ABSTRACTS

of

National e-Conference

'Bioresources and Sustainable Livelihood of Rural India'

Organized by

Department of Botany, Nagaland University,
Lumami 798 627, Nagaland, India

September 28-29, 2020

Sponsored by

'Ministry of Environment, Forest and Climate Change'
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UGC-SAP (DRS-III) Programme,
Department of Botany, Nagaland University

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Programme

National e-Conference On

'Bioresources and Sustainable Livelihood of Rural India

September 28-29, 2020

Organized by

Department of Botany, Nagaland University, Lumami-798627, Nagaland

Venue: Online; Host Venue: Department of Botany

DAY – I (28. 09. 2020) (Monday)

Inaugural Session

Time: 10.15 A.M. – 11.45 AM

Chair Person: Dr. Neizo Puro

Sequence of Events		Apprx. Time (Min.)
Prayer	Dr. Bendangnaro Jamir	2
Welcome Address	Prof. Chitta Ranjan Deb, Head, Department of Botany & Organizing Secretary, National e-Conference	7
Short Speech	Prof. Sangyu Yaden, Dean, School of Sciences, NU	5
Inaugural Address	Prof. Pardeshi Lal, Vice Chancellor, Nagaland University	10
Keynote Address	Prof. Pramod Tandon, CEO, Biotech Park, Lucknow (Bioeconomy: Entrepreneurship and Innovation for Sustainable Livelihood)	40
Words of Appreciation	Dr. Asosii Paul	5

DAY – I (28. 09. 2020) (Monday)

Technical Session – I

Time: 12.00 – 5.00 PM

(All Presenting Authors are Requested to Maintain the Time Allotted for Respective ONLINE Presentation and Join the Session At least 1 hour before Their Allotted Time, as If any Presenter is Absent/Unable to Join for Presentation, Next Presenter will be Allowed to Present before Allotted Time)

Abstract No.	Title of the Paper	Authors & Presenting Author	Time Allotted for Presentation
Sub-Themes **1. Bioresources and Conservation** **2. Microbial Bioresources** **Note: All contributory papers will get 8 min for presentation and 2 min for discussion**			
Invited Talk -1	**Biodiversity Conservation in Eastern Himalaya: with Notes on Ethnobotanical Perspectives**	**Prof. A. P. Das, RGU, AP**	**12.00-12.35 PM (30+5 min)**
Invited Talk -2	**From Field to Lab to Field: A Perspective of Native Microorganisms in *Jhum* Agriculture**	**Prof. S. R. Joshi NEHU, Shilling**	**12.45-1.20 PM (30+5 min)**
Abstract No. 03	Cultivation of High Altitude Medicinal and Aromatic Plants: A Key for Sustainable Development and Bioresource Conservation in Higher Himalayan Region (HHR) of India	**Vijay Kant Purohit**, Bhagat Singh Mengwal, Pradeep Dobhaland Jaidev Chauhan	1.30-1.40 PM
Abstract No. 04	Nodule Characterization of Some Wild Legumes Collected from Nagaland	**Maman Megu**, Chitta Ranjan Deb and A. Paul	1.45-1.55 PM
Abstract No. 05	Pollination Biology of *Thunia alba* (Lindl.) Rchb. f. (Orchidaceae) and Conservation and Their Natural Habitat	**Bhaskar Buragohain** and S. K. Chaturvedi	2.00-2.10 PM
Abstract No. 06	Description of a New Fish Species of the Genus *Garra* (Teleostei: Cyprinidae) from the Brahmaputra Basin, Nagaland, India	**Sophiya Ezung**, Bungdon Shangningam and Pranay Punj Pankaj	2.15-2.25 PM
Abstract No. 07	Correlation Studies Among the Water Physico-chemical Properties of Tsurang River, Nagaland	**Khikeya Semy** · M. R. Singh	2.30-2.40 PM
Abstract No. 08	Macropropagation of *Musa acuminata* cv Grande Nain by Rhizome Splitting	**Thejano Ngullie**, Chitta Ranjan Deb and A. Paul	2.45-2.55 PM
Abstract No. 09	Coldwater Fishery with Special Reference to Endemic Mahseer of Nagaland, Major Threats and Conservation Prospects	**Metevinu Kechu** and Pranay Punj Pankaj	3.00-3.10 PM

Abstract No. 10	Nodulation in Crop Legumes Grown in Home Garden of Lumami, Nagaland	**Bendangsenla Pongener,** Chitta Ranjan Deb, Asosii Paul	3.15-3.25 PM
Abstract No. 11	DNA Barcoding: A Taxonomic Tool for Identification of Wild Orchids	**Joyrison Kamba** and Chitta Ranjan Deb	3.30-3.40 PM
Abstract No. 12	Effect of Different Media and Growth Supplements on *In Vitro* Seed Germination and Seedling Development of *Paphiopedilum venustum* (Wall. ex Sims), an Endangered Terrestrial Orchid	**Bengia Mamu**, R.K. Singh and Oyi Dai Nimasow	3.45-3.55 PM
Abstract No. 13	Potential Algal Resources from Kohima District, Nagaland	**Keviphruonuo Kuotsu** and S. K. Chaturvedi	4.00-4.10 PM
Abstract No. 14	Fungal Population of Rhizospheric Soil from Banana Plantation Site at Mokokchung District, Nagaland, India	**W. Temjen**, M. R. Singh, T. Ajungla and A. Kichu	4.15-4.25 PM
Abstract No. 15	Morphological Identification of Fungi in Tea Soil	**Asangla Kichu**, T Ajungla, Thsangla	4.30-4.40 PM
Abstract No. 26	Ethnobiology of the Traditional Alcoholic Rice Beers of Nagaland, India	**Lydia Yeptho** and T. Ajungla	4.45-4.55 PM
Abstract No. 27	Indigenous Knowledge on Wild Edible Mushroom and its Potent Efficacy as Bioresource in Nagaland, India	**Gloria Nyenthang** and T. Ajungla	5.00-5.10 PM

DAY – 2 (29. 09. 2020) (Tuesday)

Technical Session – II

Time: 10.00 AM –5.00 PM

Sub-Themes

3. Value Addition of Local Bioresources and Livelihood

4. Role of NGOs / SHGs / Social Entrepreneur / Community Participation/IPR

Invited Talk-3	**Bio-Resources for Sustainable Livelihood-Case Studies from Thar Desert and North-Eastern Region of India**	**Prof. S. R. Rao** NEHU, Shillong	10.00-10.35 AM (30+5 min)
Invited Talk - 4	**The Prospects of Shiitake Farming in Northeast India**	**Dr. Sosang Longkumer** Director, Konger Agritech, Nagaland	10.45- 11.20 AM (30+5 min)
Abstract No. 38	Push-Pull Factor for Rural-Urban Migration: A Case Study in Ekeshwar Block, Uttarakhand, India	**Nitesh Rawat**, R.S. Negi and Santosh Singh	11.25-11.35 AM

Abstract No. 39	Consumers' Perception towards CSR Practices Adopted by Companies in the North Eastern Region of India	Arvind Kumar and **Taanika Arora**	11.40 -11.50 AM
Abstract No. 40	Bioresources and Sustainable Livelihood of Rural India: Role of Self Help Groups	**Jube Boruah Mondal**	11.55 AM - 12.05 PM
Abstract No. 16	Common Property Resources (CPRs) and Sustainability in North East India	**Sumita Banik Saha**	12.10-12.20 PM
Abstract No. 17	Dependency of Tangsa People on Surrounding Wild Vegetation in the Changlang District of Arunachal Pradesh	**Pyonim Lungphi**, Ayam Victor Singh and A. P. Das	12.25-12.35 PM
Abstract No. 18	Wild Anti-diabetic Plants and Their Traditional Remedies from Lakhimpur District of Assam, India	**Pinki Gogoi**, Abhaya Prasad Das and Ayam Victor Singh	12.40-12.50 PM
Abstract No. 19	Tourism Development Strategies of Uttarakhand Using SWOT Analysis: A Review	**Santosh Singh** and R. S. Negi	12.55-1.05 PM
Abstract No. 20	Folklore Medicinal Plant of Arunachal Pradesh Used as Immune Modulators	**Ashish Kumar Tripathi**, Limasenla, Rama Shankar	1.10-1.20 PM
Abstract No. 21	Aquatic Bioresources and Their Sustainable Utilization in Rudrasagar Lake of Tripura, Northeast India	**Moitree Taran**, Prabir Barman and Sourabh Deb	1.25-1.35 PM
Abstract No. 22	Scope for Value Added Product(s) from *Garcinia* species of Assam, India	**Ashish Kar**, N.K.Goswami, Raghuraj Singh and Satayanshu Kumar	1.40-1.50 PM
Abstract No. 23	Utilization of Bioresources for Medicinal Purposes by the *Gaddis* of Bharmour (Himachal Pradesh) and the Factors Affecting Their Transhumance	**Alpy Sharma**, Sanjay Kr. Uniyal, Daizy Rani Batish	1.55-2.05 PM
Abstract No. 24	Charcoal – A Value Addition Option of Bamboo	**Runumee D. Borthakur**, R. K. Kalita and S. J. Bora	2.10-2.20 PM
Abstract No. 25	A Preliminary Study on Wild Edible Fruits and Vegetables Used by the Ao-Naga Tribe of Mokokchung District of Nagaland, India	**Piyongchila Jamir** and Limasenla	2.25- 2.35 PM
Abstract No. 28	The Value Addition Study of Honey- a Source of Anticancer Compound Chrysin	**Khumukcham Nongalleima**, P. Yuvaraj, Huidrom Birkumar Singh	2.45-2.55 PM
Abstract No. 29	Bamboo as a Potential Source of Livelihood in Nagaland, India	**Maongkala Walling** and Neizo Puro	3.00-3.10 PM
Abstract No. 30	Introduction of *Bambusa tulda* Roxb. along with Shifting Cultivation as a Sustainable Bioresources	**Pangwan M Konyak** and T. Ajungla	3.15-3.25 PM

Abstract No. 31	NTFPs as Means of Livelihood in Mon District Nagaland	**Andrew Konyak** and Neizo Puro	3.30-3.40 PM
Abstract No. 32	Diversity of Lesser Known Edible Legumes of Nagaland and Their Nutritional Analysis	**Aolemla Pongener** and Chitta Ranjan Deb	3.45-3.55 PM
Abstract No. 33	Wild Bioresources Used for Livelihood in Phek District, Nagaland	**Pfüchüpe-ü Mero**	4.00-4.10 PM
Abstract No. 34	Molecular Identification, Quantification of Phytochemical Contents and Antioxidant Activity of *Dendrobium heterocarpum* Wall. ex Lindl.: a Potential Medicinal Orchid	**Temjennokcha B. Longchar**, Chitta Ranjan Deb, N. S. Jamir	4.15-4.25 PM
Abstract No. 35	Nutritional Assessment of Some Wild *Musa* of Nagaland, India	**Thejavitsu Noah Vupru*,** Asosii Paul, Bendangnaro Jamir and Chitta Ranjan Deb	5.00-5.10 PM
Abstract No. 36	Ethnobotanical Studies on Some Legumes used by Angami, Ao and Konyak Tribes of Nagaland, Northeast India	**Phejin Konyak** and Limasenla	5.15-5.25 PM
Abstract No. 37	Ethnobotanical Resources Used by Angami-Naga Tribe of Kohima District, Nagaland, India	**Ruokuonuo Kuotsu** and Limasenla	5.30-5.40 PM

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Abstracts

Sub-Theme

‘Bioresources and Conservation’

Abstract No. 01 (Extended)

Biodiversity Conservation in Eastern Himalaya: with Notes on Ethnobotanical Perspectives

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Abstract

The importance of Great Himalayas in the creation of suitable environment for rapid evolution is now well-realized. The easternmost part of it, the Eastern Himalaya has been recognized as the place of origin and early evolution for angiosperms.

Eastern Himalaya actually represent the easternmost part of the IUCN demarcated Himalaya Hotspot for biodiversity conservation and is known as a wonderful store house of biological elements with high proportion of endemics. Eastern part of Nepal, whole of Sikkim, major part of the northern hilly tract of West Bengal, TAR, Bhutan, part of Assam and Arunachal Pradesh are located within Eastern Himalaya. Plants of this region has attracted plant lovers and plant hunters equally from round the world to visit, explore and exploit its vegetation at least during the last three centuries. Many East Himalayan species are now not available in their native habitat but some of those are available in European gardens even today.

Terai and Duars region of West Bengal are also with equally rich vegetation cover having contiguity with the East Himalayan forests. The importance of East Himalayan vegetation is immense. Numerous publications documenting the useful plants native to the region are available. These include numerous species of orchids, epiphytes and different types of edible, ornamental and medicinal plants. Even today, so many species are regularly but illegally exploited from this region and are exported to remote locations across the international border. These include mainly ornamentals of different habit groups and scientifically and ethnically known medicinal plants. Numerous journals, Indian and foreign, dealing with taxonomy, vegetation, biological diversity, ethnobotany, etc. are regularly publishing numerous such articles on this region. The history of scientific documentation of

plants in the East Himalayan region was initiated in the first decade of 19th century. Since then so many Indian and exotic groups studied the flora of this region. However, apart from Sikkim, the histories of floristic survey for other seven states of North-East India are not so impressive. But, we find, at least in the recent past such accounts are appearing and quite a few groups become active in exploration and documentation.

There are numerous *in situ* and *ex situ* Protected Areas established in the region to conserve numerous species including orchids and medicinal plants. National and State Governments are taking interest in conservation activities. But, most of these PAs are heavily marketed in the name of ecotourism, exerting negative pressure on biodiversity. Present decision to establish numerous hydroelectric power projects will be disastrous for the basic utility of such conservatories. This is also heavily affecting the existing sustainable water relation in the entire area. We forgot, no species can survive within the walled PAs.

Attempts to connect the PAs of the region with corridors and the recognition of larger transboundary PAs were failed measurably due to socio-political incompatibility of these ideas. New businesses on Himalayan snow-peak expeditions are also extensively polluting the entire area. Population explosion, urbanization, extension of Tea and other plantations with one or few (with some exotics) species are destroying the habitat. This has been aggravated through the implementation of different mega-projects within the Hotspot area.

At the same time, large number of tribal communities living throughout the East Himalayan range and also in the Terai-Duars region. Primitive tribes like Lepacha and Toto are now slowing merging with the main stream in Sikkim-West Bengal region. Other states of North-east India, especially of Arunachal Pradesh, Nagaland, Mizoram and Manipur are fully or mostly inhabited by large number of tribal communities. Most of them are forest dependent people and are procuring all the resources for their survival from their surrounding vegetation.

The overall change of climate, instrumented by so called ‘development’ is the main hurdle against conservation. Unless we can increase natural vegetation and can check the very fast rate of climatic changes, it will be impossible to conserve most of the sensitive species. And, with his own responsibility, the Man will not only kill them, but will kill the entire biosphere!

Key words: Biodiversity conservation, Tribal communities, East Himalaya, NE India.

Abstract No. 02 (Extended)

Bio-Resources for Sustainable Livelihood- Case Studies from Thar Desert and North-Eastern Region of India

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Abstract

Ecosystems in the nature have the ability to produce bio-resources and ensure to recycle them to sustain life on planet earth. These resources have the ability not only to sustain life but also ensure livelihood for its inhabitants for their development and diversification, thereby helping them to adapt to ever evolving dynamic environment(s). However over exploitation of such resources in an unsustainable manner may lead to extinction of useful bio-resources and also spell doom to mankind. The only way to ensure sustainable livelihood for the inhabitants of ecosystem(s) is to understand the quantum and range of diversity of constituent bioresources, to develop an effective sustainable utilization pattern and above all to prioritize their conservation needs. An exciting fact about natural bio-resources is that each geographical location is unique for its bio-resources. For e.g. Indian Thar desert, encompassing bulk of the arid and semiarid areas of India is also the most densely populated desert of the world. Yet the region is bestowed with unique plant genetic resources, which offer everything to the inhabitants including food, fruits, edible oils, wide range of plant-based medicines for humans besides providing live-stock with fodder and forage and help them in sustaining the harsh conditions of Thar Desert. These resources include several important trees and shrubs viz. *Acasia jacquemontii, Balanites roxburghii, Ziziphus zizyphus, Ziziphu snummularia, Calotropis procera, Leptadenia pyrotechnicaetc,* while quite a good number of herbs and grasses viz. *Lasiurus scindicus, Cyndon dactylon, Panicum turgidum, Panicum antidotale, Phragmites sps., Dichantium annulatum, Cenchrus ciliaris, Desmostachya bipinnata, Eragrostis species, Ergamopagan species, Dipcadi species, Tribulus terrestris, Citrullus colocynthis* are promising phyto-resources of the region. Similarly, the north-eastern region of India is also blessed with nature's bounty in the form of a wealth of industrially potential flora, fauna and microbial systems. Citrus, banana, turmeric,

chillies, bamboos, orchids are only a few examples to name which are unique plant resources of the region. The systematic evaluation of such medicinal and horticultural plants, isolation and characterization of active biomolecules from them would hint a wide range of drug formulations for various ailments. But most of these resources are peril and endangered in their natural habitat. Therefore it is essential to have regular assessments of the conservation status of these species, in order to prioritize those in need of conservation and provide a measure of successful actions to be taken. Further, the improvement of cultivated taxa considerably depends on the use of genetic variability available within the species. The genetic variation that exists among plant populations is a basic requirement for efficient development and improvement of such populations.

Cytogenetical and molecular approaches to characterize the diversity of plant resources, both at intra- and inter-specific levels, ranging from arid zone tree species of the Indian Thar desert to Orchids and certain important horticultural taxa of the North-Eastern region of India, was the focus of our research investigations in the last thirty years. Cytogenetical data which include chromosome karyomorphology, male meiosis, heterochromatin distribution pattern, etc.as well as DNA based markers *viz*., RAPD, ISSR, ISJ, DAMD, SRAP, AFLP, SPAR, etc. and a combination of plastid (*mat*K, *rbc*L, *psb*K-*psb*I, *psb*A-*trn*H, *atp*B and *atp*F-*atp*H) and nuclear (ITS) genes were utilized to assess the genetic diversity and phylogenetic relationship of these plants. These approaches helped in developing a better understanding of the existing genetic variability in natural and wild populations and diversity among the plant species that is a pre-requisite for forming strategies for sustainable utilization of genetic resources. A need to characterize the vast amount of plant genetic resources is also very crucial for developing strategies for their effective conservation, management and our group precisely attempted the same. Some of these observations and their implications for sustainable utilization will be discussed in detail.

Abstract No. 03

Cultivation of High Altitude Medicinal and Aromatic Plants: A Key for Sustainable Development and Bioresource Conservation in Higher Himalayan Region (HHR) of India

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Abstract

Medicinal and aromatic plants (MAPs) have been an important resource for human health care from prehistoric times to the present day. About 40,000 - 50,000 plants species are known to be used in different medicine systems throughout the world. The demand of raw materials of MAPs in pharmaceutical industry has grown rapidly because of accelerated local, national and international interest on herbal drugs. To fulfil this demand relatively a very few MAPs are cultivating in limited areas and the great majority of the MAPs particularly high altitude species are still collecting from the wild. However, over-harvesting of MAPs, land conversion, and habitat loss increasingly threaten a considerable portion of the world's MAP species and populations. Recently a number of initiatives have been launched to achieve a better framework for the sustainable use of biological diversity, particularly the CBD. Under the CBD, more specific guidance for the ecological, socio-economic and equity basis for conservation and sustainable use of biodiversity has been articulated in the Ecosystem Approach (EA). The need for cultivation of high altitude MAPs has been voiced for decades and simultaneously many organisations had worked on development of cultivation practices of some species. This argued to lead the conservation of the wild plant populations for assuring the supply of raw materials to the industry and local benefits, however, the cultivation practice is limited till date and need to promote in farmers' fields. The present study is suggested that the promotion of cultivation of selected MAPs mainly *Nardostachys grandiflora* (jatamansi), *Aconitum balfourii* (Vatsanabha, Mitha Vish), *Aconitum heterophyllum* (Atis, Atvika), *Picrorhiza kurrooa* **(**Kutki, Kedarkadwi) and *Saussurea costus* (Kuth) and many more species in high altitudes villages of the Indian Himalayan Region (IHR) could be help in regular supply of the raw materials to the industry, generate additional monetary benefits to the local inhabitants and conserve these herbs in wild for records of future generation and further scientific investigation.

Keywords: Cultivation, Ecosystem approach, Indian Himalayan region, MAPs, Monetary benefits and conservation, Sustainable development.

Abstract No. 04

Nodule Characterization of Some Wild Legumes Collected from Nagaland

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Abstract

Legumes can be generally categorized into cultivated and wild legumes. Wild legumes are widely known for its medicinal and stress tolerant properties. Besides that, legumes are also considered important because of their nitrogen fixing abilities which takes place in certain specific structures called nodules. The present work was aimed to study the nodule structures and observe the microbial colonization zones in the nodules of 10 wild legumes namely *Albizia chinensis, Crotalaria* spp., *Desmodium* spp., *Desmodium* spp., *Erytherina stricta, Leucaena leucocephala, Mimosa diplotricha, Mimosa pudica, Tephrosia candida* and *Vigna* spp. collected from Nagaland. The nodules were pink in colour because of the presence of leghaemoglobin which is indicative of nitrogen fixation. Average number of nodules ranged from 2-8 nodules per seedling plant for tree legumes while in creepers it ranged from 8-20 nodules per plant. Of the wild legumes collected 7 of them had indeterminate type nodules while 3 had determinate type. Subsequently their thin sections were observed under microscope after staining with Toulidine blue. Different zones of colonization were observed indicating that root nodules of legumes are the site for microbial association.

Keywords: Leghaemoglobin, Microbial association, Nitrogen fixation, Root nodules Wild legumes.

Abstract No. 05

Pollination Biology of *Thunia alba* (Lindl.) Rchb. f. (Orchidaceae) and Conservation and Their Natural Habitat

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Abstract

Thunia alba is terrestrial or lithophytes or grow as epiphytes on the lower branches of tree in the forest or forest margins. The pollination biology of the orchid *Thunia alba* has been studied in Mokokchung (26′19″ N, 94′30″ E) and Sumi Settsu village (26′16″ N, 94′28″ E), Zunheboto district of Nagaland State in North-East India during their flowering time from 2014 to 2017. Flowering occurs in the month of May-June every year. The spur is cylindrical, ca. 1.2 cm. meliferous, column is 2 cm. in length, laterally winged, pollinia 4 present in two pairs, connected with the sticky viscidium. The self compatible and non-autogamous flowers of *T. alba* are visited by mall solitary bee of the genus *Lesioglossum*, blue tiger butterflies, Xylocopa, Hornets, Wasps and the bumble bee *Bombus sp*. The mighty bee *Bombus* is the legitimate pollinator of the flower of *Thunia alba*. The external dimension of the bumble bee perfectly fit in to the internal architecture of the floral passage. The pollinator/ visitors foraged the flowers in search of the nectar present in the spur. During foraging the pollinaria are attached on the metascutum of the bee and get inserted into the receptive stigmatic cavity during their visit to other flowers. The mode of pollination is 'Thoraxinotribic'. The rate of open pollination was recorded 38% and manipulated pollination success was 100% (geitenogamy and xenogamy). It has been recorded that the seeds of *Thunia alba* can able to grow in natural habitat though in very negligible numbers but it will be a very useful measure to conserve this species. In-situ conservation through tissue, seed or embryo culture is another effective measure for conservation of *Thunia alba.*

Keywords: Bumble bee, Conservation, Nectar, Pollination, Thoraxinotribic pollination.

Abstract No. 06

Description of a New Fish Species of the Genus *Garra* (Teleostei: Cyprinidae) from the Brahmaputra Basin, Nagaland, India

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2. Freshwater Fish Section, Zoological Survey of India, 27 J.L. Nehru Road, Kolkata

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Abstract

Garra chathensis, a new species is described from the Chathe River, Nagaland, India. The new species is distinguished from its congeners of North-East India in having a bilobed proboscis, a black spot at the upper angle of the gill opening, 3½/1/3 transverse scale rows, 16 circumpeduncular scales, 9–10 pre-dorsal scales and 32–33 lateral line scales.

Abstract No. 07

Correlation Studies Among the Water Physico-chemical Properties of Tsurang River, Nagaland

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Abstract

Surface water samples were collected at three different stations from September, 2018 to August, 2019 along the Tsurang River. The samples were analysed for 17 physico-chemical parameters Viz. pH, Total Dissolved Solids (TDS), turbidity, Electrical Conductivity (EC), temperature, free CO_2, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Total Alkalinity (TA), Total Hardness (TH), chloride, calcium, magnesium, sulphate, nitrate, phosphorus, potassium. The present study aims to determine and identify the highly correlated and interrelated water quality parameters using Pearson's correlation coefficients. Result from the three sampling stations shows similar trend, as such pH was negatively significant with turbidity, nitrate and sulphate. TDS shows positive correlation with free CO_2 and negative correlation with total hardness. Positive correlation was recorded between turbidity, nitrate, sulphate and potassium. Total alkalinity was negatively significant with Chloride and positively significant with Magnesium. Sulphate shows positive correlation with nitrate and phosphorus. Nutrient parameters (nitrate, phosphorus and potassium) are positively significant at $p<0.05$ level in all the stations. The correlation study shows varying interrelations and dependency between the various water physico-chemical parameters of Tsurang River.

Keywords: Pearson correlation coefficient, Physico-chemical properties, Tsurang River.

Abstract No. 08

Macropropagation of *Musa acuminata* cv Grande Nain by Rhizome Splitting

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Abstract

Macropropagation in banana is one of the most efficient and affordable way for propagating banana. Since naturally, the regeneration, life span and productivity of banana is highly being reduced due to diseases and other factors in the natural environment, the present study aims to provide an alternative way to solve the issue. Different techniques for propagation of banana suckers were carried out in this experiment. The work was carried out using two techniques, Technique 1 (T1) and Technique 2 (T2) and a control or natural way. The suckers were collected from the field and washed clean and cut into five equal parts and accordingly T1 and T2 techniques were employed and treated with 1% bavistin for a minute. T1 had the maximum regenerated shoots 4 ± 1.41, while control technique had the highest number of leaves 5.3±0.71and infinite number of roots and the height of plant46 ± 0, was comparatively much taller than the other two. In this study the macropropagation Technique, T1 was observed to give the best outcome giving multiple regenerated shoots.

Keywords: Banana, Macropropagation, Regeneration, Rhizome splitting.

Abstract No. 09

Coldwater Fishery with Special Reference to Endemic Mahseer of Nagaland, Major Threats and Conservation Prospects

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Abstract

The coldwater fishery resources encompasses the high and mid-altitude lakes, snow fed rivers along the Himalayan belt, fast flowing streams and rivulets as well as their tributaries and reservoirs. Though its contribution on account of total inland fish production is considerably low, it comprises of a rich biodiversity, native valuable germplasm and helps in monitoring environmental quality in these waters. Nagaland with its unique diverse topography and rich biodiversity is also home to the mighty endemic Mahseers like *Tor* and *Neolissochilus* including other coldwater fishes such as minor carps and loaches that are widely distributed across the rivers in the state. However, due to various detrimental activities such as habitat degradation, unregulated indiscriminate fishing, over exploitation, water obstructions in the form of dams and hydro power projects are posing a grave danger in dwindling the wild population significantly. In this regard, initiatives are slowly being taken up by both private and public sectors in development of hatcheries and declaring protected zones in some parts of the river for conservation purposes in the state. Taking into consideration the wide prospects of coldwater fishery resources in this region, there is an urgent need for sustainable development by integrating better monitoring policies, stringent laws, mass awareness and constructive technology approaches for increase yield and conservation through eco-tourism.

Keywords: Anthropogenic stressors, Coldwater fishery resources, Coldwater fishes, Nagaland, Sustainable development.

Abstract No. 10

Nodulation in Crop Legumes Grown in Home Garden of Lumami, Nagaland

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Abstract

Nagaland has rich crop legume diversity which is grown in every household of the tribal population. Crop legumes can reduce atmospheric nitrogen which increases the fertility of the soil. Present study was carried out in Lumami village under Zunheboto district of Nagaland where a total of eight crop legume species were collected namely; *Canavalia gladiata*, *Dolichos lablab*, *Phaseolus lunatus*, *Phaseolus vulgaris*, *Psophocarpus tetragonolobus*, *Vigna radiata*, *Vigna umbellata*, and *Vigna unguiculata*. Root nodule morphology was recorded and internal anatomy was studied. The studied crop legume exhibit determinate type of root nodules. Transverse section of the root nodules stained with toluidine blue showed infected tissues with bacteroids.

Keywords: Crop legume, Home garden, Nagaland, Rhizobia, Root nodule morphology.

Abstract No. 11

DNA Barcoding: A Taxonomic Tool for Identification of Wild Orchids

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Abstract

With less than 2 million of the estimated 15 million plants and animals species have been identified. The rate of extinction has increased due to global warming which has consequent affects on climates and ecosystem causing physical and biological changes throughout the world. Classical taxonomy which uses morphological characters has falls short in this and are lost each year before proper documentation. Therefore, there is a need to develop a technique like DNA Barcoding which uses short DNA gene sequences from genome to identify organisms and differentiate between very closely related species in order to conserve and catalogue species diversity. The present study was investigated to check the identification success rate of some orchids species of Nagaland using *matK*, *rbcL* from chloroplast and ITS from nuclear genome. The sequences were aligned using Clustal W and genetic distances were computed in MEGA 7.0 and also analyzed the phylogenetic relationships among the investigated orchid species.

Keywords: DNA Barcoding, Identification, *matK*, *rbcL*, ITS, Phylogenetic analysis.

Abstract No. 12

Effect of Different Media and Growth Supplements on *In Vitro* Seed Germination and Seedling Development of *Paphiopedilum venustum* (Wall. ex Sims), an Endangered Terrestrial Orchid

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Abstract

Paphiopedilum venustum is one of the endangered terrestrial orchid species due to excessive collection, and destruction of its natural habitat. In order to conserve this species, an attempt was made in the present study to examine the effect of different media {Full strength Murashige and Skoog (MS) medium, ½MS, ¼MS, Vacin and Went (VW) and Kundson C (KC)}, supplemented with or without various organic and other plant growth additives {Activated charcoal (AC), Banana Extract (BE), Coconut water (CW), Green Gram (GG), Peptone, Potato Extract (PE), α-naphthalene acetic acid (NAA)} on its *in vitro* (asymbiotic) seed germination and seedling development. Further, the survival rate of seedlings in green house condition after hardening in Brick: Charcoal: Coconut husk was estimated.

Seeds were taken from mature capsules collected 210 days after pollination (DAP) capsule for *in vitro* germination and incubated for 61 days after inoculation. The highest seed germination (83%) occurred on ½ MS medium supplemented with 0.5 mg/l α-naphthalene acetic acid (NAA) and 10% coconut water (CW).Among different organic additives, CW proved to be the best resulting in 69.28% seed germination in 67 days after inoculation. The ½ MS supplemented with 0.5 mg/l NAA and 10% CW was also the best medium for seedling development(72.86 %).The well rooted seedlings of 3-4 cm height hardened *in vitro* in Brick: Charcoal: Coconut husk for 3-4 weeks before transplantation to the potting mixture resulted in 70-80% survival upon transfer and acclimatization inside green house.

Keywords: *Paphiopedilum venustum*, Growth media, Plant growth additives, Seed germination, Seedling development.

Abstract No. 13

Potential Algal Resources from Kohima District, Nagaland

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Abstract

Algae are widely used around the world as a source of food and food supplement, animal fodder, industrial applications as well as waste treatments. Algae are now in the spotlight because of their potential to be used as sustainable sources to provide solutions for food security, bio-fuel, antibiotic resistance, and to combat environmental degradation. However, in Nagaland, Algae is mostly tagged as a nuisance and there is no record of any use of algae so far. The present work reveals 17 potential algal taxa (*viz*., *Spirulina nodosa* ,*Nostoc* sp., *Lyngba* sp. *Anabaena recta*, *Cylindrospermum majus*, *Chrococcus* sp., *Oscillatoria* sp., *Spirogyra* sp., *Cladophora glomerata*, *Chlorella vulgaris*., *Scenedesmus* sp., *Rhizoclonium hieroglyphium*, *Chara* sp., *Hydrodictyon* sp., *Euglena* sp., *Pinnularia* sp., and *Nitzchia* sp.) that were collected from Kohima district which are mainly used in pharmaceutical products, bio-fertilizers and for bioremediation. This study will shed some light on the rich algal diversity of Nagaland and its potential utilization as a sustainable bioresource.

Keywords: Algae, Bioresource, Food security, Kohima district, Sustainable.

Sub-Theme

‘Microbial Bioresources’

Abstract No. 14

Fungal Population of Rhizospheric Soil from Banana Plantation Site at Mokokchung District, Nagaland, India

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Abstract

The present study aims to report the fungal population present in the rhizospheric soil of the banana plantation site at the selected site in Mokokchung District, Nagaland, India. Fungi were isolated in Potato Dextrose Agar and Rose Bengal Agar plates following serial dilution method. Morphologies were observed under macroscopic as well as microscopic studies in the purified Isolates. A total of 10 fungal species belonging genera *Aspergillus*, *Cladosporium*, *Geotrichum*, *Mucor*, *Penecillium* and *Trichoderma* were present.

Keywords: Banana plantation, Mokokchung, Mycoflora, Rhizosphere soil.

Abstract No. 15

Morphological Identification of Fungi in Tea Soil

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Abstract

The present study was conducted to find out the fungal population in tea soil of Zunheboto district, Nagaland. Soil samples were collected from rhizospheric region and inoculated in Potato Dextrose Agar (PDA) plates by using serial dilution method from which pure culture isolates were maintained by streak method. A total of 12 fungal species representing 7 genera were isolated and identified from tea soil by studying their macroscopic and microscopic characteristics with the help of available literature. Highest fungal species recorded was of *Aspergillus* and *Mucor* with 3 species each followed by *Tricoderma* with 2 species.

Keywords: Fungi, Morphology, Soil, PDA, Isolation

Sub-Theme

‘Value Addition of Local Bioresources and Livelihood’

Abstract No. 16

Common Property Resources (CPRs) and Sustainability in North East India

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Abstract

Common Property Resources (CPRs) are an integral part of lives and livelihood of the people of North East India, particularly the poor living in the rural areas of the region. Apart from being a source of economic sustenance, the CPRs play an important role in maintaining ecological sustainability of the region. The development and management of common resources such as grazing land, water, forests etc are however, not free from challenges. The strong linkage between CPRs and livelihood is emerging as a challenge for their efficient maintenance. As the pressure of increased population of humans and livestock is increasing on the CPRs, the carrying capacities of such resources are being exceeded and maintaining their sustainability is becoming difficult. The undermining of local level institutional arrangements or conventional laws is turning the CPRs into open access properties which are threatening their very existence because unlike pure public goods the use of CPRs is subtractable in nature. This paper aims at analyzing the status of CPRs in North East India, its role in maintaining sustainability, the relationship between CPRs and PPRs (Private Property Resources) and its implications on sustainability, the threats to CPRs, management of CPRs and the challenges involved.

Keywords: Common Property Resources (CPRs), Ecology, Livelihood, North East India, Sustainability.

Abstract No. 17

Dependency of Tangsa People on Surrounding Wild Vegetation in the Changlang District of Arunachal Pradesh

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Abstract

People of the Tangsa tribal community are mostly living on the Patkai Hills Range in Myanmar and India. Available folklores indicate their origin in Mongolia, migrated through Yunnan and reached Myanmar crossing the Tanai River. In India, they are residing in Changlang and Tinsukia districts of Arunachal Pradesh and Assam respectively. Tangsas mostly live in forest villages and are fully dependent on the forest produces since the time immemorial and meet up their everyday needs with naturally available wild plants and animals. The walls and floors of their stilt-houses are made of bamboos with tree-trunks using as major poles. Suitable trees and bamboos are abundant in the surroundings. They use the leaves of Sap-plant (*Salacca secunda*) for thatching. Most of the bamboos and Sap has multiple uses in their life-style.

Tangsas are expert in *jhum* cultivation. In jhum land simultaneously they cultivate a good number of crops including paddy and maize. Again, open herblands provides large number of edible herbs. Modern medical facilities are meager even today in most of the areas. So, the use of local plants to cure their ailments is their dependable practice. As their surrounding vegetation housing most of their useful plants, that's why during present COVID-pandemic condition these people are maintaining their life almost without any trouble. They can survive nicely even during crop-failure as they can find out sufficient edibles from the wild vegetation. The traditional knowledge of Tangsa community is very rich and good enough for their sustenance even it there is no external supply. However, the present generation is now learning the uses of factory products and this trend will affect their stock of traditional knowledge and will make themselves dependable on external supply of different commodities.

Keywords: Arunachal Pradesh, Changlang district, Ethnobotany, Forest dependency, Tangsa.

Abstract No. 18

Wild Anti-diabetic Plants and Their Traditional Remedies from Lakhimpur District of Assam, India

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Abstract

The North-east Indian state of Assam is the home to a number of plants that have enormous medicinal properties. Even today, people of Assam use herbal medicines and magical-spiritual practices to get rid of their physical discomforts or ailments. Their ethnomedicinal system is a nice assemblage of these two systems.

Lakhimpur district is situated at the far east corner of the state of Assam, lies between 26°48' N and 27°53' N latitudes and 93°42' E and 90°20' E longitudes with the foothills of Arunachal Pradesh at the border line, which causes an environment with considerable humidity and heavy rainfall and favoured to develop a for significantly rich floristic diversity.

The present study briefly introduces indigenous ethnomedicinal knowledge about anti-diabetic plants used by the people of different tribal communities in Lakhimpur district of Assam along with their diversity and availability in the district. The methodology comprised of interviews with the traditional healers and knowledgeable elderly persons in different villages of the district. Plants were collected from wild habitat as well as from home medicinal gardens with help of local practitioners and identified. A total of 30 different species were collected that are used in formulations and also many as single plant medicine for treating diabetes. Bark, leaf and fruits are mostly used plant-parts in medicinal formulations.

Key words: Assam, Diabetes, Ethnomedicine, Lakhimpur.

Abstract No. 19

Tourism Development Strategies of Uttarakhand Using SWOT Analysis: A Review

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Abstract

The tourism is one of the high-income and plays an effective role in regional development, national development and diversification of national economy by appropriate and systematic planning. This paper presents tourist attitudes regarding the tourism offer of Uttarakhand. The main purpose of this study is to find out tourism development strategies towards the SWOT analysis. This study aims to review the situation of tourism and identify the key challenges of tourism development for the Uttarakhand using SWOT analysis. Secondary data were used for the study, and the gathered data was processed by magazines, journal, reports, books etc. The results of SWOT analyses indicate that the studied area has high variability of potentials and tourist attractions. The sustainable tourism development planning initiative seeks to promote better private sector/government partnerships to ensure that tourism develops in Uttarakhand in a manner that is well planned, sustainable and beneficial to both the regional economy and local communities.

Keywords: Himalayan tourism, SWOT Analysis, Tourism, Uttarakhand.

Abstract No. 20

Folklore Medicinal Plant of Arunachal Pradesh Used as Immune Modulators

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Abstract

Indian medicinal plants evident amazing effects in management of various diseases among humans. The present study based on to find out role of medicine plants in Immune system as Immune modulators in human healthcare. Folk healer practices of tribes in Arunachal Pradesh, namely Nyishi, Adi, Apatani, Khampti, Mompa were screened for study. Maximum populations nearby tribal pocket were depending on native medicinal plant for folk medicine. Folk healers were selected for interaction, documentation of folk healing information and medicinal plants through questionnaires and interviews. The present study revealed that folk healers are good in healing practices for prevention of diseases. In the present scenario, there is globally interest towards the role of medicinal plants as immune modulators for the healthy life of humans. Previous so many researchers conducted in the area, it is evident that many of bioactive compounds in the form of alkaloids, flavonoids, terpenoids, polysaccharides, lactones, and glycoside products are responsible to cause alterations in the immune modulatory properties. In view of this, the importance of medicinal plants and their bioactive compounds are useful in healthy healthcare system. India has a rich legacy of folk healers and it is the need of hour to explore this folk healing knowledge.

Keywords: Folk healer, Healthcare, Medicinal plant, Immune modulators, Tribes.

Abstract No. 21

Aquatic Bioresources and Their Sustainable Utilization in Rudrasagar Lake of Tripura, Northeast India

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Abstract

Rudrasagar is an oval shaped, perennial lake and an inland natural waterlogged wetland. The lake is productive because of its ecological diversity and socio-economic importance. It is designated as a Ramsar site in the year 2005 as it complies with the criteria's of the ramsar wetland and considered as a national as well as of international importance. The preliminary study aims to assess the biodiversity status and ecosystem services of Rudrasagar Lake. The main provisional services provided by the lake are food (aquatic plants and fishes), fuel wood and timber whereas, the cultural services provided are boat raiding, tourism and recreational activities due to its historical importance. A total of 37 aquatic plants, 31 phytoplanktons, 51 fishes and 21 birds species were reported from the lake. The main intimidations to the wetland are increasing silt loads due to deforestation, expansion of agricultural land and land conversion due to population pressure. To reduce stress on the lake, better monitoring, planning, restoration and management are essential. Different restoration activities like awareness programme, cleaning, consultation and capacity building activities were conducted in the area. Restoration activities for better utilization of aquatic bioresources like *Hydrilla* based fish feed were introduced in the water body which becomes a good alternate source of food for many edible fishes. The water hyacinth based craft preparation was conducted for improving the livelihood of the common people. Various stakeholders along with the local community and the corporate sector need to come together for formulating an effective management plan for the conservation of Rudrasagar Lake.

Keywords: Biodiversity, Ecosystem services, Threats, Management, Utilization.

Abstract No. 22

Scope for Value Added Product(s) from *Garcinia* species of Assam, India

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Abstract

Garcinia (Clusiaceae) was established by Linneaus based on the specimen he received from *Laurentius Garcin*. In India it has two distinct distributional zones, i.e., the Northeast and Western Ghats. Out of 400 identified species 40 species are edible (Karnik, 1978). Recent year's scientist, pharmaceutical companies and industries across the World are showing interest on *Garcinia* for its manifold uses. With this background the study was carried out in different parts of Assam from 2018 to 2019 with the objectives to find out local uses and species wise market demand; to find out possible products from pulp and seeds and scope for development of value added product(s).

Data on local uses and market demand were gathered through extensive field survey in homestead garden, forest area, markets and also through a structured questionnaire. Possible products from rind and seeds were analyzed through standard methods. Scope for development of value added products were studied based on field and laboratory data.

From the field study it was observed that four species are sold in the local market, six species are used locally as additive and for jelly and refreshing drink which can be promoted as value added product(s). Four species are used in local traditional medicine. Laboratory analysis revealed that solid fat from seeds of *Garcinia* species contains high stearic acid. Fruit juice contains hydroxyl citric acid (HCA) and is rich in anthocyanins. Fruit rinds contain Taxol mimic compounds anticancer compounds polyisoprenylated benzophenones such as xanthochymol and isoxanthochymol.

Therefore, from the study it can be concluded that *Garcinia* species has good potential for development of value added products for food, dye, herbal and cosmetic industries which would contribute in enhancing the livelihood of local people.

Keywords: Anthocyanins, *Garcinia*, Local uses, Solid fats, Stearic acid.

Abstract No. 23

Utilization of Bioresources for Medicinal Purposes by the *Gaddis* of Bharmour (Himachal Pradesh) and the Factors Affecting Their Transhumance

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Abstract

Gaddis, a transhumant community that rears sheep and goats follows seasonal migration in the Himalaya. Their movement patterns are guided by climatic conditions and on way, they are dependent on available bioresources, especially for medicinal purposes. However, concerns are now being raised on the declining status of *Gaddis* transhumance as also of their traditional knowledge. The present study was, therefore, carried out to document the factors affecting their transhumance vis-à-vis utilization of plants for medicinal purposes. The study was carried out in Bharmour, district Chamba of Himachal Pradesh, which is known to be the origin place of *Gaddis*. Structured questionnaires for respondent surveys were used (n=25).

The study revealed that changing climate (78%), livestock theft (75%), fodder scarcity & human-wildlife conflict (67%), and the need for education (50%) are some of the important factors that are weaning the *Gaddis* from this profession. However, they still depend on bioresources for sustenance and use38 commonly available plant species for treating 28 ailments that include fever, stomach ache, cough and cold, wounds etc.

The reported species (n=38) belong to 29 families with Lamiaceae (n=5) having the maximum representation followed by Asteraceae (n=3). With regards to the plant part used, roots were maximally used (16) and were followed by leaves (12). Branches and stem had the minimum representation (n=1 each).

Thus, the study identifies factors affecting *Gaddis* transhumance and also their knowledge on uses of bioresources. Factoring these into policy initiatives such that a win-win is created is the need of the hour.

Keywords: Bioresources, Decline, *Gaddi*, Livelihood, Transhumance.

Abstract No. 24

Charcoal – A Value Addition Option of Bamboo

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Abstract

North Eastern region of India is one of the biodiversity hot spot endowed by nature on mankind. This region of India is the hub of different bioresources in general and very rich in bamboo in particular. Bamboo is the tallest grass in the world and is found abundantly in this region. This particular bioresource is used in different purposes with little or no modification. Charcoal is a common form of fuel derived from bamboo /wood. Bamboo charcoal is an excellent renewable source of energy due to its high calorific value and surface area. The high cost of conventional fossil fuels, to wean away the people from forest based fuel wood and ban of cutting trees from forest has resulted increasing interest in utilizing bamboo as renewable energy sources. Bamboo is an important renewable energy source which offers sustainable long term supplies of quality raw material for energy purpose. By changing the physical state or form of bamboo, charcoal can be produced. Production of bamboo charcoal is a process of value addition which in turn uplifts the livelihood of bamboo growers. However limited study has been undertaken in this area to study the suitability of different bamboo species used for charcoal making and asses the quality of charcoal. In view of this, present study has been undertaken to study the quality of charcoal prepared from *Bambusa tulda, Bambusa balcooa, Melocanna baccifera* and *Dendrocalamus hamiltonii.* The highest calorific value (7090 Kcal/kg) was recorded in *Bambusa balcooa* followed by *Bambusa tulda, Melocanna baccifera and Dendrocalamus hamiltonii.* Among the four bamboo species *B. balcooa* has shown excellent properties and time required for complete combustion is more.

Keywords: Bamboo, Bamboo charcoal, Bioresource, Calorific value.

Abstract No. 25

A Preliminary Study on Wild Edible Fruits and Vegetables Used by the Ao-Naga Tribe of Mokokchung District of Nagaland, India

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Abstract

The paper deals with 50 species of wild edible plants which are used as fruits and vegetables by the Ao-Naga tribe of Mokokchung district. The paper also includes local name, botanical name, flowering and fruiting season, parts used and mode of utilization of the collected species. The present study reveals how wild edible fruits and vegetables play an important role in procuring food for consumption and generating income for the local people.

Keywords: Ao-Naga, Mokokchung, Nagaland, Wild edible fruits, wild edible vegetables.

Abstract No. 26

Ethnobiology of the Traditional Alcoholic Rice Beers of Nagaland, India

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Abstract

This paper draws from oral folklore traditions the ethnicity linked with the traditional alcoholic rice beverages of Nagaland to the fulgid prospective of the dystonic development of modernization that has left its impact on the customs and ethos of a Naga community. Documentation on 5 different types of alcoholic rice beers *viz*., *Aji, Katsing, Khe, Zou- ngao* and *Zutho* were prepared along with the method of preparation, the unique starter cultures used and the cultural heritage linked with the beverage. Traditional epistemology of the alcoholic rice beverages depicts their historical use during religious ceremonies, festivals and customary rituals. The distinction between the various tribes with regards to the methods of preparation and the unique starter culture corresponds to the dynamic adaptations to local bio-cultural context, geography, storage processing, cooking techniques and so on. As a result, traditional gastronomy links the study of perception and practices of a particular food that distinguishes a certain tribe and highlights culinary tradition that goes beyond the boundaries of a single community to counter the oblivion caused by modernity that affects a rural community.

Keywords: Alcoholic rice beer, Culinary tradition, Modernization, Nagaland, Traditional knowledge.

Abstract No. 27

Indigenous Knowledge on Wild Edible Mushroom and its Potent Efficacy as Bioresource in Nagaland, India

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Abstract

Nagaland harbours a rich flora of macrofungi due to favourable environment and climatic conditions as it lies in the Indo-Burma (Myanmar) Biodiversity hotspots. Mushrooms as we know are a versatile super food loaded with their important nutritional profiles and promote a healthy immune system. It plays a vital role in the food culture of the ethnic people of Nagaland. Though there are no written manuscripts on the mushroom as a diet and traditional medicine, the tales and myths about mushroom in the folk tales and folk songs seem undeniable of the fact that they were part and parcel of the ancient past. The tribal thus possess a wide array of knowledge on wild mushrooms which also differs from one village to the other. During the present pandemic as well mushrooms have proved to be one of the sustaining bioresources, especially in the villages. Though some research have been done on some certain perspective of these wild edible fungi, the full benefits of the research have not been extended for the upliftment of the villagers on forest produces for their food security. Today we also see that this rich traditional knowledge especially among the younger generation is diminishing. Thus, looking into the present scenario, the present study has been taken to make a baseline for the mycofloristic and ethnomycological knowledge about the macrofungi of Nagaland. It will help to enhance the knowledge of edible mushroom and their utilization, to cultivate and conserve them.

Keywords: Bioresource, Indigenous, Nagaland, Tribal community, Wild edible mushroom.

Abstract No. 28

The Value Addition Study of Honey- a Source of Anticancer Compound Chrysin

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Abstract

Honey is a natural ready to eat food consumed throughout the World since ages. Honey is the main income source in some geographical regions. There are reports that various plant sources generated 0.2mg/100 g of honey. It contains many bioactive constituents and it has been used in many traditional ethno-medicinal therapeutics. Chrysin is one of the compounds in honey which serves as constituents in dietary supplements. It is considered safe to have daily consumption of 0.5-3 g of Chrysin. Against various cancer cells, Chrysin showed lethal dose in micromolar ranges. Till so far, there is no report on toxicity in clinical trials and adverse events. FDA also approved Chrysin as aromatase inhibitor for the treatment of cancer. Honey has a wide scope of value addition. It can be used as sugar substitute and as a food. It can be used in backing, confectionary, and pasteurization of fruits in short, it has wide applications in food industry. Also, honey can be used in production of non-alcoholic beverages as well as fermentation process. However, there is no data on exact quantification of secondary metabolites in honey. Therefore, because of its useful medicinal properties, value addition of honey can be a good sustainable source of livelihood.

Keywords: Honey, natural-food, value-addition, Chrysin, cancer.

Abstract No. 29

Bamboo as a Potential Source of Livelihood in Nagaland, India

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Abstract

Bamboo is grown all over the state of Nagaland. It is a predominant plant species of the state. Bamboo has acquired important social and economical services for their role in the daily lives of the Nagas. The aim of the study is to determine how bamboo resources impact the social and economic aspects of the bamboo farmers. The social impact assessment of bamboo has revealed that bamboo plantation; harvest and bamboo products enterprises have brought much social benefits to the local people. Economic assessment manifested that bamboo forest have positive impact on the local people. It has been found that in the study area the beneficiaries are mostly agri-farmers. Therefore, it has been observed that most of the local people rely exclusively on agricultural income. Bamboo has been used as utensils, burn bamboo as fire wood and building raw material. The main bamboo products made by the Naga tribes are variety of baskets and allied product, musical instrument and various implements which contributes to the revenue generation. With the increase in demand of timber, bamboo resources serve as an alternate sustainable raw material and endow gross economic income and employment opportunities for the unemployed sectors of the Naga society.

Keywords: Agri-framers, Bamboo, Nagaland, Socio-economic, Traditional.

Abstract No. 30

Introduction of *Bambusa tulda* Roxb. along with Shifting Cultivation as a Sustainable Bioresources

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Abstract

Bambusa tulda Roxb. commonly also known as Bengal bamboo or Indian Timber Bamboo is a tropical species originating from North-east India having thick wall, clumps and length up to 25m (80 ft). The length, strength, rapid growth and availability in huge cluster make the species an excellent choice for many domestic and commercial purposes. This bamboo species has found considerable uses in handicrafts and construction. The tender shoot of the *tulda* bamboo are also being harvested by many tribal of north-east India as food delicacy. The theme focuses on introducing *B. tulda* along with shifting cultivation, as a counter measure to soil erosion. The bamboo species can be cultivated at either along the edge of the field during crops cultivation or inside the field after crops harvest to prevent competition. Either way the bamboo species can grow in abundance and prevent soil erosion besides offering a huge output of bamboo products which can be a sustainable bioresources. Vegetative method of *B. tulda* propagation involves cutting of premature side stem along with its fully functional roots to be planted apart from its parent cluster. The traditional practice also includes cutting down and burning of *B. tulda* root to enrich the soil with phosphate before Ghost chilli propagation.

Keywords: Bengal bamboo, Ghost chilli propagation, North East India, Shifting cultivation, Sustainable bioresources.

Abstract No. 31

NTFPs as Means of Livelihood in Mon District Nagaland

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Abstract

The Konyaks since time immemorial has been dependent on forest and its products. The use of Non-Timber Forest products (NTFPs) in Mon district was studied through surveys and interviews with the vegetable vendors in Mon and Aboi town market and villagers of Chingkao, Hongphoi, Longwa, Nyahnyu and Sheanghah Tangten. Forest has been a source of livelihood as it has provided them with food, medicine, construction materials and other utilitarian items especially for the economically marginal people residing in and around the forest. This paper accounts 31 species of plants belonging to 23 families that are used with the traditional knowledge passed down from generations. The study shows the diverse NTFPs that are the source of livelihood and it also has consequences of overuse of NTFPs contributing to reduction of forest cover.

Keywords: Forest, NTFPs, Konyaks, Livelihood.

Abstract No. 32

Diversity of Lesser Known Edible Legumes of Nagaland and Their Nutritional Analysis

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Abstract

Legumes are mostly recognized for their dietary and economic values. Some of the edible legumes are less known yet, have huge potential for health benefits as they are highly nutritious, and also for food security. In Nagaland, India, although, there are many wild and cultivated legumes which have the capacity to be used as pulses, they are still not explored for their importance to the full potential. Present study in six districts of Nagaland recorded 20 species of edible legumes so far with some of their varieties. Ten (10) fresh edible legumes have been tested for their nutritive value. Amongst the species studied, *Psophocarpus tetragonolobus* showed maximum moisture content with 90.48 %. Highest protein content was observed in *Phaseolus vulgaris* (54.4128 mg/g), while total carbohydrate content and reducing sugar were maximum in *Pisum sativum* (757.443445 mg/g) and *Canavalia gladiata* (155.58 mg/g) respectively. In *Mucuna pruriens*, the highest phenolic content was observed (18.3007 mg GAE/g) while the maximum flavonoid content was found in *Bauhinia variegata* (68.7585 mg QE/g). Highest antioxidant activity was observed in *Mucuna pruriens* with IC50 value of 127µg/ml. In addition to being a highly nutritious food, there is also evidence that edible legumes can play a major role in managing a number of health conditions and therefore, the need for exploration and conservation of the edible legumes.

Keywords: Antioxidant, Edible legumes, Lesser known legumes, Nutritional value, Pulses.

Abstract No. 33

Wild Bioresources Used for Livelihood in Phek District, Nagaland

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Abstract

Bioresources in the form of wild edibles are an integral part of the culture and tradition of a large number of indigenous people of the world. Apart from farming, rural people depend on collection of wild edibles and other resources from the forest for their livelihood. These contribute to the rural income to some extent through their sales. Wild edibles are freely available and they are cheap and affordable, so they constitute a major part of daily food intakes of the rural population. They are also a good source of nutritious food and hence they contribute to a well-balanced and healthy diet. The present study deals with the identification, and documentation of wild edibles used for livelihood in Phek district, Nagaland. A total of 97 wild edibles were found, out of which 40 were wild vegetables, 45 were wild fruits and 12 were mushrooms. It was found that collections of these wild edibles are done mostly by men. This study discusses how these wild edibles are used in various ways and how they contribute to rural livelihood. There is a need to develop strategy for sustainable collection of wild edible resources, their management, conservation of potential habitats and people's livelihood systems as they are very much inter-connected.

Keywords: Wild edibles, rural income, healthy diet, sustainable collection, conservation

Abstract No. 34

Molecular Identification, Quantification of Phytochemical Contents and Antioxidant Activity of *Dendrobium heterocarpum* Wall. ex Lindl.: a Potential Medicinal Orchid

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Abstract

Orchids are primarily known for its ornamental values though many are used as herbal medicines, food and for cultural values. Uses of orchids as medicine in India have been documented in India since Vedic period. However, their therapeutic properties are confined to pockets of region and people around the world. Studies in phytochemical and pharmacology have reported beneficial compounds paving way in developing novel drugs. In this aspect, *Dendrodium heterocarpum* Wall. ex Lindl. a native orchid of Nagaland can be viewed as a potential medicinal plant. Molecular Identification was done by markers of chloroplast and nucleolar region using *mat*K, *rbcL* and ITS primers. Phytochemical content and antioxidant activity was examined on different age of the plants (in years) and showed significant result depending on its age (in years). Phytochemical quantification showed highest of Total alkaloid 37.86 mg AT/g DW in 1yr old pseudobuld , Total flavonoid 13.63 mg QE/g DW in leaves, Total phenol l5.98 mg GAE/g DW and Total tannain 8.57 mg TA/g DW in 3 yr old pseudobulb . Antioxidant activity evaluated by 2, 2-diphenyl-1-picrylhydrazyl (DPPH) and Ferric reducing ability of plasma (FRAP) assay showed correlation of the polyphenolic constituents and free radical scavenging capacity. The study concluded on the finding that older plants have higher or almost equivalent phytochemical content, which can be an aspect considered for sustainable harvest of the plant parts without harming the ecosystem.

Keyword: Nagaland, orchid, medicine, phytochemical , antioxidant, molecular marker

Abstract No. 35

Nutritional Assessment of Some Wild *Musa* of Nagaland, India

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Abstract

Banana is one of the staple foods in India and is consumed for its excellent nutritional and nutraceutical properties. The present study reports the nutritional studies on four wild *Musa* species of Nagaland whose nutritional values are compared with regard to their fruit including comparison with values from both the peel and pulp. Assessment of proximate composition of organic constituents such as protein, reducing, non-reducing sugars and total carbohydrate along with total phenol and flavonoid content was evaluated. The result of the quantitative proximate composition of the four *Musa* species revealed that the protein content was highest in the pulp of *Musa aurantiaca.* Carbohydrate content in the pulp of *Musa balbisiana* was comparatively higher than the others. The highest total phenol concentration was found in the pulp of *Musa balbisiana* and the highest total flavonoid concentration was found in the pulp of *Musa sikkimensis.*

Keywords: Comparative nutritional values, Nagaland, Nutritional values, Wild *Musa*.

Abstract No. 36

Ethnobotanical Studies on Some Legumes used by Angami, Ao and Konyak Tribes of Nagaland, Northeast India

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Abstract

The Fabaceae or Leguminosae, commonly known as the legume, pea, or bean family, is a large and economically important family of flowering plants. In Nagaland, there are many wild legumes which are underutilised by the indigenous, though some are cultivated and yet more to explore the value of its uses for sustaining the livelihoods. The present study describes some important ethnobotanical uses of Legumes, which are being used by the Angami, Ao and Konyak tribes of Nagaland. Its special emphasized as medicinal purposes, consumption as food, used as shampoos, poisoning and packaging. A total of 19 species were collected which is being put in diverse ethnobotanical uses by the locals in the study area.

Keywords: Ethnobotanical, Fabaceae, Legumes, Nagaland.

Abstract No. 37

Ethnobotanical Resources Used by Angami-Naga Tribe of Kohima District, Nagaland, India

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Abstract

The present study deals with ethnomedicinal plants used by the Angami- Naga tribe of Kohima district, Nagaland. During the study 35 species of plants belonging to 33 genera and 24 families were recorded. The paper also includes the local, scientific names, the mode of preparation, uses and plant parts used. The finding reveals the importance of conserving plant resources in the study area.

Keywords: Ethnobotanical, Angami-Naga, Kohima, Nagaland.

Sub-Theme

‘Role of NGOs / SHGs / Social Entrepreneur / Community Participation/IPR’

Abstract No. 38

Push-Pull Factor for Rural-Urban Migration: A Case Study in Ekeshwar Block, Uttarakhand, India

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Abstract

Rural to urban migration is one of the important dimensions of structural transforamtion, but the patterns of migration show wide variations across the country in India. The present study explored the motivation of rural-urban migrants who moved from the rural to urban area of Uttarakhand. A survey of 100 migrant families reported their socio-economic profile before and after migration, personal and general reasons for migration, problems in the village and the city, and perception of push and pull factors. Major reasons for migration mentioned in this study were education, employment opportunities with the associated income, and facilities. These were perceived as both, push and pull factors. Declining environment or agriculture were never mentioned spontaneously as personal reason, and only occasionally as a presumed general reason for migration, but were frequently confirmed as a major problem in the village. Thus, although such problems existed, they seemed not a major driver of rural-urban migration. For most of the respondents their migration resulted in a profound change of livelihoods and significantly improved their socio-economic situation. The main reasons for migration are low agriculture productivity, health facilities and educated unemployment that are unwilling to work as manual wage labour. It depicts the hardships of village life in general and women in particular in the Hill region of Uttarakhand in the wake of increasing out migration. These results as major push factors for rural-urban migration in Uttarakhand.

Key words: Agriculture, Migration, Unemployment, Uttarakhand.

Abstract No. 39

Consumers' Perception towards CSR Practices Adopted by Companies in the North Eastern Region of India

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Abstract

Sustainability can act as a crucial source for a firm's success. The Corporate Social Responsibility Practices adopted by the company are used for developing sustainable growth. The purpose of this research to assess the perception of consumers towards CSR practices with special reference to environmental practices for ensuring sustainability and practices for rural development, adopted by companies in the north east region of India. The study is based on a descriptive and inferential research design, wherein the data was collected through a self-designed structured questionnaire which consists of close-ended and open ended. The findings of the study helped in revealing the perception of consumers towards environmental protection and rural development as CSR practices by the companies in north east region of India. Also, the relationship between various demographic factors and their perception towards CSR practices were explored, which can be effective for the companies to design and adopt targeted CSR practices for different target groups.

Keywords: Corporate social responsibility, CSR practices, Environmental protection, Rural development, Sustainability.

Abstract No. 40

Bioresources and Sustainable Livelihood of Rural India: Role of Self Help Groups

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Abstract

India is a land where there is a unique harmony between tradition and modernity, scientific temper and spiritual philosophy, humility and pride. In India ~50% population are women, traditionally women use to confine themselves to household activities and there were restrictions on their movement, education, occupation and their role in the society. With the changes in traditional way of thinking, society is also changing. The sustainable development of a country depends on gender equality. In paper focus on how women empowerment can contribute in socio-economic development. The Government of India declared 2001 as the Year of Women's Empowerment. Empowerment means accepting and allowing people who are kept outside of the decision-making process into it. It also includes the action of raising the status of women through education, raising awareness, literacy and training. Self Help Groups have been playing a vital role in employing the women, it is also used as financial resources availed to fund investments in assets creation and help financially and socially for the downtrodden women in India. Women in Indian society have come a long way from the days of being worshipped as goddesses to being molested and harassed. Kofi Annan, the former secretary-general of the United Nations, once stated: "There is no tool for development more effective than the empowerment of women." Indian women are treading toward empowerment to make conscious, progressive decisions for them. Sociologist Dhruba Hazarika has rightly said that empowerment of women means equipping them to be economically independent, self-reliant, in addition to providing positive self-esteem to face any difficult situation. Women should be equipped enough to participate in any development process. Women's empowerment is key to social development and economic progress, Budget 2020 rolled out key women-centric initiatives and policy measures. Finance Minister Nirmala Sitharaman made history when she became India's first full-time woman Finance Minister to present the Budget. This year, in 2020 with her second Budget, Sitharaman

focused on three themes. Aspirational India, Economic Development and Caring Society. Women constituted an important part of the Finance Minister's Budget speech this year as she announced that women self-help groups (SHGs) in villages, the daanyalakshmis (seed distributors), will be ably supported by the government's Mudra Schemes and NABARD. She also highlighted the success of the government's 'Beti Bachao, Beti Padao' campaign and allocated a total of Rs 28,600 Crore for women-specific schemes for the financial year 2020-21.

Keywords: Rural development, Rural economy, Women empowerment.

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