



# NEWSLETTER

## LANDSCAPE NEWS



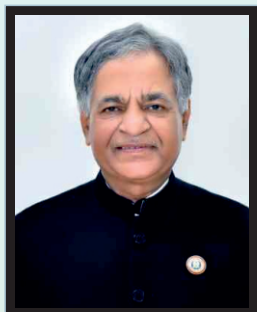
■ Quarterly

■ Volume 1, Issue 2

■ October 2022

### MESSAGE FROM EX- VICE CHANCELLOR PROF. P. C. TRIVEDI (BOTANIST)

I am glad to know that this volume of the News Letter "Landscape is being published as a tribute volume to Prof B D Sharma. I know Prof B D Sharma since 1975 and have interacted with him. Many times during academic events, conferences, examination, meetings and other places. I always found that he was a very impressive teacher a hard worker and dedicated plant researcher. He was very passionate to explore plant fossils. Prof. Sharma had the life of quite exceptional achievements. He was regarded with a very high esteem and affection by all those who had known him or were benefitted by his teaching and knowledge. He was a gentle, cultured person of considerable charm with tremendous determination and strength of character. He will always be remembered as a outstanding distinguished Palaeobotanist of the world. I extend my tribute to him. I wish that young students are inspired to read biography (life sketch) of late Prof B D Sharma and his contribution to the development of plant science discipline with special reference to the fossil flora. I extend my deepest gratitude and thanks to the editorial team for the publication of the special volume of Newsletter "LANDSCAPE" as a tribute of the Late Prof B D Sharma.



**Prof. P. C. Trivedi**

Ex- Vice Chancellor, JNVU

### FROM THE DESK OF VICE CHANCELLOR

I feel happy and proud that this volume of landscape newsletter of WRCAC is being published to give tribute our teacher Late B D Sharma. The biography of Prof. Sharma is very inspiring. His research contribution in the field of fossil plants always motivate the scholars. I hope that this volume of Newsletter disseminate the academic and research activity among enthusiastic students who are passionate to explore new things. My best wishes to the editor and readers.



**Prof. K. L. Shrivastava**

Vice Chancellor, JNVU

### Tribute from Department of Botany Alumni

*Prof. B. D. Sharma.....The Legend of Palaeobotany*



Late Prof. B. D. Sharma ji was born in the district Mohindergarh, Haryana on 14 April, 1940. He received primary and intermediate education from Narnaul town. He has completed post-graduation (Botany) from D. A. V. College, Ajmer. He was very much influenced by the teachings of Prof. K. M. Gupta and subsequently joined PH.D. program at University of Rajasthan, Jaipur under his supervision to work on " Indian fossil cycads with special reference to the genus *Williamsonia*". Latter he joined Department of Botany as Lecturer in 1967 and got superannuated in the year 2000 from the post of Professor. He served as Head of Department, Botany from year

1994 to 1998 and Member, JNVU Syndicate (1998-1999).

He was well known authority of Palaeobotany, palaeontology, Gymnosperms, Pteridophyta and Bryophyta. He was next only to doyen of Palaeobotany in India after late Prof. Birbal Sahni. He has worked out many research projects sanctioned by various Govt. funded agencies. He worked out Fossil Flora of Carboniferous period, Fossil Flora of Jurassic period, Fossil flora of Rajmahal Hills, Bihar. Ferns and Fernallies of Rajasthan. He has described morphology, anatomy and reproductive biology of many living and fossil genera and species belonging to above subjects. Some of them are *Pentoxylon*, *Williamsonia*, *Ptilophyllum*, *Bucklandia*, *Nilssonia* and many more. He has also worked out life cycle of many species of Bryophyta, Pteridophyta and Gymnosperm. He also worked on origin and evolution of Gymnosperms and Primitive

Angiosperms. He described 22 new genera and 66 new species belonging to Bryophyta and Pteridophyta. He received many prestigious awards. He supervised nine students for Ph.D. degree and has published >300 research papers in International and National Journals of high reputation. He was Fellow of Indian Fern Society (FIFS) and Fellow of Palaeobotanical Society (FPS). He was awardee of Life time achievement award of Indian Botanical Society.

He was very popular among students and known for his teaching style that always associated with evidence of latest research papers, with the his personal research opinion on the same topic and critic's and suggestions, using plants specimens, slides, photographs and experiments results for demonstration. He is very polite but showing strength in class room. He always narrated a relevant story of particular plant which was taught in class room.



The main purpose of sharing such stories to students to teach them how to explore particular plant, how to design experiment to understand morphology, anatomy and life cycle and which scientist offered critical and appreciative remarks, which was tremendous and inspiring to students and making them interested in exploration of plants. His untiring efforts, dedicated research and above all a touching humanity were the hallmark features which all of us keep trying to emulate.

**Prof. Praveen Gehlot**

Director  
JNV University Alumni  
Association

## So grateful you were our teacher..... Prof. B. D. Sharma

Dear Sir,

On behalf of myself, my classmates and other students of Department of Botany, Jai Narain Vyas University, I would like to express my deep sense of gratitude to our all-time great *guru* –Prof. B. D. Sharma for always being a guiding light and a beacon of life and who helped us in our journey with great wisdom and priceless guidance, without which we could have never reached where we are today. Thank you Sir for everything!

Whenever, we needed to take the next step towards our dream you have always given us the much desired strength. You were emboldening and helped us in many ways. Your positivity and encouragement brightened our days and future. We truly appreciate you and sparing your invaluable time and teaching nuances of life of both plants and us. Your meticulous and duteous a teaching style made our learning an absorbing and easy process. You taught us with love, effort and energy that attracted and glued to the wonderful subject of plant sciences in general and Paleobotany in particular. Your excellency, devotion, ability, capability, delightfulness, kindness, Intelligence and conciliatory qualities have always inspired us in

the classrooms and made us better citizen in the civilized society.

Your research contribution in development of subjects viz. Bryophyta, Pteridophyta, Gymnosperm and Palaeobotany at International levels which always motivate us to accomplish innovations and new inventions.



You are the doyen of these subjects and an expert of par excellence and we are fortunate to be your students. We enjoyed every minute of your lecture as well as your marvelous sense of humor. You truly cared about your student's career each and every time. You made a huge impact on students who needed a path for successful life with high order of ethical and moral values. The most tearful fact is that we will never see you again in classroom again, but we feel your excellence of superpowers every day. We are so proud of you! ...Thanks for being a superb teacher! Our endless gratitude to you for all you have done, which we always remember.

We always miss you..... We always remember you..... with our eyes filled with tears of thankfulness... Amen

Your students  
M.Sc. 1996 Batch (Passed out)

## Role of Indian Medicinal Plants to Combat Covid-19

Global terror has been sparked by the unforeseen pandemic brought on by the new coronavirus 2019 (COVID-19). The introduction of COVID-19 puts everyone on edge. Countries are making the most of their resources to fight the virus and reduce infection. However, most nations are unprepared for a pandemic of this magnitude and may not be able to stop the spread of the illness or effectively cure it. A vaccination can significantly lower morbidity and mortality in such a setting. However, the potential issue won't go away until a reliable viral vaccination is developed. Delays in the development of a vaccine would put people who are near to the outbreak's focal point in urgent danger of exposure.

There is a need to produce more respirators and masks in this pandemic circumstance due to the delay in vaccine development in order to prevent any aerosol with germs. It can be useful to utilise personal respiratory protection equipment to minimise the spread of COVID-19. Since infectious germs can spread via a number of different pathways, protection for the respiratory system and the face is necessary for those that are often spread by droplets or aerosols. The major ways that COVID-19 infection is spread are by coughing and sneezing, where infectious aerosol droplets of various sizes may be inhaled. Larger studies offer helpful information on the control of respiratory virus outbreaks with a high risk of transmission from person to person. Medical mask use is



S. N.	Name of Plant	Local Name	Medicinal Properties
1	<i>Tinospora cordifolia</i>	Giloy	Anti-viral, Immunomodulator, Anti-inflammatory
2	<i>Andrographis pauculata</i>	Kalmegh	Anti-viral, Immunomodulator
3	<i>Ocimum sanctum</i>	Tulsi	Anti-viral, Immunomodulator, Anti-inflammatory
4	<i>Citrus limon</i>	Nimbu	Anti-viral, Immunomodulator, Anti-inflammatory
5	<i>Piper nigrum</i>	Kali-Mirch	Anti-viral, Antioxidant, Anti-inflammatory
6	<i>Phyllanthus emblica</i>	Bhumianwla	Anti-viral, Immunomodulator, Anti-inflammatory
7	<i>Withania somnifera</i>	Ashwagandha	Anti-viral, Immunomodulator, Anti-inflammatory, Antioxidant
8	<i>Glycyrrhiza glabra</i>	Mulethi	Anti-viral, Anti-inflammatory, Antiallergic, Immunomodulator
9	<i>Zingiber officinale</i>	Adarak	Anti-viral, Anti-inflammatory, Antiallergic, Immunomodulator
10	<i>Curcuma longa</i>	Haldi	Anti-viral, Anti-inflammatory, Antiallergic, Immunomodulator
11	<i>Vitex negundo</i>	Nergundi	Inhibitory action against Virus.

advised by the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) during patient care in high-risk circumstances. Thus, the use of surgical masks, eye shields, and gloves might be considered as suitable PPE for the prevention of COVID-19. At the moment, filter features like fibre diameter, charge, packing density, filter thickness, as well as particle characteristics like diameter, density, and velocity, determine how effectively respirators and masks filter air.

The Indian Council of Medical Research (ICMR) often provides updates on the progression, course, and outcome of diseases. Every other day, the therapy method is altered. There is currently no developed or approved allopathic treatment for COVID-19. The same subject is still being researched, although no real progress has been made. Additionally, the existing repurposed

medications do not come without substantial negative side effects.

In addition, despite all efforts, it has taken time for the vaccination to reach every member of the community. In such circumstances, the general public has begun to favour available complementary and alternative medical systems. Additionally, Traditional Indian Medicine (TIM) has the potential to treat and stop the spread of the SARS-CoV 2 virus, according to data. The following page seeks to summarise the Indian medicinal plants that are widely available and are suggested to be helpful in COVID-19.

Allopathic medications do not currently appear to provide a treatment for Covid-

19. Given the effective and logical use of Traditional Indian Medicine in controlling the COVID-19 pandemic in India, it is appropriate and essential to examine how pharmaceuticals are referenced in the Indian System of Medicine in order to handle the COVID-19 problem. Promoting host immunity against different diseases is one of TIM's methods. With this strategy, traditional medicine adopts a holistic approach to illness prevention; our focus might be on prevention until a proven treatment for COVID-19 is made accessible. The best course of action in this case may therefore be to combine the advantages of both modern and traditional medicine.

**Dr. Dinesh Hans**

Department of Botany  
Seth Ranglal Kothari Government P.G.  
College, Rajsamand



## Fossils of Oxygen producing photosynthetic cyanobacteria and algae

Among all evolutionary events, the one which definitely have the paramount impact on Earth's biome and subsequent biotic phylogeny is the origin of O<sub>2</sub>-producing photosynthetic cyanobacteria. Since the algae are generally composed of 'soft tissue', fossilization, particularly in the lower geological strata, either has not occurred or else of poor formation. In recent years more attention has been paid to Archeozoic or pre-cambrian rocks and the result has been the discovery of fossil remains of a much greater age than previously reported. First record of living organism having RUBISCO-mediated CO<sub>2</sub>-fixation capability have been reported to be present even before 3500 million years ago (Precambrian era during Archean eon; Fig. 1). Many fossil specimens are collected from this period which belongs to Oscillatoriaceae, Nostocaceae etc. Fossils of earlier microbial life and cyanoabacteria are known as stromatolites. Some of them date back to 3.4 billion years, making them the oldest record of life on Earth. Stromatolites were typically formed in shallow water by the growth of layer upon layer of cyanobacteria. These layers often form very beautiful, and colorful banded structures in the rock.

Fossil records of microscopic spherical algae (*Eosphaera* and *Huroniospora*) that resemble the living genus *Porphyridium* are known from the Gunflint Iron Formation of North America (date back to about 1.9 billion years ago). Recently, a team of scientist from China reported millimetre-sized, multicellular and morphologically differentiated



macrofossils (*Proterocladus antiquus*) from rocks date back to 1 billion years ago. These are interpreted as benthic siphonocladalean chlorophytes, suggesting that chlorophytes acquired macroscopic size, multicellularity and cellular differentiation nearly a billion years ago. Stefan Bengtson and his team from the Swedish Museum of Natural History in Stockholm studied fossils from Chitrakoot in India, and found two types of multicellular colony dating to 1.6 billion years ago. One is a thread-like form (*Rafatazmia chitrakootensis*), and the

other is lobe-shaped (*Ramathallus lobatus*). Using 3D X-ray microscopy, the team found that the colonies contained structures characteristic of red algae. Similarly, fossils that resemble the modern tetraspores are known from the Amelia Dolomites of Australia (date back to some 1.5 billion years ago). Organic cysts of green algae resembling modern Micromonadophyceae cysts are also discovered (dating from about 1.2 billion years ago). Likewise, the fossil records are also discovered for the order Dasycladales, which are calcified unicellular forms with intriguing construction dating back to the Triassic Period (about 252 million to 201 million years ago).

Origin and evolution of cyanobacteria created oxygenic environment and provided conducive environment for aerobic respiration. Later, symbiotic origin of plastid from cyanobacteria is hypothesized as leading to evolution of algae.

### Future scope of research

The prehistoric carbonification of diatoms is the major source of fossil fuel we used in modern day. The investigation of rocks from different timeline can reveal more about the evolution of cyanobacteria and algae in

particular and origin of autotrophic organism in general and there is a lot of scope of research in this direction. In particular Cryptophyceae is considered as an evolutionary enigma with no fossil record, and phylogenetic data are also ambiguous.

**Harish<sup>1</sup> and Kunal Seth<sup>2</sup>**

<sup>1</sup>Plant Biotechnology Laboratory, Department of Botany, MLS University,

<sup>2</sup>Department of Botany, Govt. Science College, Pardi - 396125 Valsad (Gujarat)

EON	ERA	PERIOD	EPOCH	Million Year Ago
Phanerozoic	Cenozoic	Quaternary	Holocene	0.01
			Pleistocene	1.8
		Tertiary	Pliocene	5.3
			Miocene	23.0
			Oligocene	33.9
			Eocene	55.8
			Paleocene	65.5
	Mesozoic	Cretaceous		146
		Jurassic		200
		Triassic		251
	Paleozoic	Permian		299
		Carboniferous		359
		Devonian		416
		Silurian		444
		Ordovician		488
		Cambrian		542
Proterozoic	Precambrian time—fossils record of about 1.9 billion years ago of eukaryotic algae and of about 3.4 billion years ago of cyanobacteria are available			4600
Archean				
Hadean				

Figure 1: A typical geological time scale



## पादप जीवित जीवाश्म

जीवाश्म शब्द का अर्थ है, ऐसी सभी वस्तुएं जो हमे पुरातन काल में रहने वाले प्राणियों के अस्तित्व के विषय में जानकारी देती है। इसी प्रकार जीवित जीवाश्मों से तात्पर्य उन पौधों से हैं जो आज से करोड़ों वर्ष पूर्व अस्तित्व में आये थे तथा कभी पूरी दुनिया में उनका वर्चस्व रहा एवं जिनकी कुछ प्रजातियां अभी भी जीवित अवस्था में मिलती है। यद्यपि उस काल की अधिकांश प्रजातियां धरा से विलुप्त हो गई है।

पादप जीवित जीवाश्मों में साइकैड्स एवं गिंको प्रमुख है।

**1. साइकैड्स** - इस वर्ग के पौधों की उत्पत्ति उच्च ट्राइसिक (182X10<sup>6</sup> वर्ष) पूर्व मानी गई है तथा इस वर्ग के अब मात्र 9 सदस्य जीवित रह गए हैं। इस वर्ग की जीवित प्रजातियां हैं- साइकस, माइक्रोसाइकस, डायून, सिरटोजामिया, जामिया, स्टेन्जोरिया, रावेनिया, एनसिफेलार्टस एवम् मेकोजामिया। इनमें से जामिया, सिरटोजामिया, डायून तथा माइक्रोसाइकस प्रजातियां अमेरिकी भू-भाग में जबकि स्टेन्जोरिया एवं एनसिफेलार्टस अफ्रीकी महाद्वीप में पाई जाती है। पूर्वी विश्व में बावेनिया, साइकस तथा मेकोजानिया प्रजातियां मिलती है।

इन सभी में साइकस, माइक्रोसाइकस, डायून तथा सिरटोजामिया वृक्ष प्रजातियां हैं। इस वर्ग के पौधों की प्रजातियों में वृद्धि दर अत्यन्त कम होती है। मैक्सिको के जालपा कस्बे में "डायून इड्यूल" के मादा वृक्ष जिसकी आयु लगभग 1000 वर्ष है।

**2. गिंको** - इस वृक्ष के वर्ग में लगभग 15 प्रजातियां सम्मिलित है जिसमें से एकमात्र "गिंकगो विलोबा" जिसे मेडनहेयर वृक्ष भी कहा जाता है, जीवित प्रजाति है। आज के 20 करोड़ वर्ष पूर्व ये सभी प्रजातियां सम्पूर्ण विश्व में थी तथा कहा जाता है कि अतीत भू-वैज्ञानिक महाकल्प में यही एकमात्र उत्तरजीवी बची है। यह अधिकतर चीन एवं जापान में उगाया जाता है तथा वहां के मन्दिरों, उद्यानों में इसे लगाते हैं। इसे वहां पवित्र पादप मानते हैं। इसके कुछ वृक्ष तो एक हजार वर्ष से भी पुराने बताये जाते हैं। भारत में भी यह लाया गया है तथा वन अनुसंधान संस्थान देहरादून के वन उद्यान एवं देश के कुछ अन्य बगीचों में भी यह लगा हुआ है।

डॉ. नवीन कुमार बोहरा  
पाल रोड ए जोधपुर (राज.)



## Need of native efficient N fixing rhizobia for sustainable yield of grain legume crop for arid and semiarid regions of India



Farmers from ancient times are doing crop rotation, after growing legumes crop like Guar, Moth, Mung, Chawla in their fields they grow millets resulting in enhanced yield without knowing the role of microscopic bacteria for soil fertility. Now it is very well established that rhizobia are N fixing soil bacteria that enhance growth and yield of the legume crops in a nutrient deficient soil without the use of chemical fertilizers. The use of chemical fertilizers for increasing growth and yield of crops affect environment negatively as well as add extra burden in the form of government subsidies and economic growth of nation and their farmers. The use of N fixing rhizobia provides several challenges like type of soil (acidic or alkaline), soil micro flora including beneficial or pathogenic microbes as well as local/native less efficient but stress tolerant N fixing bacteria. Therefore, one strategy could be to screen highly efficient promiscuous N fixing bacteria from the different set of environments to use in that particular environment reducing the chances

of negative interaction with other native soil bacteria and that can be used for multiple legume crop such as moth, mung, chawla, guar in arid and semi-arid regions where the soil is throughout alkaline in nature. Over the last one-decade, Biological N fixation and Microbial Genomics lab of Department of Botany launched massive research program with the help of financial grants from DBT, DST and UGC to understand legume-rhizobia interaction in arid and semi-arid regions to identify native N fixing bacteria capable of nodulating multiple crop legumes with significant N fixation. After isolating and screening thousands of N fixing rhizobia few native rhizobia has been isolated, identified and fully characterized on molecular basis and have been deposited in national bacterial culture repositories like NCCS Pune. The focus was to isolate N fixing bacteria from native legumes growing in the region to avoid rejection/antagonism and growth in the hostile environment of the arid and semi-arid regions like high temperature, and low soil-water moisture. A status report on nodulating native legumes and molecular characterization of associated N fixing microsymbiont of the Indian Thar desert were presented at various national and international conferences and published in the leading journal and books (Sprent and Gehlot 2011; Gehlot et al 2012; Panwar et al, 2017; Tak et al 2016; Sankhla et al 2017; Rath et al 2018; Choudhary et al 2017, 2020; Chouhan et al 2022). Several post-graduate students from Rajasthan and other states have been trained in rhizobia technology to sensitize the importance of the research work through Ph.D. program, network multi-institutional programs. Detailed study on promiscuous nature of the discovered N fixing bacteria, their host range and efficacy of N fixation and genomic characterization to decipher tolerance to stress is underway. The long term objective would be the development of formulation of efficient N fixing rhizobia with synergistic bacteria for particular region.

**Nisha Tak & Hukam S. Gehlot**

Department of Botany, Jai Narain Vyas University, Jodhpur (Rajasthan)





## Potential Underutilized Crops Of North-East India for Therapeutics & Nutraceuticals



The plant resources utilization is an effort of mankind over-million of years of search to mitigate hunger, utilization as fodder, feed, shelter, medicine

and other myriad uses. Globally a limited number of crop species provide the basic diet supplement of carbohydrates, fats, and proteins. Now since more people are reverting back to the plant-based health care practices & traditional medicine systems; there will be huge demand for underutilized crops as major source of nutraceuticals & therapeutics. Modern food & nutrition research links diet to health-related aspects of bioactive food components, which can promote health, prevent or delay the onset of disease, optimize performance and alleviate lifestyle-related ailments besides providing nutritional benefits to individual and populations. Diet in human health is no longer only nutrition, but with the advancement of lifestyle-related ailments, food is seen as a nutraceutical for remedial health care. Nutritional scientists are constantly in search of novel food of nutritional & nutraceutical importance, for which lesser known & underutilized species can play a promising role. Focusing attention on lesser known and underutilized species is an effective way for a diverse healthy diet, to combat lifestyle related ailments and also as a remedial health care system in developing countries. The enormous plant diversity of North-eastern region (NER) of India encompasses various plants of edible/food, fodder with nutritional importance. Diverse climatic situation, tremendous photo-resources, distinct bio-cultural knowledge and strong belief on traditional culture & cuisine makes NER of India a rich resource of

underutilized, lesser-known plant species. Due to remoteness the utilization of traditional knowledge of local plant resources had largely been hidden except for some ethnobotanical studies in fragmented form. These underutilized plants are important source of perpetual health and a source of income to local residents. For example *Allium tuberosum* (Dungduge saag), *Calamus erectus* (Phykre), *Colocasia antiquorum* (Lankay), *Choerospondias axillaris* (Lapsi), *Citrus macroptera* (Sohkwit), *Cyclanthera pedata* (Chuche Karela), *Cyphomandra betacea* (Tree tomato), *Dioscorea alata* (Ghar tarul), *Elaeagnus latifolia* (Sohshang), *Flemingia procumbens* (Sohphlang), *Heracleum*

sinusitis, stomach ache, diarrhea, flatulence, nausea, vomiting, influenza, pain lowering, immunity enhancer, appetizer, anti-inflammatory, useful in rheumatic diseases, common cold, stomach ache, diabetes, blood pressure reducing, convulsions, etc. Pharmacologically these are known for various properties like anti-microbial, anti-inflammatory, anti-diabetic, anti-neurodegenerative, anti-diarrheal, antioxidant, antiviral, anti-cancerous, digestive, carminative, anti-septic, anti-influenza, anti-spasmodic, immune-modulator, gastro-protective, analgesic, hepato-protective, etc. These wild edible plants are an integral resource of

supplement/substitute food of native communities, beside the routinely available resources. It is necessary to take up research interventions for the conservation of underutilized plant species of NER of India. Many of the underutilized species are non-cultivated species gathered from the wild or naturally grown plants. Among the non-cultivated ones, many are destructively harvested in the form of root, stem, tuber, bark, etc. These crops are adapted to agro-ecological niches and marginal areas and can be cultivated using low input and biological techniques. The underutilized crops possess diversity of habit such as tree, herb, climber, shrub, bamboo & cane, and are consumed for various parts including seed, root/tuber, stem/young shoot, leaves, inflorescence/flower, fruit, etc. Through this article, it is emphasized that these potential underutilized crops can not only contribute to food security but could be good genetic resources for nutraceuticals & therapeutics which can be further researched for enhancing the healthy food bowl of future generations.



Underutilized crops (a) and grains (b) in the market.

*wallichii* (Chimping), *Myrica esculenta* (Sohphie), *Oroxylum indicum* (Totala), *Plectocomia himalayana* (Benth-ko-tusa), *Solanum incanum* (Bii), etc. are used as underutilized crops with utility in various traditional and research validated remedial health care practices. However, majority of these plants are lesser known, non-commodity crops and remain underutilized species without realizing their potential. Most of these lesser known plants are used for culinary applications as spices, soup, sauce, fresh salad, dry or fermented preserved foods. Apart from culinary applications, these lesser known crops are traditionally used in various ailments like cough, fungal infection, body ache,

Jitendra Kumar Shukla,  
\* Sunil S. Thorat and Evanylla  
Kharlyngdoh

IBSD Node SHILLONG, MEGHALAYA



## Indian Thar Desert: A Journey From Survival Food to Exquisite Cuisine

The Indian Thar Desert is blessed with valuable natural resources with special mention of arid fruits and vegetables. Agriculture-based livelihood is the primary source of natives of Rajasthan, although water is a constraint. In Rajasthan, agriculture is chiefly dependent on rainfed conditions and sources of irrigation are extremely limited. Irregular rainfall is a common phenomenon that imposes frequent famines, as popularly mentioned in local proverb “*Marwar me kanwale ubo kal*”, and always multiplies the problems. In such conditions, people have learned the effective management of natural resources (water, plant and animal based) for food, fodder, fibres, therapeutics, fuel, and shelter. The people of Rajasthan have their own traditional wisdom for preservation of plant products to obtain seasonal foods throughout the year. Following these practices, they understood to overcome major constraints of food and nutritional security during famine times.

Arid fruits / vegetables are characterized by a rich source of essential vitamins, micronutrients, protein, and other phytochemicals. There are several plant species that contribute to the livelihood and nutritional security of indigenous people. Some of them are – *Acacia senegal* (Kumbhat), *Calligonum*

*polygonoides* (Phog), *Citrullus lanatus* (Matira), *Capparis deciduas* (Ker), *Cucumis collosus* (Kachara/Kachari), *Praecitrullus fistulosus* (Tindi), *Prosopis cineraria* (Khejari), *Salvadora oleoides* (Piloo), *Ziziphus nummularia* (Ber) and many other herbal/medicinal plants with nutraceutical values. Usually, indigenous people take an iron and protein-rich diet in form of chapati

made from dried Phog-buds is consumed during summers. Dehydrated Kachri – a rich source of Vitamin-C, is consumed as vegetables and chutney. Fruits of *Ziziphus nummularia* (locally known as Ber), are comparable to apple in flavonoid content results in high antioxidant activity. All these kinds of preserved foods are available in local markets (traditional market of



although having great nutritional values. These issues can be resolved by developing innovative ways for value addition and making strategies for marketing such underutilised foods. The biotechnology approach has proved efficient for the conservation, mass propagation and value enhancement of plant bioresources of arid regions of Rajasthan. Many researches from the Biotechnology unit, Department of Botany, Jai Narain Vyas University, Jodhpur, are available for efficiently utilizing the bioresources using biotechnology tools. In conclusion, as the demands for food, fuel, fodder, and medicines are ever-increasing, it is hard to predict which specific species will be required in the future. Therefore, we (the indigenous people) should feel a responsibility to safeguard and promote our traditional food preservation values.

**Dr. Sumitra K. Choudhary**  
Department of Botany, Jai  
Narain Vyas University,  
Jodhpur



(Sogra), Kheech, Dhokla from pearl millet/other millets and Bakla (steamed moong/moth bean). Famous Rajasthani dish 'Panchkuta', a mix vegetable prepared from preserved fruits of Khejri (Sangari), Ker, Kumbhat, Lasura (Goonda) and Capsicum (Mirchi) proved a health promoting cuisine. Native people also used to prepare “Rabori” from sorghum flour. Rayta

Jodhpur/Osian and Bikaner) and considered as a secondary source of income for local people. The Thar Desert has its own importance and peculiarities in the era of climate change and global warming. In these climatic situations, arid food may provide better options for food and nutritional security. It is a fact that arid fruits are still underutilized/unexplored,



## Biotechnological tools for conservation of phytodiversity: an introduction

Over 400,000 of the 1.7 million species of living organisms described so far on Earth are plants, more than 37,400 species threatened with extinction. The loss of species on Earth is ever increasing, owing to anthropogenic effects on natural ecosystems, climate change, and ecological collapse. "Global Tree Assessment", the largest conservation assessment in IUCN history, was organised in 2016 by the BGCI in collaboration with IUCN to increase awareness about trees. In 2021, it reported 58,497 tree species, of which 17,510 (about one-third) were threatened. This is more than double numbers of threatened reptiles, amphibians, birds, and mammals altogether. Of 17,500 tree species, nearly 2,800 of them have been classified as critically endangered. It is estimated that 142 species have been extinct in the wild.

Owing to ignorance of plant conservation aims and the fact that plants are typically less eye-catching than birds and animals, tree conservation has become lost in worldwide biodiversity priorities. The stories of extinct mammals and birds often obscure the dilemma of trees. Using a few species in mass plantation drives paradoxically often makes these issues worse. The diversity of the trees is just as important as their quantity. A single species can serve as the cornerstone of an entire ecosystem, and its extinction could set off a chain reaction of extinctions that could ultimately result in the collapse of an ecosystem.

According to Irwin (2022), hundreds of plant conservationists are currently working around the world to conserve the plants, which are approaching extinction. In these circumstances, in vitro propagation can play as one of the most promising roles for the conservation of threatened species. Plant tissue culture techniques provide alternatives for propagation of taxa with a limited explant source, seed dormancy, self-incompatibility, inbreeding depression, lower seed production, seedling viability/survival, etc. In vitro methods such as

micropropagation, somatic embryogenesis, organogenesis, encapsulation technology, transverse thin cell layer, cryopreservation, micrografting and genetic homogeneity assessment have also been employed in the ex situ conservation of over a hundreds of threatened plant species.

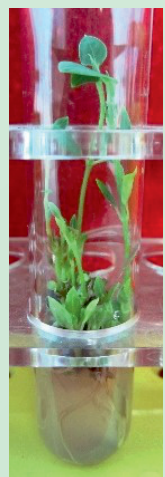
Biotechnology Unit, Department of Botany, Jai Narain Vyas University, Jodhpur has been working on the development of biotechnological tools for the characterization, conservation, and propagation of plant species adapted to the harsh environmental conditions of arid and semi-arid regions for over 30 years. Our laboratory has developed, defined, and standardised a number of tissue culture protocols for different



plants, particularly tree species, medicinal and herbal plant species, crop plants, as well as rare, endangered, and threatened (RET) species, with financial support from Department of Biotechnology (DBT), Department of Science and Technology (DST), University Grants Commission (UGC), Council of Scientific and Industrial Research (CSIR), and other Government of India agencies. The worked RET species include *Alhagi maurorum*, *Anogeissus sericea*, *Blyttia spiralis*, *Cadaba fruticosa*, *Caralluma edulis*, *Ceropegia bulbosa*, *Celastrus paniculatus*, *Commiphora wightii*, *Ephedra foliata*, *Eulophia nuda*, *Farsetia macrantha*, *Glossonema varians*, *Gymnema sylvestre*, *Leptadenia reticulata*, *Maerua oblongifolia*, *Mitragyna parvifolia*, *Pueraria tuberosa*, *Rauwolfia serpentina*, *Sarcostemma acidum*, *Tylophora indica*, *Withania coagulans*, etc. Establishment of aeroponic unit the laboratory has strengthened the existing infrastructure for plant propagation and phytodiversity conservation.

**Ashok Kumar Patel,  
Narpat S. Shekhawat**

Department of Botany, UGC – CAS, Jai Narain Vyas University,  
Jodhpur – 342005 (Rajasthan)





## विश्व के महत्वपूर्ण जीवों में स्थान रखती है फंजाई



प्रो. प्रवीण गहलोत

पृथ्वी पर सम्पूर्ण जीव-जन्तुओं व वनस्पतियों में महत्वपूर्ण स्थान रखने वाले जीवों में शुमार है-फंजाई, जिसे फंगस या हिन्दी में कवक भी कहा जाता है। सम्पूर्ण पृथ्वी पर फंगस की 3-5 मिलियन प्रजातियों के पाये जाने का अनुमान है इनमे से करीबन 1 लाख से ज्यादा प्रजातियों की खोज हो चुकी है। फंगस

विशेषज्ञ-प्रवीण गहलोत के अनुसार फंजाई या कवक के बिना किसी भी ईको सिस्टम (पारिस्थितिकी तंत्र) का स्थायी रहना असंभव है क्योंकि किसी भी ईको सिस्टम की प्रथम इकाई पेड़-पौधों को न्यूट्रिशन (पोषण) प्रदान करने वाली फंजाई होती है। फंजाई द्वारा मिट्टी में उपस्थित कार्बनिक पदार्थ का जैव-अपघटन करके उन्हें सूक्ष्म पोषक तत्वों में परिवर्तित कर दिया जाता है जो की पेड़-पौधों के लिए पोषण है।

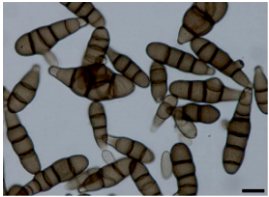
विश्व में फंजाई की कुछ प्रजातियां मानव के लिए हानिकारक है तो कुछ जातियां अत्यंत लाभदायक भी हैं। प्रति वर्ष वनों में और कृषि में पेड़-पौधों को होने वाले रोगों का कारण फंजाई है जिसके कारण करीबन एक चौथाई उपज की हानि होती है। गेहूँ, चावल, बाजरा व अन्य धान के प्रमुख रोग का कारण भी फंजाई है व इन रोगकारक फंजाई के कारण प्रतिवर्ष फसल का 25-30 प्रतिशत भाग नष्ट हो जाता है। यदि मानव के फंजाई रोगों की बात करे तो हाल ही में कोविड-19 से संक्रमित मरीजों में ब्लैक फंगस के संक्रमण के कारण विकराल स्थिति पैदा हो गई थी।

कवक विशेषज्ञ-प्रवीण गहलोत के अनुसार फंगस की कुछ प्रजातियां हमारे लिए अत्यंत उपयोगी हैं। विश्व में सर्वाधिक खाई जाने वाली फंगस में मशरूम (खुम्बी) का विशेष स्थान है प्रति वर्ष लाखों टन मशरूम (एगोरीकस, प्ल्यूरोटस, मार्केला इत्यादि) मशरूम को कृत्रिम रूप से संवर्धन कर खाने में काम लिया जाता है। विश्व के सबसे महंगे जैव-पदार्थों में भी कोर्डिसेप्स फंगस का स्थान है। कोर्डिसेप्स फंगस का उपयोग शक्तिवर्धन दवाइयों व पौरुषत्व बढ़ाने में किया जाता है, जो की बाजार में लगभग 05-08 लाख रुपये किलो मिलता है। यह सिर्फ हिमालय के पिथौरागढ़, चमौली, सिक्किम, तिब्बत व चीन में पायी जाती है। यूरोपीयन देशों में टयूबर (ट्रफल) नामक की फंगस भी अत्यन्त दुर्लभ है व बहुत महंगी मिलती है जिसका उपयोग भी शक्तिवर्धन दवाइयों में किया जाता है। राजस्थान के थार मरुस्थल में दो फंगस फैलोरीनिया व पोडोक्सीस मशरूम पाई जाती है जो कि बाजार में बारिश की ऋतु में 400-500 रुपये किलो मिलती है। गेनोडर्मा नामक फंगस भी थार मरुस्थल में आसानी से मिल जाती है। इसका उपयोग भी आयुर्वेदिक दवाइयों व हर्बल चाय बनाने में किया जाता है, ज्ञातव्य है कि विश्व की प्रथम एन्टीबायोटिक औषधी पेनीसीलीन भी पेनीसीलीयम नामक फंगस से बनाई गई थी।

### अल्टर्नेरिया

प्रमुख सब्जिया आलू, टमाटर, मीच, बैंगन

इत्यादि में झुलसा रोग का कारण अल्टर्नेरिया है इसके कारण विश्व में प्रतिवर्ष 30-35 प्रतिशत सब्जियां रोग ग्रस्त हो जाती हैं।



### कोर्डिसेप्स (कालाजीरा)



विश्व की सबसे महंगी फंगस जो की हिमालय के ऊँचे स्थानों पर पाई जाती है। इसका उपयोग शक्तिवर्धन व वीर्यवर्धन दवाइयों बनाने में किया जाता है इसका बाजार मूल्य 05-08 लाख रुपये किलो है।

### मार्केला (गुच्छी)



पोषण व स्वाद के लिए उपयोग में ली जाने वाली मशरूम में प्रोटीन, फाइबर, पोटेशियम, कॉपर व विटामिन्स होते हैं। इनमें सर्वाधिक मात्रा में विटामिन-डी पाया जाता है।

### फैलोरीनिया मरु खुम्बी



राजस्थान के थार मरुस्थल में दो

मशरूम फैलोरीनिया व पोडोक्सीस पाई जाती है। वर्षा ऋतु में बाजार में यह 400-500 रुपये किलो उपलब्ध रहती है। इसमें प्रोटीन, कैल्शियम, सोडीयम, पोटेशियम व विटामिन्स पाये जाते हैं। मारवाड़ में पाट (गोठ) पर इसकी सब्जी बनाने का प्रचलन है।

### एगोरिकस मशरूम (खुम्बी)



विश्व में सबसे अधिक भोजन के रूप में उपयोग में ली जाने वाली फंगस एगोरिकस (मशरूम) है जिनका फार्म हाउस पर संवर्धन कर बाजारों में उपलब्ध करवाया जाता है।

### गेनोडर्मा (लिन्जी)



आयुर्वेदिक औषधी के सर्वाधिक उपयोग में ली जाने वाली फंजाई का उपयोग हर्बल चाय में, शरीर की इम्यूनोटी बढ़ाने में, वजन कम करने व स्ट्रेस (तनाव) कम करने में किया जाता है। चीन में गेनोडर्मा फंजाई से विविध प्रकार की औषधीया बनायी जाती है।

### म्यूकर (ब्लैक फंगस)

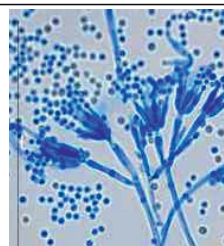


वैश्विक महामारी कोविड-19 की महामारी पश्चात्

लोगों की प्रतिरोधक क्षमता कम होने व कृत्रिम श्वास लेने के उपरान्त म्यूकर (ब्लैक फंगस) का संक्रमण हो गया था जिसके कारण बहुत से लोगों की मृत्यु हो गई थी या उनके आँख व जबड़े को निकालना पड़ा था।

### पेनीसीलीयम

विश्व की प्रथम एन्टीबायोटिक दवाई को एलेक्जेंडर फ्लेमिंग ने 1945 में बनाई थी। पेनीसीलीन नाम एन्टीबायोटिक पेनीसीलीयम नामक फंगस से बनाई गई थी।



### फ्यूजेरीयम

वनों के पेड़ों व कृषि फसलों में म्लानी रोग हेतु जिम्मेदार फंगस फ्यूजेरियम है इसके कारण प्रतिवर्ष 20-30% पौधे सूख जाते हैं।

