research was carried out to investigate the phytochemical analysis, antioxidant, and antidiabetic activities. The phytochemicals were checked through qualitative and quantitative analysis. In qualitative analysis, eleven tests were performed in four different solvents (aqueous, methanol, ethanol and diethyl ether) and results revealed that flavonoids, lignin (Labat test), terpenoid compounds were present in all four extracts. Sterols were present in aqueous, methanol and ethanol. Triterpenes and lignin (Dahlman test) were present in methanol and ethanol extracts while glycosides were present in aqueous and ethanol extract. In addition, total phenolic content (TPC), total tannin content (TTC) and total flavonoid content (TFC) of different extracts (aqueous, methanol and ethanol) were checked through quantitative analysis. TPC and TTC showed linear relations while in TFC aqueous extract showed slightly linear relations when compared to standard. *R. pentapomica* leaves were used to check the anti-diabetic and

anti-oxidant potential of the aqueous, methanol and ethanol extracts. Hence these extracts were tested for alpha-amylase and DPPH (2,2-diphenyl-1-picryl-hydrazyl-hydrate) inhibition. In alpha-amylase inhibition assay, the aqueous, methanol and ethanol extracts were dose-dependently inhibiting the alpha-amylase level. While the highest inhibition (%) was present in aqueous and lowest in ethanol extract. On the other hand, DPPH results revealed that aqueous, methanol and ethanol extracts were significantly and dose-dependently increases. The highest inhibition (%) was present in methanol while the lowest (%) inhibition was in ethanol extract. Therefore, these results revealed that *R. pentapomica* possessed a significant antidiabetic and antioxidant potential.

### **SYNTHESIS OF ZN-DOPED TiO<sub>2</sub> NANOPARTICLES USING ZANTHOXYLUM ARMATUM EXTRACT**

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#### **Abstract:**

The current research focused on the Zn-doped TiO<sub>2</sub> nanoparticles using *Zanthoxylum armatum* extract. Green synthesis is a simple, non-toxic and eco-friendly approach to the synthesis of nanoparticles. It is also beneficial for environmental and biomedical applications. To synthesize Titanium dioxide (TiO<sub>2</sub>) a simple, non-toxic, and eco-friendly green method was successfully adopted. *Zanthoxylum armatum* leaf extract was utilized as a capping and stabilizing agent to lower the metal ions during the manufacture of TiO<sub>2</sub> nanoparticles. We have optimized the different parameters like concentration, time, and temperature. The synthesized Zn-doped TiO<sub>2</sub>NPs were characterized throughout this research work using various instrumentation techniques. The highest absorbance of titanium dioxide was detected at 360 nm using a UV/visible spectrophotometer. According to FTIR research, the peak for TiO<sub>2</sub> is located at 600 cm<sup>-1</sup>; however, doping causes the peak to move to 610 cm<sup>-1</sup> to replace the Ti ion in the TiO<sub>2</sub> crystal lattice. Scanning electron microscope investigated that TiO<sub>2</sub> has a definite shape and morphology. Following the validation of characterization, the synthesized Zn-doped TiO<sub>2</sub>NPs were applied against various pathogens to study their anti-microbial potentials. The anti-bacterial activity of Zn-doped TiO<sub>2</sub> has shown robust anti-bacterial activity against two gram-ve bacteria (*Salmonella* and *Escherichia coli*) and two gram-ve bacteria (*Staphylococcus epidermidis* and *Staphylococcus aureus*). The maximum zone of inhibition was found in Zn-doped TiO<sub>2</sub>, while the minimum zone of inhibition in pure TiO<sub>2</sub>. Synthesized Zn-doped TiO<sub>2</sub> has demonstrated strong antifungal efficacy against a variety of fungi. The maximum zone of inhibition was present in (*Candida glabrata* and *Candida albicans*), whereas minimum inhibition in (*Aspergillus flavus* and *Aspergillus niger*). Moreover, doping TiO<sub>2</sub> nanoparticles with metal oxide greatly improves their characteristics; as a result, doped metal oxide nanoparticles perform better than doped and un-doped metal oxide nanoparticles. Compared to pure TiO<sub>2</sub>, Zn-doped TiO<sub>2</sub> nanoparticles exhibit considerable anti-microbial activity.

**SYNTHESIS AND BIOLOGICAL ACTIVITIES OF IRON DOPED TITANIUM DIOXIDE NANOPARTICLES USING MORUS ALBA L. EXTRACT**

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**Abstract:**

Green synthesis of nanoparticles (NPs) is progressing because of its effortlessness in synthesis, cost, non-toxicity and sustainability. Titanium dioxide (TiO<sub>2</sub> NPs) was prepared using the leaf extract of *Morus alba*, which serves as a reducing and stabilizing agent. The current study was directed to investigate and analyze impact of pure Titanium dioxide (TiO<sub>2</sub>) and iron-doped TiO<sub>2</sub> nanoparticles against several pathogens. The synthesized TiO<sub>2</sub> were characterized by different techniques. UV analysis of synthesized TiO<sub>2</sub> elucidated absorbance at 380nm. In SEM examination the Titanium nanoparticles were spherical in shape and 32 to 48 nm in size. By FTIR analyzing molecular groups from leave extract that may be involved in the bio reduction process, the stabilizing mechanism was confirmed. FTIR revealed that pure TiO<sub>2</sub> has 600cm<sup>-1</sup> peak while on doping the peak is shifted to 617cm<sup>-1</sup>. TiO<sub>2</sub> and Fe doped NPs were examined for their characteristics. The antibacterial activity of FeNPs synthesized from *M. alba* against *Salmonella typhi*, *Escherichia coli*, *Staphylococcus epidermidis*, and *Staphylococcus aureus* was noticeably higher. With the exception of *Candida albicans*, FeNPs shown improved qualities in an antifungal strategy against *Candida glabrata*, *Aspergillus flavus*, and *Aspergillus niger*. This work so suggests that doping increases the antimicrobial capabilities of nanostructures. Significant effects against reducing the microbial activity of various strains shown by FeNPs. The widespread use of green nanoparticles as an effective substitute for chemical fungicides and pesticides is responsible for these encouraging outcomes. Doping is easy and best method to increase the photocatalytic and catalytic properties of Fe-doped TiO<sub>2</sub> which further use in many industrial and pharmaceutical applications. Its commercial use and use as a biological control for the management of plant fungal infections must be explored.

**PHYTOCHEMICAL SCREENING, ANTI-ALPHA-AMYLASE AND ANTIOXIDANT POTENTIAL OF DEBREGEASIA SALICIFOLIA ROOT BARK EXTRACT**

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**Abstract:**

Medicinal plants contain phytochemicals in one or more of its organs that are used for therapeutic purpose. These plants possess different pharmacological potential for different diseases. As *Debregeasia salicifolia* is also a plant of medicinal importance with various pharmacological activities including anticancer, antinociceptive, antioxidant,

antihyperlipidemic, antifungal, antibacterial and antidiabetic activities. Therefore, the purpose of the current study is to explore the medicinal properties of *D. salicifolia* root bark. The phytochemicals of three different (methanol, ethanol and aqueous) extracts were checked qualitatively and quantitatively. quantitative approach indicated the presence of tannin, phenols and flavonoids as causative agent of antioxidant and antidiabetic activity. In alpha-amylase test all the concentrations were significant and dose dependently increases compared to standard, the highest inhibition was shown by aqueous extracts and the lowest % inhibition was present in ethanol extract. In the anti-oxidant, the graph has significant relation and dose-dependently increases. The highest % inhibition was in methanol, while the lowest % inhibition was indicated by aqueous extract. Antidiabetic effect was checked through alpha-amylase inhibition and antioxidant through DPPH assay. This study establishes that the extract has high efficacy with comparatively less toxicity that can be used for DM management.

### **SYNTHESIS OF TiO<sub>2</sub> NANOPARTICLES USING *BERBERIS LYCEUM* ROYLE EXTRACT**

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#### **Abstract:**

*Berberis lyceum* belongs to the family Berberidaceae and it is also known as Indian barberry in English, kashmal or kasmal in Hindi, and Ishkeen in Urdu. It is distributed in the Himalayas Mountains, temperate and semi-temperate areas of Pakistan, India, Afghanistan, Nepal, and Bangladesh. *B.lyceum* is the oldest medicinal plant used to treat different diseases like liver disorders, intestinal disorders, skin infections, cough, diabetes mellitus, etc. In the current study, Titanium oxide acts as the precursor, and leaf extract acts as the reducing agent in the green synthesis method used to synthesize Titanium dioxide (TiO<sub>2</sub>) nanoparticles from *Berberis lyceum* plant leaves extract. The characterization was done by using UV-visible absorbance spectroscopy, Fourier transform infrared spectroscopy (FTIR), and scanning electron microscopy methods (SEM). The presence of spherical-shaped TiO<sub>2</sub> confirmed the successful production of nanoparticles by using a scanning electron microscope. FTIR study revealed the presence of alcohols and phenolic compounds responsible for the formation of TiO<sub>2</sub>NPs. The wavelength of synthesized TiO<sub>2</sub> nanoparticles was recorded as 380 nm (0.197) absorbance by using UV-visible absorbance spectroscopy. The disc method was used to investigate the antifungal activity of the generated TiO<sub>2</sub> NPs at various concentrations and *Aspergillus niger* showed a maximum zone of inhibition against nanoparticles. The observation is that the inhibition zone increases proportionally with the increased nanoparticle concentration. The synthesized nanoparticles were also subjected to free radical scavenging activity using DPPH assays. The DPPH scavenging activity of the TiO<sub>2</sub> nanoparticles exhibited a maximum IC<sub>50</sub> value is 49.21%.

**Keywords:** *Berberis lyceum*, Titanium dioxide, Nanoparticles, DPPH, SEM, FTIR,

## **BIODIESEL SYNTHESIS, OPTIMIZATION AND CHARACTERIZATION OF NON-EDIBLE OIL SEEDS VIA HIGH PERFORMANCE PHYTO-NANO CATALYSTS**

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### **Abstract:**

Rapid increase in population and increasing energy demand led to energy crisis globally which leads to the search for alternative sources of energy. Biofuel is an attractive solution for offsetting fossil fuels for a number of different reasons. From socioeconomic perspective edible seeds oil should be substituted by non-edible, lower-cost and reliable feedstock for biodiesel production. In this study *Citrus medica* was explored as a viable non-edible seed oil (33% w/w) source for biodiesel synthesis through the use of recyclable and environmentally friendly zinc oxide nanoparticles (NPs), which were made from the aqueous leaf extract of *Portulaca oleracea*. Advanced methods such as Energy Diffraction X-Ray (EDX), Scanning Electron Microscopy (SEM), and X-ray diffraction (XRD) were used to characterize green nanoparticles of zinc oxide. At the ideal reaction conditions of oil to methanol ratio (6:1), loading of catalyst (0.14), reaction duration 120 min and temperature 85 ° C, a maximum yield of 91% of methyl ester was obtained. Methyl ester was detected in the synthetic biodiesel sample by both nuclear magnetic resonance and Fourier-transform infrared spectroscopy (FTIR). Gas chromatography-mass spectrometry (GC–MS) research revealed five different methyl esters' peaks in the biodiesel. Methyl esters' fuel characteristics were examined and determined to be comparable to international standards. According to the findings, *Citrus medica* is a potentially environmentally friendly feedstock for the sustainable production of biodiesel by utilizing green nanoparticles of copper oxide as a catalyst,

**Keywords:** Green nanoparticles, Zinc oxide catalyst, Non-edible seed oil, *Citrus medica*, Biodiesel

## **POTENTIATION OF ANTIBACTERIAL ACTIVITY OF CEFIXIME IN SYNERGY WITH SKIMMIA LAUREOLA FRANCH. AGAINST RESISTANT BACTERIAL ISOLATES**

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Beneficial interaction known as synergism between plants extracts and antibiotics is a possible solution to bacterial resistance. The aim of this study is to assess the synergistic antibacterial

effects of *Skimmia laureola* (*S. laureola*) extracts and cefixime against resistant bacterial isolates. Successive extraction with sonication aided maceration was used to prepare *S. laureola* ethyl acetate (EA), methanol (M), and aqueous (Aq) extracts, which were subjected to chromogenic assays for phytochemical evaluation and antioxidant activity. Antibacterial activity of extracts was determined using disc diffusion and microbroth dilution assays. Synergistic evaluation of extracts and mechanistic insights were provided by Checkerboard method, time kill kinetics and protein estimation studies. Aqueous extract exhibited the highest percent extract recovery (7.33%). The highest total phenolic ( $16.95 \pm 0.16$   $\mu\text{g}$  GAE/mg of extract) and flavonoid content ( $10.925 \pm 0.13$   $\mu\text{g}$  QE/mg of extract), as well as notable antioxidant capacity ( $102.86 \pm 0.01$   $\mu\text{g}$  AAE/mg of extract), reducing power ( $121.5 \pm 0.03$   $\mu\text{g}$  AAE/mg of extract), and significant radical scavenging activity ( $18.2 \pm 0.09\%$ ) was exhibited by Aq extract. Extracts showed noteworthy antibacterial activity (MIC 500  $\mu\text{g}/\text{ml}$ ). The checkerboard method revealed total synergism with 4- and 16-fold reductions in the MICs of *S. laureola* extracts and cefixime. Moreover, the synergistic therapy demonstrated a time-dependent reduction in bacterial growth even after nine and twelve hours of treatment. Together with the cell membrane damage brought on by cefixime, it was also found that the synergistic combinations resulted in a greater inhibition of bacterial proteins than the extracts alone. Our findings suggest that *S. laureola* aqueous extract showed maximum synergistic activity and can be a potential candidate for treatment challenges of multidrug resistance.

#### **ANTIBACTERIAL POTENTIAL AND SYNERGISTIC INTERACTION BETWEEN ALKANNA TINCTORIA (L.) TAUSCH AND CEFIXIME AGAINST RESISTANT BACTERIAL STRAINS**

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Antimicrobial resistance makes antibiotic treatment difficult. This study was aimed to evaluate the synergistic antimicrobial interactions of *Alkanna tinctoria* extracts with cefixime against resistant clinical isolates to counteract microbial resistance. Successive extraction with sonication aided maceration was employed to prepare ethyl acetate (EA), methanol (M), and aqueous extracts (Aq), which were subjected to phytochemical and antioxidant colorimetric assays. Antibacterial susceptibility through disc diffusion and microbroth dilution while synergistic evaluation by checkerboard, time kill kinetics and protein estimation studies was performed. Ethyl acetate extract showed maximum percent extract recovery (3.42%). Phytochemical evaluation showed that EA extract had significant amounts of phenols and flavonoids ( $22.9 \pm 0.63$   $\mu\text{g}$  QE/mg of extract and  $15.42 \pm 0.12$   $\mu\text{g}$  GAE/mg of extract respectively). Remarkable total antioxidant capacity ( $130.67 \pm 0.08$   $\mu\text{g}$  AAE/mg of extract), percent free radical scavenging ( $17.3\% \pm 0.08$ ) and reducing power potential ( $121.46 \pm 0.04$   $\mu\text{g}$  AAE/mg of extract) was displayed by M extract. Extracts showed minor to moderate antibacterial activity with MIC value of 500  $\mu\text{g}/\text{ml}$ . Checkerboard method analysis revealed that EA extract against showed total synergism with 8- and 16-fold reduction in extract and



cefexime MIC values resistant *E. coli* and MRSA. The time kill kinetics demonstrated enhanced antibacterial effect when extract and cefexime was used in combination. Protein estimation showed that combinational treatment resulted in more inhibition of bacterial proteins than extract and cefexime alone. Hemolytic analysis revealed that the extracts were biocompatible. In conclusion, *A. tinctoria* extracts have significantly enhanced the antimicrobial potential of cefexime and thus have proven to be a better alternative against multidrug resistance.

**DELINEATING THE ENZYME INHIBITION PROFICIENCY OF GREEN  
SYNTHESIZED SILVER NANOPARTICLES OF *SERIPHIDIUM KURRAMENSE*  
(QAZILB.) Y.R.LING**

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The primary objective of this research is to determine the enzyme inhibitory proficiency and kinetic parameters of green synthesized silver nanoparticles of *Seriphidium kurramense*.

Biogenic silver nanoparticles of each extract namely aqueous, methanol and ethyl acetate (S.K.Aq.NP, S.K.MeOH.NP and S.K.E.A.NP respectively) were prepared by precipitation method. Zeta sizer, UV-Vis spectrophotometer and FTIR were utilized for characterization of nanoparticles. Antioxidant evaluation of nanoparticles was performed followed by hemocompatibility profiling. Enzyme inhibitory proficiency was appraised by standard chromogenic assays including  $\alpha$ -amylase,  $\alpha$ -glucosidase, and urease inhibition assays. Michaelis-Menten equation and Lineweaver-Burk plots were employed to assess the kinetic parameters. Characterization techniques confirmed the synthesis of NPs. Antioxidant profiling showed that aqueous nanoparticles had better ferric reducing antioxidant power ( $110.4 \pm 0.28$   $\mu$ g AAE/mg of sample), total antioxidant capacity ( $108.4 \pm 0.22$   $\mu$ g AAE/mg of sample), while methanolic nanoparticles had better DPPH inhibition (12.57%). Hemocompatibility analysis revealed the NPs to be hemocompatible. A noteworthy antihyperglycemic potential by  $\alpha$ -amylase enzyme inhibition was shown by S.K.Aq.NP ( $57.2 \pm 0.06\%$ ). Substantial inhibition of  $\alpha$ -glucosidase was shown by S.K.Aq.NP as well ( $43.7 \pm 0.30\%$ ). A noteworthy urease inhibition proficiency was exhibited by both S.K. Aq. NP ( $73.1 \pm 0.02\%$ ) and S.K.MeOH.NP ( $73.4 \pm 0.02\%$ ). Enzyme kinetics plots concluded S.K.Aq.NP as a competitive inhibitor of  $\alpha$ -amylase enzyme while S.K.Aq.NP and S.K.MeOH.NP were observed to be competitive inhibitors of urease enzyme. Current findings suggest that the significant inhibition of alpha amylase and urease enzyme by aqueous nanoparticles of *S. kurramense* can be used for the prevention and treatment of various disorders.

**Reckoning the Enzyme Inhibitory Proficiency and Kinetic Properties of Leaves, Stem  
and Flower Extract of *Cirsium arvense* (L.) scope.**

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**Abstract:**

Enzyme inhibition studies are vital for drug development, offering insights into disease treatment and metabolic regulation, shaping the design of effective medications. The current study was aimed to explore enzyme inhibitory proficiency and kinetic properties of leaves stem and flower extracts *Cirsium arvense* (L.) scop. commonly known as Bhurbur. Successive extraction with sonication aided maceration was employed to prepare *C. arvense* extracts ethyl acetate (E.A) and methanol (M). Extracts were subjected to phytochemical and antioxidant colorimetric assays. Enzyme inhibition proficiency of extracts was validated by  $\alpha$ -amylase and glucosidase and protein kinase enzyme inhibitory assays and further evaluated for enzyme kinetics studies. Phytochemical evaluation revealed that *C. arvense* M leaf extract had highest phenolic ( $22.6 \pm 1.5 \mu\text{g GAE/mg}$  of extract) and flavonoid content ( $6.52 \pm 0.5 \mu\text{g GAE/mg}$  of extract). Antioxidant profiling showed that M leaf extract had highest total antioxidant capacity ( $127.1 \pm 1.3 \mu\text{g AAE/mg}$  of extract), percent free radical scavenging ( $22.7 \pm 0.74\%$ ) and ferric reducing antioxidant power ( $140.05 \pm 1.5 \mu\text{g AAE/mg}$  of extract). All the test extracts were found to be hemocompatible. M and E.A Flower extracts showed significant cytotoxicity ( $\text{LC}_{50} \pm 25.8 \mu\text{g/ml}$ ,  $12.63 \mu\text{g/ml}$ ). Among all the extracts screened, M leaf extract has shown 41% inhibition against  $\alpha$ -glucosidase whereas E.A leaf extract exhibited potent  $\alpha$ -amylase inhibition ( $\text{IC}_{50} \pm 165.1 \mu\text{g/ml}$ ) and M stem extract has shown 78.1% urease inhibition. Plots of enzyme kinetics concluded that E.A leaf and flower extracts were competitive inhibitors of  $\alpha$ -amylase enzyme whereas methanolic stem extract and E.A flower extract had shown uncompetitive inhibition like thiourea. E.A flower extract and M extract of stem had shown competitive inhibition against urease enzyme. Findings of the study suggested that M leaf extract and E.A extract of stem have remarkable potential to treat diabetes and gastric ulcers.

**GROWTH PROFICIENCY OF MILK THISTLE AND SAFFLOWER IN NON-TRADITIONAL, ECOFRIENDLY CULTIVATION SYSTEMS**

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**Abstract:**

Hydroponics and aquaponics are two eco-friendly soilless cultivation strategies used for growing crops. *Silybum marianum* (Milk thistle) and *Carthamus tinctorius* (Safflower) are two important medicinal herbs of Asteraceae family grown all over the world for their extensive therapeutic uses. This study was intended to link nutrient gain and ion balance with the growth of milk thistle and safflower cultivated in hydroponics, aquaponics systems along with traditional cultivation of these plants in soil. The experiment was performed at the Aquaponic

set up maintained at Government College Women University, Faisalabad under TDF02-178. Coconut husk was used to raise healthy seedlings of both medicinal plants. After first germination, seedlings were transplanted into three distinct environments: soil (T0), hydroponic (T1), and aquaponic (T2). The pots were filled with sandy loam soil in (T0). The Hoagland solution (pH=5.6 to 7.0) was applied in the hydroponics system. The Nile tilapia (*Oreochromis niloticus* L.) was integrated into an aquaponics system (T2) in which water was completely circulated from the fish tank to the grow beds every two hours throughout the day. Growth attributes including shoot length, root length, fresh and dry shoot weight, fresh and dry root weight, number of leaves were recorded. Data were also collected and evaluated for a nutrient content and ion analysis (sodium, potassium, and calcium). The statistical analysis of the data was done using R studio. The comparison of eco-friendly cultivation systems with soil concluded that hydroponically grown plants showed a vigorous growth. While root length in soil (T0) was recorded to be higher. Results of ion analysis revealed higher concentration of sodium and potassium in hydroponically grown plants while significant calcium levels were found in plants cultivated in aquaponic set up.

### **MORPHOPALYNOLOGICAL STUDIES OF HONEY BEE FLORA OF DISTRICT HARIPUR**

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#### **Abstract:**

Melissopalynology is the study of pollen grains present in honey, and it can provide valuable information about the plants visited by bees and their foraging preferences. Honey is a nutrient-rich natural substance prepared by honeybees from the nectars of flowers. Various factors including botanical composition of the bee diet, geographical locations and environmental features affect the biochemical properties of honey, including its composition in biomolecules. This knowledge is essential for understanding the ecological relationships between honey bees and their foraging habitats, as well as the potential impact of environmental factors on honey production. Present study was aimed to analyze the melissopalynological study of District Haripur to determine the floral sources and to identify the pollen types present in the honey samples collected from various regions of the District Haripur. This information would help determine the ecological origins of the honey and provide insights into the nectar-producing flora that serves as the primary nectar source for honey bees in the region. The study involved examination of the pollen grains composition of multifloral honey samples. From the selected areas 50 samples of honey are collected and out of these only in 31 honey samples pollen grains were present. The vegetation of the area is very dense therefore most of the samples were multifloral because honey bees collect nectar from different plants. In 31 samples, 05 samples were unifloral, 04 samples were bifloral and the rest of the samples were multifloral. From several plant species pollen were collected and the maximum number of pollen grains belong to *Zea mays* L. which contain 568 pollen grains, and sample number 45 of *Citrus medica* V. *limetta* contains 315 pollen grains, which is the second-highest quantity. The current study identified an extensive range of foraging plant sources for honeybees and demonstrated

adequate potential for expanding and sustaining beekeeping in District Haripur. The current study provides new knowledge about the palynological description of the honey bee flora of this region. Moreover, this study identifies an extensive range of foraging plant sources for honeybees and demonstrates adequate potential for expanding and sustaining beekeeping in the District Haripur.

### **SYNTHESIZED HETEROCYCLIC THIAZOLE DERIVATIVES**

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#### **Abstract:**

Thiazoles and their derivatives are found to be associated with various biological activities such as antibacterial, antifungal, anti-inflammatory activities and commonly revealed as an essential part of new and structurally varied natural products that display a broad diversity of biological activities with synthetic compounds. Through modification or derivatization, Thiazole derivatives may be used as a template for the improvement and designing of more effective therapeutic agents. This study aimed to evaluate the biological activities i.e. antibacterial, cytotoxic and antioxidant. The antioxidant activities were determined by using two assays i.e., 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radical and H<sub>2</sub>O<sub>2</sub> scavenging activity. Antioxidant activities DPPH and hydrogen peroxide assay ranges from  $26.76 \pm 0.8$  to  $90 \pm 1.03$  and  $41.3 \pm 0.5$  to  $96.06 \pm 0.8$  respectively. Assessment of cytotoxic brine shrimp lethality bioassay and estimation of the antioxidant activity of new synthesized Thiazole derivatives Antibacterial assay was carried out and it revealed that compound EK.08 possess maximum antimicrobial activity against G (+) and G (-) bacteria. This study also showed that heterocyclic thiazole derivatives are rich in antioxidants. IC<sub>50</sub> value shows the potency of cytotoxic action of derivatives, thus EK.01 and EK.06 possessed least value so it exhibits higher cytotoxic effect and these compounds can also be used to prepare drugs against bacterial diseases, free radicals damages and cancer. The present research will encircle activities of that can be proved to be useful for the design and development of new drugs. Thus Thiazole moiety has gained important necessary position in medicinal chemistry.

**Keywords:** Antioxidants, DPPH, Free Radicals, Cytotoxic Assay, Thiazole Derivatives

### **EFFECTS OF MICROFIBERS FROM WASTEWATERS ON RICE (*ORYZA SATIVA* L.) GROWTH AND METABOLISM**

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**Abstract:**

The ubiquitous presence of microplastics in the environment has raised concerns about potential ecological and agricultural consequences. This study investigates the specific effects of microfiber microplastics derived from wastewater on rice growth and plant health. A controlled greenhouse experiment was conducted, exposing rice plants to varying concentrations of microfiber microplastics commonly found in wastewater effluents. Our results indicate that exposure to microfiber microplastics significantly influences rice growth parameters, including plant height, root length, and biomass. Morphological analyses reveal alterations in root structure, suggesting a potential hindrance to nutrient uptake. Furthermore, physiological assessments demonstrate a correlation between microplastic exposure and diminished photosynthetic efficiency, indicating a negative impact on overall plant health. In addition, the study explores the translocation and accumulation of microplastics within different plant tissues. Microscopy and spectroscopy techniques were employed to trace the movement of microfibers from roots to shoots. The findings emphasize the potential bioaccumulation of microplastics in edible parts of the rice plant, posing implications for food safety and human health. The study provides valuable insights into the intricate interactions between microfiber microplastics and rice plants, shedding light on the potential risks associated with agricultural practices that involve water sources contaminated with microplastics. These findings contribute to the growing body of knowledge regarding the environmental consequences of microplastic pollution and underscore the importance of mitigating measures to safeguard both agricultural ecosystems and food security.

**TRADITIONAL USES AND STATUS OF *BETULA UTILIS* IN DISTRICT CHITRAL  
HINDUKUSH RANGES**

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**Abstract:**

The present study aims to review and document information on traditional uses, population density and commercial aspects and conservation related issues of *Betula utilis* which is commonly known as the Himalayan Birch. *Betula utilis*, belongs to the family Betulaceae, is found at the range from 3000-4500 m. This study further analyses the concerns of conservation and management of this species in view of its importance for ecological, ethnobotanical and economical perspectives. This species is distributed in the temperate Himalayan region, from Kashmir to Bhutan, Afghanistan and Pakistan. For the district Chitral, this species found at high altitude of Eastern Hindukush ranges i.e. Laspur, Shishikoh and Yarkhoon. Taxonomically, a polymorphic species as regards the shape and the number of veins of the leaf, size of the male catkins and the nature of the fruiting scales. *Betula utilis* is one of one of the ethnobotanically important species for Chitral. The outer bark of this species has been used historically for writing as well as for making agriculture tools, timber, medicines, musical tools,

shelter, fire wood, hatching, fodder and making other different items of daily usage leads to reduce its population. Conservation status of this species is not clear. Major threats to *Betula utilis* includes over- harvesting, deforestation, erosion, grazing, and flood. These threats can be overcome by sustainable utilization, micropropagation, in situ and ex situ conservation.

## **IDENTIFICATION OF MELLIFEROUS FLORAL DIVERSITY IN AZAD KASHMIR PAKISTAN**

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### **Abstract:**

Honey Beekeeping is the flourishing environmental friendly economic activity in Azad Kashmir and there is growing interest in the availability of floral resources in the region. Favorable environmental conditions, landscape and floral biodiversity maintains the melliferous pollen flow in the region helping local communities economically. Yet to date, data on the pollen profiling of honey is scarce. In this paper, we quantify the important melliferous flora in the region. For this purpose, a total of sixty honey samples were collected from three divisions of Azad Kashmir. Honey samples were analyzed for the pollen spectra by melissopalynological analysis. Light microscopy and Scanning electron microscopy (SEM) were used for the qualitative and quantitative analysis. Pollens were identified by the size, shape, pollen class and ornamentation. Results showed the presence of more than ninety plant species belonging to thirty seven families. A mix of floral sources including weeds, medicinal plants and native flora was identified in the region. These results were helpful in identifying the plant resources for honey in the region. These findings also identified the balance and imbalance of pollen availability in the area throughout the year. These results will be helpful in the conservation of floral diversity around the apiaries. (For ORAL presentation)

## **ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS OF BANDI SEERAN HILLS, DISTRICT HARIPUR, PAKISTAN**

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### **Abstract:**

The research was carried out to investigate ethnomedicinal uses of plants and their conservation status in Bandi Seeran hills. Because of the extension and representation of the Hills, the region

is endowed with a diversified and distinctive flora. Data was collected through questionnaire by interviewing 50 local inhabitants. Total of 43 plant species, that belongs to 27 families and 40 genera had been reported from area. The inhabitants utilized numerous plant parts, including rhizomes, roots, stems, leaves, flowers, and fruits, for a variety of reasons in their daily lives. Throughout the research, it was discovered that the family Asteraceae contributed the most of the plant species (05) to indigenous uses, following family Solanaceae (04), Fabaceae (03), while the remaining families possess one or two species each. The assembled species were identified, preserved and voucher specimens were submitted in the herbarium of the University of Haripur. The analysis of the data revealed that the stem, entire plant, and leaves are the most often used parts. To get a comprehensive image of the usage and significance of particular plant species ethnobotanical indicators (Relative Frequency Citation, Use value, and Jaccard index) were calculated. The RFC value ranges from 0.1 to 0.8 for the recorded species, where *Olea ferruginea* (0.8) shows highest value and least for *Artimesia scoparia* (0.3). The UV value ranges from 0.17 to 0.87, which showed that locals exploited them more or less. Correlation analysis ( $p = 0.756$ ) between RFC and UV was done using Pearson's correlation with the help of SPSS. Folk remedies were mostly used by the local population because of their wide availability, cheap price, and superior effectiveness against ailments. Unfortunately, this valuable traditional knowledge is quickly vanishing, and numerous therapeutic plants are in grave danger.

**Key words:** Ethnobotany, Conservation, Folk Remedies, Relative frequency, Jaccard index. Pearson's correlation.

#### **PHYTOGENIC FEED ADDITIVES AS AN ALTERNATIVE TO CONTROL POSTPARTUM PROBLEMS IN ORGANIC DAIRY FARMING**

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#### **Abstract:**

The growing interest in sustainable organic dairy farming has led to an exploration of the potential of various phytogenic feed additives and plant-based supplements to address the postpartum problems in dairy cows. Phytogenic treatments demonstrate anti-inflammatory, immunomodulatory and antimicrobial effects in cattle, therefore presenting an alternative to conventional allopathic medicines. Postpartum problems in organic dairy farming can have significant economic and ethical implications, making it crucial to find natural and sustainable solutions. Major postpartum problems in dairy animals include anestrus, metritis, mastitis, retained placenta, uterine prolapse, hypocalcemia as well as hypophosphatemia. This review highlights the healing effects of various phytogenic feed additives as an alternative to conventional treatments in ensuring the well-being and productivity of the dairy cows in organic farming. The use of herbal remedies like *Allium sativum*, *Trigonella foenum-graecum*, *Carica papaya* and *Cucumis sativus* can help alleviate the condition of anestrus by providing nutritional support, hormonal regulation, and by reducing stress on the animal. Herbal remedies such as *Moringa oleifera*, *Trachyspermum ammi*, *Carica papaya*, and *Allium sativum* have shown promising results in reducing the incidence of retained placenta in postpartum cattle.

The incidences of uterine prolapse can be treated by the use of *Zyzyphus rummularia* roots, *Trapa natans*’ flour, and *Momordica charantia* extract. For cases of uterine infection herbs like *Aristolochia indica*, *Allium sativum*, *Convolvulus microphyllus* roots, *Cactaceae*, and *Citrus medica* fruit are used as potential treatments and for prevention. Different medicinal plants including *Cyperus rotundus*, *Moringa pterygosperma*, *Zingiber officinale* and *Allium cepa* have shown to increase the conception rates in repeat breeder cows by addressing the hormonal imbalances. Common treatment and prevention options for mastitis in dairy cow is the use of herbal remedies such as *Persicaria senegalense*, *Moringa oleifera* leaves, *Terminalia chebula*, *Spathodea campanulate* and *Tridax procumbens* Linn. For the treatment of postparturient hypocalcemia options like dandelion supplementation and phytogenic ingredients like nettle and alfalfa are considered in high-producing cattle. The review emphasizes the appropriate dosage, duration of treatment, and potential side effects for each herbal remedy for different postpartum problems and sustainable and eco-friendly solutions to postpartum problems in organic dairy farming.

### **EFFICACY OF PHYTOGENIC FEED ADDITIVES ON RUMEN AND REPRODUCTIVE HEALTH OF DAIRY CATTLE**

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#### **Abstract**

Efficiency of a dairy farm mainly depends upon the good productive and reproductive behavior of cows. There are several factors which reduce the productivity of cows e.g. imbalance nutrition, poor digestibility of nutrients, various diseases, stress, reproductive issues etc. Phytogenic feed additives (PFAs) are substances of plant origins that are added to animal feed to enhance the performance and health of the animals. PFAs in the feed improve the digestibility of various nutrients, ruminal and reproductive health. These additives have also shown the ability to improve dry matter intake of animals. They also increase feed efficiency due to improved feed utilization, ruminal pH and volatile fatty acids production. Milk production and composition i.e. fat, total solid, protein and lactose are also improved by supplementation of herbal mixtures. Studies also show that mixture of condensed tannins, encapsulated cinnamaldehyde, curcumin, capsaicin, and piperine improves the fat corrected and energy corrected milk and also increases the milk production. Supplementing herbal mixtures also prevent the animal from subacute ruminal acidosis by improving ruminal fermentation. Several biologically active compounds have been isolated in the herbs which have antioxidant, antibacterial and anti-inflammatory activities. Several herbs have shown to have positive effects on ovarian cyclicity, uterine health, and augmentation of reproductive hormones. Herbs may also improve the conception rates and help in achieving the target of producing 1 calf in 12 months from each cow for the profitability of farm. Extracts of *Azadirachta indica* and *Achyranthes aspera* have shown to reduce subclinical endometritis in

cattle. Supplementation of *Moringa oleifera* enhances the antioxidant activity, IgG and serum total proteins in cattle. *Yucca* has also improved the fertility in dairy animals. These phytochemicals need to be investigated further for their effects on cattle health.

**AEROBIOLOGICAL MONITORING OF POLLEN AND SPORES IN SPRING 2023  
IN RELATION WITH METEOROLOGICAL PARAMETERS IN RAWALPINDI.**

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**Abstract:**

Aerobiological studies play a significant role in dispersal, transmission and deposition of airborne particles, used to provide information on pollen diversity and allergy hazards to susceptible individuals. Weather variables e.g. temperature, wind speed, relative humidity and rainfall greatly affects the concentration of pollen in the air. This study consists of airborne pollen and spore monitoring carried out from January 2023 to April 2023 by using Burkard 7 days volumetric trap. Collection of nearby flora for reference pollen slides preparation was carried out in order to characterize the prominent plants in the area. Monthly weather reports of Pakistan Meteorological Department were assessed for weather parameters along with manual observation of meteorological factors to build connection with grains/m<sup>3</sup> pollen and spore concentration. Results revealed that the January 2023 was the coldest month with least pollen and spore concentrations. Early pollen season onset was observed in February 2023 due to changes in weather conditions. March 2023 indicates the peak for pollen concentration as a result of high temperature than previous months. Wind speed and relative humidity have limited impact on pollen load. Whereas rainfall and temperature have shown significant effects on airborne pollen and spore concentrations. Pollen of Pinaceae 14 %, Poaceae 20% and Betulaceae 24% were observed in highest concentration along with *Alternaria* 27 %. Geological location and vegetation are also responsible in depicting their concentration in the ambient air. Furthermore, meteorological parameters vary throughout the year influencing the overall seasonal airborne pollen diversity.

**AMELIORATIVE EFFECTS OF PLANT GROWTH PROMOTING BACTERIA,  
ZINC OXIDE NANOPARTICLES AND OXALIC ACID ON *LUFFA ACUTANGULA*  
GROWN ON ARSENIC ENRICHED SOIL**

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**Abstract:**

Arsenic (As) contamination and bioaccumulation are a serious threat to agricultural plants. To address this issue, we checked the efficacy of As tolerant plant growth promoting bacteria (PGPB), zinc oxide nanoparticles (ZnO NPs) and oxalic acid (OA) in *Luffa acutangula* grown on As rich soil. The selected most As tolerant PGPB i.e. *Providencia vermicola* exhibited plant growth promoting features i.e. solubilization of phosphate, potassium and siderophores production. Innovatively, we observed the synergistic effects of *P. vermicola*, ZnO NPs (10 ppm) and OA (100 ppm) in *L. acutangula* grown on As enriched soil (150 ppm). Our treatments both as alone and in combination alleviated As toxicity exhibited by better plant growth and



metabolism. Results revealed significantly enhanced photosynthetic pigments, proline, relative water content, total sugars, proteins and indole acetic acid along with As amelioration in *L. acutangula*. Furthermore, upregulated plant resistance was manifested with marked reduction in the lipid peroxidation and electrolyte leakage and pronounced antagonism of As and zinc content in leaves under toxic conditions. These treatments also improved level of nutrients, abscisic acid and antioxidants to mitigate As toxicity. This marked improvement in plants' defense mechanism of treated plants under As stress is confirmed by less damaged leaves cell structures observed through the scanning electron micrographs. We also found substantial decrease in the As bioaccumulation in the *L. acutangula* shoots and roots by 40 and 58% respectively under the co-application of *P. vermicola*, ZnO NPs and OA in comparison with control. Moreover, the better activity of soil phosphatase and invertase was assessed under the effect of our application. These results cast a new light on the application of *P. vermicola*, ZnO NPs and OA in both separate and combined form as a feasible and ecofriendly tool to alleviate As stress in *L. acutangula*.

### **EXPLORING HEAVY METAL TOXICITY, HEALTH RISK ASSESSMENT, NUTRITIONAL ANALYSIS, AND PLANT SURVIVAL STRATEGIES IN WILD EDIBLE VEGETABLES**

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#### **Abstract:**

Heavy metals are well-known environmental pollutants owing to their toxicity, longevity in the atmosphere, and ability to accumulate in the human body via bioaccumulation. This study evaluates the toxicity of heavy metals, associated health risks, and anatomical responses in five native edible species from polluted areas in Islamabad, Pakistan. The findings indicate that the overall toxicity pattern of metals in all species was headed by lead (Pb), followed by cadmium (Cd), zinc (Zn), and copper (Cu). The metal concentration of Pb in *Taraxacum officinale* was 17 mg/kg, while Zn in *Plantago lanceolata* was 88.83 mg/kg, both exceeding the recommended limits. The levels of Cd ranging from 1.67-1.17 mg/kg surpassed the reference limit. *P. lanceolata* exhibited a higher translocation factor for Zn at 2.91 mg/kg. None of the investigated plant species was classified as hyperaccumulators, but most of them showed potential for phytostabilization and phytoextraction. The maximum health risk index was found for *T. officinale* (0.595 mg/kg), and Pb had the highest target hazard quotient (1.096 mg/kg), exceeding the standard limit of 1.0. Proximate composition revealed that all species have great nutritional significance, and total energy estimation was maximum in *Solanum nigrum* (409 Kcal/100 g). In anatomical traits, leaf dry content, leaf mass area, and stomatal density significantly varied in all species in response to metal toxicity. This study concludes that wild

vegetables are a significant source for a balanced diet, but the presence of toxic metals poses different health risks to consumers. Furthermore, plants undergo various structural changes to adapt to mental stress.

**Keywords:** Heavy metal toxicity, Wild vegetables, Health risk index, Proximate analysis, Plants survival strategies

**GREEN SOLUTIONS: PHYTOREMEDIATION OF HEAVY METALS IN SOIL  
ADJACENT TO MUZAFFARABAD'S CRUSHING INDUSTRY, AZAD JAMMU  
AND KASHMIR**

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**Abstract:**

The detrimental impact of the crushing industry on human and environmental health in Muzaffarabad City has led to the urgent need for soil remediation. This study aimed to assess the efficacy of native plant species *Rumex hastatus*, *Amaranthus spinosus*, and *Cirsium arvense* in removing heavy metals from contaminated soil and understand their physiological and biochemical responses to the polluted environment. Soil and plant samples collected from the industrial area were analyzed for heavy metals (Fe, Zn, Mn, Hg, Pb, Cu, Cd, Cr, Ni, and As) to study their accumulation and transfer in different plant parts. Additionally, various plant parameters, including photosynthetic rate, transpirational rate, stomatal conductance, internal CO<sub>2</sub> concentration, proline, total soluble sugars, photosynthetic pigments (chlorophyll a, b, carotenoids), and antioxidant enzymes (SOD, POD, CAT, APX, H<sub>2</sub>O<sub>2</sub>), were investigated. The physico-chemical properties of soil demonstrated as pH (8.16), EC (1229 µS/cm), total phenols (366 mg/L), total nitrogen (165 mg/L), sulphate (1721 mg/L), phosphorus (134 mg/L) and ions such as Cl<sup>-</sup> (4.40), Na<sup>+</sup> (521) and K<sup>+</sup> ions (28.10). The amount of metals concentration in soil samples were significantly higher than the permissible limits. The concentration of metals in polluted soil obtained in the sequence of Fe (169.44 mg/L) > Zn (86.28 mg/L) > Mn (28.41 mg/L) > Cu (14.70 mg/L) > Ni (8.12 mg/L) > Cd (2.58 mg/L) > Pb (2.29 mg/L) > As (1.73 mg/L) > Cr (1.64 mg/L) > Hg (1.20 mg/L). Significant reductions in metal concentrations were observed in the rhizospheric zones of each plant. *Rumex hastatus* exhibited the highest metal absorption, with the order of absorption being Fe > Zn > Cu > Mn > Ni > Hg > Cd > Cr > As > Pb, followed by *Amaranthus spinosus* and *Cirsium arvense*. Metal concentrations were consistently higher in the roots, followed by shoots and leaves, across the studied plant species. Biological indices such as BCF, TF, and BAC indicated the robust phytostabilization potential of these plants for the specified metals. The physiological responses of the selected plants demonstrated their strong adaptability to the environment, with *Rumex hastatus* emerging as a potent hyperaccumulator, followed by *Amaranthus spinosus* and *Cirsium arvense*. Statistical analysis revealed significant correlations, variances, and covariances between biological indices and plant parameters.

**Keywords:** Phytoremediation, Heavy metal, Antioxidants, Hyperaccumulator, Muzaffarabad

**BIOGENIC SYNTHESIS AND CHARACTERIZATION OF SILVER  
NANOPARTICLES USING *RANUNCULUS MURICATUS* LEAF EXTRACT AND  
THEIR EFFECT ON MAIZE SEED GERMINATION**

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**Abstract:**

Silver nanoparticles (AgNPs) have garnered significant research interest due to their versatile applications and the “Green” approach in terms of environmental friendliness, economic potential, feasibility, and wide range of applications in agriculture. AgNPs are now employed to promote seed germination and plant development. In this study, we examined the effect of *Ranunculus muricatus* mediated AgNPs dosage on seed germination of corn seeds. *R. muricatus* is known to contain bioactive compounds, such as flavonoids and polyphenols, which serve as reducing and stabilizing agents for the synthesis of AgNPs. The synthesized AgNPs were characterized UV-visible spectroscopy, scanning electron microscopy (SEM), X-ray diffraction analysis (XRD) and Fourier Transform Infra-Red spectroscopy (FTIR). UV spectroscopy showed absorbance at 445 nm. SEM analysis revealed the spherical shape of particles of size 20nm. The XRD analysis showed that AgNPs are crystalline in nature. The sharp diffraction peaks of XRD were observed at 38, 44, 64 and 77, corresponding to (111), (200), (220) and (311) crystallographic planes. The FTIR analysis identified the several functional groups, including hydrocarbon chains (2922 cm<sup>-1</sup>), alkynes (2127 cm<sup>-1</sup>), carboxylic acid (1725.7 cm<sup>-1</sup>), amides (1638.5 cm<sup>-1</sup>), alkenes (1568.7 cm<sup>-1</sup>), esters (1367.6 cm<sup>-1</sup>), acyl groups (1228.1 cm<sup>-1</sup>), and phenolic/alcoholic groups (1028 cm<sup>-1</sup>) on AgNPs. The effect of AgNPs on seed germination using fresh and dry weights, root and shoot lengths and chlorophyll content growth parameters was observed. The germination rate of seedlings was enhanced in response to AgNPs at high concentration at 200ppm. A significant positive influence on root and shoot length and fresh weight was observed with statistical significance ( $P \leq 0.05$ ). The results of this experiment showed that the use of AgNPs increased the germination in maize seedlings.

**LICHEN: A SYMBIOTIC MARVEL IN NATURE**

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**Abstract:**

Lichen, a fascinating and diversified organism, represents a remarkable example of symbiosis in the natural world. This complex life form results from the intimate association between a fungus and a photosynthetic partner, typically an alga or a cyanobacterium. Lichens represent

self-supporting symbioses, which occur in a wide range of terrestrial habitats. The mutualistic relationship between these components creates a unique and resilient entity capable of thriving in diverse and extreme environments, ranging from barren deserts to polar regions. The secondary metabolites produced by lichens possess bioactive compounds with pharmaceutical properties, while their role as indicators of air quality underscores their importance in monitoring pollution levels. Advances in molecular biology techniques have provided insights into the intricacies of the fungus-alga interaction, shedding light on the signaling pathways and physiological processes involved. This abstract highlights the significance of lichens in ecological, medicinal, and industrial contexts, emphasizing the need for continued research to unlock the full potential of these extraordinary organisms. Understanding the complexities of lichen biology not only deepens our appreciation for the wonders of symbiosis in nature but also holds promise for innovative applications across various scientific disciplines. Current research discovered that diverse collection of secondary metabolites are produced by these slow developing organisms which are biocompatible. Lichens produce strong secondary metabolites such as phenolic compounds and usnic acid. In addition to this, lichens have strong antimicrobial activity and frequently used in pharmaceutical industry. They are used to cure many diseases as they possess analgesic and antipyretic properties. They are used to cure cancer and many dangerous disease like piles, heart disorders, infection in lungs and many digestive track disorders. The biocompatibility of many lichen and their metabolites from Himalayan region is largely remained unknown. The study concluded the prime importance of lichens owing to their use in medicines, food, drug and minerals without the threat to ecosystem. The present study revealed bio pharmaceutical potential of lichens and will encourage future investigation to increase social awareness about the importance of lichens in the field of medicine as natural products.

**PHYTOCHEMICAL ASSESSMENT OF THREE MEDICINAL PLANTS AND  
EXPLORATION OF THEIR ANTIMICROBIAL RESPOSIS AGAINST FUNGAL  
DISEASES OF CORN IDENTIFED FROM TEHSIL SAMAHNI DISTRICT  
BHIMBER, AZAD KASHMIR**

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**Abstract:**

The current research was focused on responses of three medicinal plants named as, *Carissa opaca* Haines, *Grewia optiva* Burret and *Vitex negundo* L. against dominant fungal diseases such as downy mildew, dry ear rot, maize leaf blight and stalk rot of maize crop. Phytochemical screening of these three medicinal plants were also under investigation. The responses of three medicinal plants were assessed by applying agar disk diffusion and agar well diffusion methods. On the other hand, phytochemical analysis was conducted by applying gas chromatography and mass spectroscopy methods. The phytoconstituents tests were applied against *Carissa opaca* plant indicated that leaf extracts explored the presence of alkaloids,

flavonoids and phenols. The phytoconstituents tests were applied against *Grewia optiva* plant indicated that leaf extracts explored the presence of phenols, steroids and carbohydrates. The phytoconstituents tests were applied against *Vitex negundo* plant indicated that leaf extracts explored the presence of flavonoids, steroids and saponins. Overall, phytoconstituents tests indicated that methanolic leaf extracts explored maximum presence of tannins, flavonoids, phenols, alkaloids, carbohydrates, proteins, and steroids. Antifungal activities of the three selected medicinal plants were tested against five fungal species named as, *Aspergillus flavus*, *Aspergillus niger*, *Alternaria solani*, *Candida albicans* and *Penicillium monotricales*. Maximum antifungal activity (33 cm) was shown by *Carissa opaca* against *Penicillium monotricales* and minimum activity was shown by *Vitex negundo* (13 cm) against *Aspergillus flavus*. It was concluded that the *Carissa opaca* indicated maximum antifungal activity which is recommended best for the management of crop diseases.

### **ENTOMOPHILOUS POLLINATION IN SAFFLOWER (*CARTHAMUS TINCTORIUS* L.)**

#### **IN AGRI-ENVIRONMENT OF KHAIRPUR, SINDH.**

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#### **Abstract:**

**Pollination** is the act of transferring pollen grains from the male stamen to the female carpel. Pollinators are an important element of the world's biodiversity and play an important role in crop and vegetative production. In the classification of insects as pollinators, two major characteristics are often considered. The first is insect pollen grain harvesting during flower visits. Pollen grains are collected by insects using their hind legs, mandibles, or both in some situations. The second factor is insect vibration of flowers, which encourages pollen grain release. *Carthamus tinctorious* L. is oldest seed crop commonly known as Safflower belongs to Asteraceae family or Compositae family (Weiss, 2000). Native to Africa, Asia and Middle East. Safflower is a long-established crop with a wide range of usage. it is used as saffron bastard, saffron thistle and saffron dyer's, people use safflower as an affordable substitute for saffron since it has a similar taste and aroma (Flavor), so it requires a big amount of it to be added in food. Safflower is mostly self-pollinated, although for optimal fertilization and yield, bees or other insects are usually necessary. With pollen transport by a variety of insects, there is the potential for significant outcrossing. The purpose of the study was to investigate the pollination mechanism and insect pollinators that pollinate safflower. The study was conducted in November 2021 at the Centre for Biodiversity and Conservation using the standard procedure for the plantation of safflower, pollinator surveys and bagging experiment using three treatments. According to the findings of this study, Safflower flowers attract a wide variety of insect pollinators, with a total of 61 insects observed in whole studies. This indicates that these flowers are a valuable resource for local pollinator species. The insect visitors of the Safflower have been found to come from 10 different species, with the order Hymenoptera having the greatest diversity of insects. The flowers that were left open for insect pollination produced 53 seeds on average. Which are significantly higher than the number of seeds in net

covered and completely covered produced on average 15.5 and 2.9 respectively.

## **EDAPHOVEGETATION RELATIONSHIP IN THARPARKAR DESERT, SINDH PAKISTAN**

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### **Abstract:**

Soil plays an influential role in the growth and distribution of plants. It provides the mechanical support and nutrient storage necessary for plant growth that is very essential for the development of vegetation such as sodium (Na), potassium (K), phosphorus (P), and nitrogen (N) (Arshad *et al.*, 2008). 22 samples of different Tharparkar Soil were collected for analysis at the water testing laboratory Nuclear Institute of Agriculture (NIA) Tandojam Hyderabad Sindh Pakistan. Plant and Soil sampling approach and a detailed topography survey were combined to evaluate Edapho Vegetation Relationship and its influence on plant. The quadrature sampling method is one of the mainly adequate methods for vegetation surveys. The research used ten (10) quadrates per site; each quadrate was 12.6 feet. Every species of a plant were counted and all quadrates were separated from each other by 50m. Aims and Objectives were of my study to evaluate the nutrients contents in the soil, To assess the pH, EC and texture of the soil, To explore the relationship between the soil factors and their impact on vegetation. The materials were used in field work at Tharparkar desert, Sindh Pakistan such as Garden trowels, Bucket auger, Blade shovel, Tube sampler, Measuring tape, rope, digger, soil sampling plastic bags, tags, field notebook, pen, pencil, GPS (Global Positioning System), Digital Camera, hand gloves, Face mask were used. The soil's nutrient levels were found to be deficient, as per the recorded data. The average organic matter content was considerably lower than the standard level, measuring below 0.5%. The percentage of nitrogen was also below the recommended level for healthy plant growth. In about half of the samples, the potassium content was less than 100 ppm, which is below the normal range of 100-400 ppm in healthy soils. Additionally, most of the samples showed sodium content below 500 ppm. These findings indicate that the soil may not be conducive to supporting healthy plant growth and requires appropriate intervention to replenish the nutrient levels. The distribution of plant species was affected by various soil parameters. Among these parameters, the parentage of silt, organic matter, and potassium had a relatively higher impact on vegetation dynamics. Although Tharparkar is predominantly a sandy desert, there exists a small proportion of clay. The texture of the soil in the area is primarily classified as sandy loam and loamy sand. The electrical conductivity (EC) of the soil was mostly below 100

**Keywords:** Edapho vegetation, Relationship, Soil sampling, Analysis, Soil Texture, Chemical Analysis, Macronutrients, CCA, Findings, NIA

## **GENOMICS ASSISTED CONSERVATION OF ENDANGERED HIMALAYAN YEW IN PAKISTAN**

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### **Abstract:**

The present research project is based on ecological modelling and genomics assisted conservation of Himalayan Yew (*Taxus wallichiana* Zucc.) in Pakistan. The species is found at elevation of 2000-3000m and its population is declining rapidly in the natural habitats. Major reasons for the decline of *Taxus wallichiana* are its low genetic base, narrow ecological altitude coupled with excessive utilization of the species for extraction of wood and an anticancerous drug “*Taxol*” (paclitaxel). *Taxus wallichiana* is included in appendix II of the World Red Databook (IUCN-Redlist) and is a species of high priority among the scientific world. Climate change has already impacted the geographical distribution of many species including Yew. Many studies have indicated that plant species has shifted to higher latitudes and elevation, affected by climate change that increases the risk of its extinction. From this perspective, conservation related insights into the species based on genetic architecture of the species needs a thorough evaluation to be applied and to redefine both *insitu* and *exsitu* conservation approaches for Himalayan Yew.

**Keywords:** Himalayan Yew, Ecological modelling, *insitu* and *exsitu* conservation.

## **ECO-FRIENDLY POTENTIAL FUNGICIDES “IN VITRO ANTI FUNGAL BIOASSAY OF MEDICINAL PLANTS EXTRACTS COLLECTED FROM KHYBER PAKHTUNKHWA”**

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### **Abstract:**

Antifungal activities of four medicinal plants extracts *Berberis lycium*, *Peganum harmala*, *Caruma longa* and *Silybium marianum* and two concentrations of each plant crude extracts 5 mg/ml (low) and 300 mg/ml (high) were conducted against two different fungus strains i.e. *Candida albicans* and *Aspergillus niger* using disc diffusion method. The experiments were carried out to find anti fungicidal potential of these plants extracts. The experiment was conducted in the biosafety level 3 Microbiology laboratory, Faculty of Life Sciences, University of Bradford, West Yorkshire Bradford, UK. The antifungal investigation was performed in three replicates using growth media Czapek Dox Agar CM0097 from Oxoid medium for the growth of *Candida albicans* and *Aspergillus niger* fungus strains. All the four plants have showed antifungal activities and proved their effectiveness of its traditional use herbal medicine. The maximum activity was reported in *Berberis lycium* which seem to be

most active and lowest value was recorded in *Silybum marianum*. The maximum inhibition zone has been reported as 16 mm for the *Berberis lycium* extracts and minimum zone of inhibition was recorded 9.83 mm for *Silybum marianum* extracts. In case of concentration the maximum bacteria inhibition was noticed 14 mm for 300 mg/ml (High) and the minimum inhibition zone of 11 mm was recorded for 5 mg/ml concentration (low). In case of fungus strains the *Candida albicans* zone of inhibition was observed 8 mm which was minimum zone of inhibition while zone of inhibition was maximum and high growth inhibition was recorded in *Aspergillus niger* that is 17 mm. The highest zone of inhibition was observed in 16.16 mm in *Berberis lycium* and 16 mm in *Carcuma longa* followed by 15 mm *Peganum harmala* and 9.83 mm in *Silybum marianum*. In comparison Terbinafine the standard fungicide produce 17 mm zone of inhibition. The plants crude extracts and fungus strains have significant effects on inhibition of fungus growth fungus while different concentrations of plant extracts have non significantly affected the zone of inhibitions. In addition the two and three ways interactions between plants, fungus and concentration was also non-significant. The conclusion may be withdrawn from the results that plants have different level of antifungal activities against different fungus strains. Therefore, these extracts may possess high activities against certain fungus pathogen and minimum or low activities against other fungus. Therefore, further assessment may be carried out of these extracts against different plants and human fungus pathogens. Further assessment may be carried out of these extracts particularly the *Berberis lycium* against different plants and human fungus pathogens to developed drugs for multi resistance plant and human fungus pathogen. Isolation, characterization of each component of crude extracts and screening of these components against pathogenic fungus to determine active compounds in *Berberis lycium* and other crude plant extracts.





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