



National Conference on Integrating Biological Resources for Prosperity

February 6-7, 2020, Biratnagar

ABSTRACT



Hariyo Ban Program



CODEFUND



2. Calls for
1. Collective
1. Issues and
1. Actions



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Prof. Dr. Tej Narayan Mandal

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Dr. Tilak Prasad Gautam

Mr. Kul Prasad Limbu

Day 1 (6 February 2020)

INAGURAL SESSION [09.00-11.00PM]

Hall A (Sagarmatha)

PLENARY SESSION [11.00-12.30PM]

Hall A (Sagarmatha)

Chair: Prof. Dr. Ram Prasad Chaudhary

Rapporteur: Dr. Tilak Prasad Gautam

11.00-11.15AM	Biocultural Diversity <i>Kamal Krishna Joshi</i>
11.15-11.30AM	Plant science education and society <i>Sanu Devi Joshi</i>
11.30-11.45AM	Botanical society and school education <i>Tirtha Bahadur Shrestha</i>
11.45-12.00PM	Endemic flowering plants of Nepal: Status and distribution <i>Keshab Raj Rajbhandari, Sanjeev Kumar Rai, Mohan Dev Joshi, Subhash Khatri, Ganga Datt Bhatt and Rita Chhetri</i>
12.00-12.15PM	Status of aquatic biodiversity in Bangladesh <i>Binay Kumar Chakraborty</i>
12.15-12.30PM	Inclusion of Gender in Forestry Sector <i>Radha Wagle</i>

SPECIAL SYMPOSIUM

Department of Environment and Department of Plant Resources/Plant Resource Center,

Ilam [11.00-12.30PM]

Hall C (Kanchenjunga)

Chair: Mr. Sindhu Dhungana

Rapporteur: Mr. Rajesh Tamang

11.30-12.30PM	Interactive workshop on Environmental Awareness as well as Medicinal and Aromatic Plants policy
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GENERAL [01.30-03.45PM]

Hall A (Sagarmatha)

Chair: Dr. Kamal Krishna Joshi

Rapporteur: Dr. Narayan Prasad Ghimire

01.30-01.45PM	Chemical safety of herbal medicines <i>Hari Datta Bhattachari</i>
01.45-02.00PM	Wetlands environment for the integrated development of Taltalaya (TTL) in Itahari Metropolitan City, Sunsari District, Province 1, Nepal <i>Shailendra Pokhrel, Rita Koirala (Arjel), B.K. Sharma, Juddha Bahadur Gurung and Pabeen Shrestha</i>
02.00-02.15PM	Biodiversity of Dipang Lake Basin Area on lake cluster of Pokhara Valley, Kaski <i>Juddha Bahadur Gurung, Shailendra Pokhrel and Aashish Tiwari</i>

02.15-02.30PM	Botanical Gardens of Nepal and their roles in Plant conservation and livelihood <i>Dipak Lamichhane</i>
02.30-02.45PM	Importance of molecular study and its application for flora of Nepal <i>Mitra Lal Pathak</i>
02.45-03.00PM	Translating access to genetic resources and benefit-sharing into practice: Prospects and challenges in Nepal <i>Yadav Uprety, Amit Poudyal and Racchya Shah</i>
03.00-03.15PM	Aquatic phytodiversity and macroinvertebrates in lakes and rivers of Setikhola watershed, Kaski, Nepal <i>Kanchan Devi Upadhyay, Narayan Prasad Ghimire, Janardan Mainali and Shiva Kumar Rai</i>
03.45-04.00PM	TEA BREAK

BIOTECHNOLOGY AND BIOCHEMISTRY [01.30-03.45PM]

Hall B (Lhotse)

Chair: Prof. Dr. Sanu Devi Joshi

Rapporteur: Dr. Man Dev Bhatt

01.30-01.45PM	<i>Invited Speaker</i> An in-silico investigation for recent trends of genome editing in rice <i>Umesh Prasad Shrivastava and Pramod Kumar Kushwaha</i>
01.45-02.00PM	Screening of antioxidant activity, total phenolic content and GC-MS study of <i>Zingiber montanum</i> (J.Koenig) Link ex A. Dietr. <i>Chandra Mohini Nemkul, Gan B Bajracharya and Ila Shrestha</i>
02.00-02.15PM	Antioxidant and cytotoxic activities of plant tissue culture materials of <i>Dendrobium longicornu</i> <i>Mukti Ram Paudel and Bijaya Pant</i>
02.15-02.30PM	Chromatographic separation of <i>Everniastrum nepalense</i> from eastern Nepal and their antimicrobial activity <i>Suman Rai and Saraswati Yonghang</i>
02.30-02.45PM	Antioxidant activity of selected fresh green leafy vegetables cultivated in Dharan sub-metropolitan city <i>Arjun Ghimire and Sudip Bhattarai</i>
02.45-03.00PM	Application of plant proteolytic enzymes in non-rennet cheese production <i>Bunty Maskey, Dhan Bahadur Karki and Nabindra Kumar Shrestha</i>
03.00-03.15PM	Effect of alcoholic fermentation on fos levels and radical scavenging activity of Yacon (<i>Smalanthussonchifolius</i>) root slices <i>Samip Shasi Pande and Basanta Kumar Rai</i>
03.15-03.30PM	Formulation of amyolytic starter using yeasts and molds screened from traditional <i>murcha</i> <i>SangenRuma Rai, Basanta Kumar Rai and Dil Kumar Subba</i>
03.45-04.00PM	TEA BREAK

ECOLOGY AND ENVIRONMENT-1 [01.30-03.45PM]

Hall C (Kanchenjunga)

Chair: Prof. Dr. Shankar Narayan Sinha

Rapporteur: Dr. Dil Kumar Subba

01.30-01.45PM	Soil microbial biomass and N-mineralization in Sal bearing forests of tropical region in
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	eastern Nepal <i>Tej Narayan Mandal, Tilak Prasad Gautam and Krishna Prasad Bhattarai</i>
01.45-02.00PM	Assessment of air pollution impact on micromorphological and biochemical properties of <i>Callistemon citrinus</i> (Curtis) Skeels and <i>Lagerstroemia indica</i> L. <i>Anjana Devkota, Sushila Devi Shrestha and Pramod Kumar Jha</i>
02.00-02.15PM	Trees outside forests in Kathmandu valley, Nepal <i>Babita Shrestha, Bhuvan Keshar Sharma and Ram Kailash Prasad Yadav</i>
02.15-02.30PM	Climate change and its impacts on grain protein, potassium, calcium and iron content of <i>Fagopyrum</i> spp along elevation gradient in central Nepal <i>Dol Raj Luitel, Mohan Siwakoti and Pramod K. Jha</i>
02.30-02.45PM	Change in forest volume and biomass: a revisit study at Annapurna Conservation Area, Nepal <i>Pareesh Pokharel and Ole Hofstad</i>
02.45-03.00PM	Decomposition and nitrogen release in leaf litter of leguminous and non-leguminous plant species <i>Amrit Maya Lawati and Tej Narayan Mandal</i>
03.00-03.15PM	Climate sensitivity pine forests (<i>Pinus roxburghii</i> , <i>Pinus wallichaina</i>) in the mid-hills of central Himalaya <i>Achyut Tiwari, Neeta Thapa and Tulasi Siwakoti</i>
03.15-03.30PM	Diversity and regeneration of forest along altitudinal gradient in Yangshila Morang, eastern Nepal <i>Priti Dhakal and Anjana Devkota</i>
03.30-03.45PM	Morphological variations in Niger (<i>Guizotia abyssinica</i> Cass.) <i>Poonam Shah and Bhabindra Niroula</i>
03.45-04.00PM	TEA BREAK

HIGHER PLANT DIVERSITY AND SYSTEMATICS [01.30-03.45PM]

Hall D (Makalu)

Chair: Dr. Keshab Raj Rajbhandari

Rapporteur: Dr. Bhabindra Niroula

	<i>Invited Speaker</i>
01.30-01.45PM	Bio-economic development in Nepal: Opportunities and challenges <i>Sangeeta Rajbhandary</i>
01.45-02.00PM	Diversity and conservation of <i>Senecio</i> Linn. in Nepal <i>Sudha Joshi (Shrestha)</i>
02.00-02.15PM	Higher plant diversity of Annapurna Rural Municipality of Myagdi district, Province Four (Gandaki State), Central Nepal <i>Kamal Maden, Milan Dahal, Shankar Basyal, Rajendra Basaula, Kul Prasad Limbu, Rishi Baral, Jhapendra Pun and Yatra Thulung</i>
02.15-02.30PM	Aquatic and semi-aquatic angiosperm diversity of Marchwary rural municipality of Rupandehi with special reference to ethnobotanical survey <i>Anant Gopal Singh</i>
02.30-02.45PM	Floristic composition of Eastern Mid-Hills of Nepal <i>Mohan Sangroula, Mohan Siwakoti and Chitra Bahadur Baniya</i>
02.45-03.00PM	Herbarium specimens of the endemic flowering plants of Nepal <i>Kalpna Sharma (Dhakal), Sajita Dhakal, Bharat Babu Shrestha, Mohan Siwakoti, Suresh Kumar Ghimire, Sanjeev Kumar Rai and Subhash Khatri</i>

03.00-03.15PM	Garden flowers in Tansen Municipality, Palpa <i>M.R. Gubhaju and M. Panth</i>
03.15-03.30PM	Emerging values of Kiwifruit (<i>Actinidia</i> Lindl.) with emphasis on <i>Actinidia chinensis</i> Panch. and <i>Actinidia deliciosa</i> (A.Chev.) C.F. Liang and A.R. Ferguson <i>Mira Dhakal and Shandesh Bhattarai</i>
03.30-03.45PM	Wall flora of Mahendranagar municipality <i>Tilmaya Dhakal (Kharel)</i>
03.45-04.00PM	TEA BREAK

POSTER: FAUNAL DIVERSITY [01.30-02.30PM]

Review checklist of Dharan Birds, Sunsari district, Province 1

Asmit Subba

Seasonal diversity of avifauna and anthropogenic impacts in and around of Jamunkhadi area, Kankai Municipality, Jhapa, Province-1, Nepal

Bikash Niraula, Damodar Thapa Chhetry and Bharat Raj Subba

Study on macrofauna biodiversity of Devidaha, Sirha, Nepal

Indrika Kumari Chaudhary and Prakash Kumar Yadav

Study of general behavior and singing pattern of Oriental Magpie Robin *Copsychus saularis* (Linnaeus, 1758)

Jyoti Karna, Bharat Raj Subba, Damodar Thapa Chhetry and Haimanti Bhattacharya

Diversity of herpetofauna and analysis of people's perception at Sukhani Martyrs Memorial Foundation Park in Arjundhara Municipality- 9, Jhapa

Sabin Adhikari

Study of feeding analysis of Ostrich *Struthio camelus* Linnaeus, 1758 in Rupandehi District, Province No. 5, Nepal

Sushmita Panta and Damodar Thapa Chhetry

Prevalence of intestinal helminths parasites in Rajbanshi community of Birtamode, Jhapa District

Uday Kumar B.K.

POSTER: ICHTHYOLOGY [02.30-03.30PM]

On the production technology of Watercress *Roripa naustercium-aquatilicum* and Small Indigenous Fish Species (SIS) in the integrated system

Abhilasha Jha and Bharat Raj Subba

Fecundity on Hillstream Catfish *Pseudecheneis sulcatus* (McClelland, 1842) from Tamor River, Nepal

Dipak Rajbanshi, Prakash Kumar Yadav and Bharat Raj Subba

Demand of fishes and their diversity in markets of Saptari District

Jay Narayan Shrestha and Samjhana Shrestha

Fecundity of *Glyptothorax telchitta* (Hamilton,1822) from Tamor River, Nepal

Jwala Paudel and Bharat Raj Subba

Present status of finfish market in Biratnagar

Roshani Budhathoki, Puja Rai, Anisha Ghimire, Upendra Sahani, Soni Meheta and Pinky Jha

A glimpse of shellfish market in Biratnagar Sub-Metropolitan City, Province 1, Nepal

Sameer Singh, Anjana Sapkota, Jamuna Rajbansi, Alina Bhandari, Deepika Karki, Jwala Poudel, Nisha Acharya, Aligna Chaudhary and Samikshya Karki

Observation on growth performance of major carps with small indigenous species
Yam Bahadur Mahato, Pushpa Kumari Mishra and Jay Narayan Shrestha

ICHTHYOLOGY [04.00-05.30PM]

Hall A (Sagarmatha)

Chair: Prof. Dr. Binay Kumar Chakraborty

Rapporteur: Jay Narayan Shrestha

04.00-04.15PM	<i>Invited Speaker</i> Endemic fish species of Nepal <i>Dilip Kumar Jha</i>
04.15-04.30PM	EUS infected fishes and its isolated bacteria in eastern Nepal <i>Ganesh Bahadur Thapa and Joydeb Pal</i>
04.30-04.45PM	Gonadosomatic index-based size at first sexual maturity of the Copper Mahaseer, <i>Neolissochilus hexagonolepis</i> (McClelland, 1839) from the mid-reaches of the Tamor River <i>Suren Subba, Vinod Kumar Mahaseth and Bharat Raj Subba</i>
04.45-05.00PM	Anthropogenic impact on fish of Tamor River, Nepal <i>Jawan Tumbahangfe, Archana Prasad and Bharat Raj Subba</i>
05.00-05.15PM	Food and feeding behaviour of Tank goby <i>Glossogobius giurius</i> (Hamilton and Buchannan, 1822) of Singhiya River, Biratnagar <i>Anjali Risal and Vinod Kumar Mahaseth</i>
05.15-05.30PM	Oxygen uptake in relation to body weight in Hill stream long-tail catfish <i>Olyra longicaudata</i> (McClelland, 1842) <i>Samjhana Shrestha, Jay Narayan Shrestha and Bharat Raj Subba</i>
05.30-05.45PM	TEA BREAK

LOWER PLANT DIVERSITY: ALGAE, BRYOPHYTE AND PTERIDOPHYTE

[04.00-05.30PM]

Hall B (Lhotse)

Chair: Prof. Dr. Sangeeta Rajbhandari

Rapporteur: Dr. Sudha Joshi

04.00-04.15PM	<i>Invited Speaker</i> The freshwater red alga <i>Compsopogon caeruleus</i> (Compsopogonophyceae, Rhodophyta): A new report for Nepal <i>Shiva Kumar Rai, Orlando Necchi Jr, E.K. Ganesan, John A. West and Dilli Ram Rai</i>
04.15-04.30PM	Dynamics of red bloom algae of <i>Euglena sanguinea</i> in earthen ponds <i>Ram Bhajan Mandal, Sunila Rai, Madhav Kumar Shrestha, Dilip Kumar Jha and Narayan Prasad Pandit</i>
04.30-04.45PM	Study of ferns and fern-allies of Dharan, eastern Nepal <i>Sanju Parajuli</i>
04.45-05.00PM	Seasonal variation of phytoplankton diversity with water quality at the shoreline of Beeshazar Lake, central Nepal <i>Deepa Roka, Narayan Prasad Ghimire and Shiva Kumar Rai</i>
05.00-05.15PM	Studies on diatoms (Bacillariophyceae, Algae) of Tamor River, Mulghaat, Dhankuta <i>Samjhana Rai, Shiva Kumar Rai and Meenakshi Thapa</i>
05.30-05.45PM	TEA BREAK

ECOLOGY AND ENVIRONMENT – 2 [04.00-05.30PM]**Hall C (Kanchenjunga)****Chair:** Prof. Dr. Tej Narayan Mandal**Rapporteur:** Dr. Krishna Prasad Bhattarai

04.00-04.15PM	<i>Invited Speaker</i> Role of trees for reducing heavy metals in the ambient air of Kathmandu valley <i>Mukesh Kumar Chettri, Jaya Prakash Hamal and Kumudini Shakya</i>
04.15-04.30PM	Effect of different environmental conditions on seed germination and seedling growth of two crops and some weed seeds <i>Mallik B.B. Das, Bipana Devi Acharya, Mohammad Saquib and Mukesh Kumar Chettri</i>
04.30-04.45PM	Spatiotemporal variations of hydrogeochemistry and its controlling factors in the Koshi River Basin, central Himalaya <i>Ramesh Raj Pant, Fan Zhang, Faizan Ur Rehman, Guanxing Wang and Chen Zeng</i>
04.45-05.00PM	Leaf litter decomposition and nutrient release pattern of five selected tropical tree species <i>Shreehari Bhattarai and Balram Bhatta</i>
05.00-05.15PM	Population status and New Conservation challenges for endangered <i>Nardostachys jatamansi</i> from alpine habitats in Langtang National Park <i>Suman Poudel and Suresh Kumar Ghimire</i>
05.15-05.30PM	Variation of selected hydrological properties in forest, cultivated land and grassland in Makawanpur, Nepal <i>Sujita Shrestha and Gandhiv Kafle</i>
05.30-05.45PM	TEA BREAK

BIOLOGICAL INVASION – 1 [04.00-05.30PM]**Hall D (Makalu)****Chair:** Prof. Dr. Dharma Raj Dongol**Rapporteur:** Dr. Umesh Prasad Srivastava

04.00-04.15PM	<i>Invited Speaker</i> Invasive alien species a curse or boon: an overview <i>Mohan Siwakoti</i>
04.15-04.30PM	Publishing occurrence data of endemic and alien plant species of Nepal in Global Biodiversity Information Facility (GBIF) <i>Bharat Babu Shrestha, Ganesh Datt Joshi, Yagya Raj Paneru, Kalpana Sharma (Dhakal), Sajita Dhakal, Suresh Kumar Ghimire, Tirtha Raj Pandey, Bhaskar Adhikari, Subhash Khatri, Sanjeev Kumar Rai and Mohan Siwakoti</i>
04.30-04.45PM	How an invasive <i>Ageratina adenophora</i> affect native vegetations of Nepal <i>Lal B. Thapa, Sujan Balami and Tej Bahadur Darji</i>
04.45-05.00PM	Impacts of invasive alien plant species on ecosystem services in the lake cluster of Pokhara valley, Nepal <i>Hom Nath Pathak, Dinesh Raj Bhuju and Bharat Babu Shrestha</i>
05.00-05.15PM	Distribution of invasive plant species along altitudinal gradient in eastern Nepal <i>Satyam Kumar Chaudhari and Diwas Dahal</i>
05.30-05.45PM	TEA BREAK

POSTER: BIOTECHNOLOGY, BIOCHEMISTRY, FUNGI AND PLANT PATHOLOGY**[04.00-05.00PM]**

Mycoflora associated in some commercially cultivated mushrooms in Kathmandu City, Nepal
Hari Sharan Adhikari and Sanjay Kumar Jha

Toxicity test of some selected wild mushrooms of Nepal
Madhu Bilash Ghimire, Hari Prasad Aryal and Rajeswar Ranjitkar

Investigation on phytochemicals for chemical constituent analysis and antioxidant scavenging activity of *Clerodendrum viscosum* from Morang, Nepal
Punam Kumari Sah, Tilak Prasad Gautam, Suraj Shah and Pawan Shah

Assessment of diseases on *Swertia chirayita* of Dolakha district, central Nepal
Rabindra Thapa and Sanjay Kumar Jha

An efficient acclimatization techniques of tissue culture raised commercially valuable native orchids of Nepal *Phaieus tankervilleae* (Banks) Blume and *Cymbidium aloifolium* D. don
Sabari Rajbahak, Krishna Chand, Laxmi Sen, Pusp Raj Joshi, Anil Shah, Mukti Ram Paudel and Bijaya Pant

Proximate analysis of coal and antimicrobial activity of silver nanoparticle impregnated activated charcoal
Suman Rai and R. Katuwal

Day 2 (7 February 2020)**FAUNAL DIVERSITY [08.00-10.15AM]****Hall A (Sagarmatha)****Chair:** Prof. Dr. Ram Bahadur Thapa**Rapporteur:** Dr. Ganesh Thapa

08.00-08.15AM	<i>Invited Speaker</i> Faunal diversity of Tapli Rural Municipality, Udayapur, Province 1, Nepal <i>Bharat Raj Subba and Shailendra Pokharel</i>
08.15-08.30AM	Distribution of <i>Phlebotomus argentipes</i> sand fly (Diptera: Psychodidae) in areas with visceral leishmaniasis in Nepal <i>Lalita Roy, Surendra Uranw, Kristien Cloots, Murari Lal Das and Wim Van Bortel</i>
08.30-08.45AM	Status and diversity of indigenous small fish species (SIS) in Tarai wetlands of Province 1, Nepal <i>Prakash Kumar Yadav and Bharat Raj Subba</i>
08.45-09.00AM	Amphibian species richness in different habitats of Kapilvastu District, Nepal <i>Pit Bahadur Nepali and Nanda Bahadur Singh</i>
09.00-09.15AM	Status and threats to waterbirds: a case study of birds of Phewa Lake, Pokhara, Nepal <i>Shubhas Chandra Bastola and Bishnu Prasad Bhattarai</i>
09.15-09.30AM	Species diversity and conservation practices of turtle and tortoises in Betana wetland area <i>Dibya Raj Dahal</i>
09.30-09.45AM	Altitudinal distribution of herpetofauna in Ghandruk Region of Annapurna Conservation Area, Nepal <i>Bivek Gautam and Mukesh Kumar Chalise</i>
09.45-10.00AM	Soil fauna of Ranibari Community Forest (RCF), Kathmandu, Nepal <i>Pratistha Shrestha and Prem B. Budha</i>
10.15-10.30AM	TEA BREAK

MEDICINAL PLANTS AND ETHNOBIOLOGY – 1 [08.00-10.15AM]

Hall B (Lhotse)

Chair: Prof. Dr. Kanta Poudyal/Prof. Dr. Sasinath Jha

Rapporteur: Dr. Anant Gopal Singh

08.00-08.15AM	<i>Invited Speaker</i> A case study of <i>ex-situ</i> conservation on <i>Zanthoxylum armatum</i> DC. in Khokana village, Lalitpur District, Nepal <i>Ila Shrestha, Budhi Ratna Dangol and Nirmala Joshi</i>
08.15-08.30AM	Pattern of β -thalassemia and other haemoglobinopathies: a cross-sectional study in the ethnic groups of eastern terai Nepal <i>Gita Shrestha and Nanda Bahadur Singh</i>
08.30-08.45AM	Efficacy of <i>Ocimum sanctum</i> (Tulsi) leaf extract as an anti-hyperglycemic agent in albino rats <i>Arpana Kumari and B.S. Jha</i>
08.45-09.00AM	In vitro evaluation of <i>Rhododendron arboreum</i> (Sm) Trautu for potential antibacterial activity <i>Astom Mondal, Karabi Biswas, Sushree Ghosh and Sankar Narayan Sinha</i>
09.00-09.15AM	Inventory of non-timber forest products in Annapurna Conservation Area <i>Bhuvan Keshar Sharma, Shailendra Pokhrel and Juddha Bahadur Gurung</i>
09.15-09.30AM	Ethnobotany on Musahar community in Dhanusa district central Nepal <i>Rajesh Tamang and Tahir Husain</i>
09.30-09.45AM	Mortality concentration of biological plant extracts on the mosquito larvae <i>Mani Bahadur Rai</i>
09.45-10.00AM	Extraction of natural surfactant from the bark of <i>Persea odoratissima</i> (Nees) Kosterm. <i>Eliza Acharya, Tilak Prasad Gautam and Ajaya Bhattarai</i>
10.15-10.30AM	TEA BREAK

ECOLOGY AND ENVIRONMENT – 3 [08.00-10.15AM]

Hall C (Kanchenjunga)

Chair: Prof. Dr. Bipana Devi Acharya

Rapporteur: Dr. Som Prasad Paudyal

08.00-08.15AM	Effects of altitude on fine root decomposition and nutrients release in Sal (<i>Shorea robusta</i> Gaertn.) bearing forests of Jhapa and Ilam Districts in eastern Nepal <i>Krishna Prasad Bhattarai, Tej Narayan Mandal and Tilak Prasad Gautam</i>
08.15-08.30AM	Study of leaf morphology and anatomy of <i>Cinnamomum camphora</i> L. plants growing in different regions of Kathmandu, Nepal <i>Belai Meeta Suwal Singh and Ratna Silwal Gautam</i>
08.30-08.45AM	Diversity and distribution pattern of lichens in Kathmandu Valley <i>Neena Karmacharya, Chitra Bahadur Baniaand Mukesh Kumar Chettri</i>
08.45-09.00AM	Physicochemical properties of forest topsoil in relation to depth and management practice <i>Bikash Gautam and Mukesh Kumar Chettri</i>
09.00-09.15AM	Pattern of tree species richness along the altitudinal gradient of Modi River basin in Annapurna Conservation Area, Central Nepal

	<i>Ram Prasad Khanal, Mohan Prasad Devkota and Shiva Devkota</i>
09.15-09.30AM	Variation of vascular plant diversity in two aspects of Narapani-Masina landscape, Arghakhanchi, Nepal <i>Babu Ram Nepali, John Skartveit and Chitra Bahadur Baniya</i>
09.30-09.45AM	Soil properties and retreating status of Bhimthang Glacier, Manang, central Nepal <i>Mahendra Gahatraj and Chitra Bahadur Baniya</i>
09.45-10.00AM	Improvement of water quality of aquatic eco-system through macrophytes <i>Momezul Haque and Sankar Narayan Sinha</i>
10.15-10.30AM	TEA BREAK

BIOLOGICAL INVASION, ECOLOGY AND ENVIRONMENT [08.00-10.15AM]

Hall D (Makalu)

Chair: Prof. Dr. Mohan Prasad Panthi

Rapporteur: Dr. Bharat Babu Shrestha

	<i>Invited Speaker</i>
08.00-08.15AM	Coupled Human Nature Systems: Ecological survey of invasive plant species in community forests of lowland Nepal <i>Dharma Raj Dangol</i>
08.15-08.30AM	Prevalence of <i>Puccinia abrupt</i> var. <i>partheniicola</i> and its impact on <i>Parthenium hysterophorus</i> in Kathmandu valley, Nepal <i>Seerjana Maharjan, Anjana Devkota, Bharat Babu Shrestha, Chitra Bahadur Baniya, Rangaswamy Muniappan and Pramod Kumar Jha</i>
08.30-08.45AM	Spatial and temporal distribution of <i>Eichhornia crassipes</i> in Chitwan Annapurna Landscape (Chal) area, Nepal using satellite imageries <i>Himal Yonjan, Pramod Kumar Jha, Narayan Prasad Ghimire, Krishna Prasad Poudel, Abhijin Adiga, Madhav Marathe and Rangaswamy Muniappan</i>
08.45-09.00AM	Spatial and temporal distribution of <i>Lantana camara</i> in Chitwan Annapurna Landscape Nepal using satellite imageries <i>Sandeep Dhakal, Bharat Babu Shrestha, Pramod Kumar Jha, Krishna Prasad Poudel and Rangaswamy Muniappan</i>
09.00-09.15AM	Spatial distribution of an invasive weed <i>Chromolaena odorata</i> in Chitwan-Annapurna Landscape Area, Nepal using knowledge-based approaches <i>Sita Gyawali, Anjana Devkota, Pramod Kumar Jha and Krishna Prasad Poudel</i>
09.15-09.30AM	Spatial and temporal distribution of invasive weed <i>Mikania micrantha</i> in Chitwan Annapurna Landscape (CHAL) Nepal with application of satellite imageries <i>Srijana Paudel, Anjana Devkota, Pramod Kumar Jha, Krishna Prasad Poudel and Rangaswamy Muniappan</i>
09.30-09.45AM	Vegetation patterns at different management regimes of Barandabhar forest, Chitwan, Central Nepal <i>V.P. Gautam, C.B. Baniya, B.K. Sharma and R.K.P. Yadav</i>
09.45-10.00AM	Ecological studies of aquatic macrophytes (with special emphasis on <i>Nymphoides indica</i>) of Kashyap lake, Kaski, Nepal <i>Ashmita Khadka and Umesh Koirala</i>
10.15-10.30AM	TEA BREAK

[08.00-09.00AM]

Algae of Gupha Pokhari and Lam Pokhari, Sankhuwasabha District, Nepal

Ashbina Sharma Mainali and Shiva Kumar Rai

Diatoms of Manang district

Bineeta Shrestha, Gauri Lama and Lal B. Thapa

Freshwater algae (excluding diatoms and red algae) from Hasina Wetland, Sundarharaicha, Morang: New to Nepal

Dilli Ram Rai and Shiva Kumar Rai

Aquatic macrophytes of Maipokhari wetland, Ilam, Province no.1, Nepal

Raju Chaudhary and Sanjeev Majhi

Fern and fern allies of Raja-Rani Letang, Province 1, Nepal

Rijan Ojha and Bhabindra Niroula

Seasonal variation of algal diversity with reference to water quality in Jagadishpur Reservoir, Nepal

Sajita Pokhrel, Narayan Prasad Ghimire and Shiva Kumar Rai

WILDLIFE CONSERVATION [10.30-12.30PM]

Hall A (Sagarmatha)

Chair: Prof. Dr. Damodar Thapa Chhetry

Rapporteur: Dr. Pramod Kumar Kushwaha

10.30-10.45AM	<i>Invited Speaker</i> Impacts of Linear Infrastructure on endangered Bengal tiger in Nepal's Chitwan National Park- a UNESCO site <i>Krishna Hengaju, Neil Carter, Narendra Pradhan and Laxman Poudyal</i>
10.45-11.00AM	Piloting fox lights to promote the coexistence of snow leopard and local herders: A case study from Nepal Himalayas <i>Ganga Ram Regmi, Rinzin Phunjok Lama, Tashi R. Ghale, Purna Ale and Ganesh Puri</i>
11.00-11.15AM	Habitat use and conservation status of <i>Ailurus fulgens</i> (Red panda) in Choyatar community forest, Sandakpur-Ilam <i>Bhanu Kumar Bhattarai, Diwas Dahal and Kailash Kumar Kharel</i>
11.15-11.30AM	People's attitude towards wild water buffalo <i>Bubalus arnee</i> (Kerr, 1792) conservation in Koshi Tappu Wildlife Reserve, Province 1, Nepal <i>Ram Chandra Adhikari</i>
11.30-11.45AM	Role of central zoo in conservation education <i>Nilam Prajapati, Bishnu Prasad Bhattarai and Chiranjibi Prasad Pokharel</i>
11.45-12.00PM	Effect of habitats, topography and human disturbances on the occurrence of large mammals in Panchase Protected forest, Nepal <i>Jagan Nath Adhikari, Bishnu Prasad Bhattarai and Tej Bahadur Thapa</i>
12.00-12.15PM	Distribution and conservation issues of turtles in the lowland of Province No. 1, east Nepal <i>Tapil Prakash Rai, Udhab Raj Khadka, Kalu Ram Rai, and Hermann Schleich</i>
12.30-01.30PM	LUNCH

MEDICINAL PLANTS AND ETHNOBIOLOGY- 2 [10.30-12.30PM]

Hall B (Lhotse)

Chair: Prof. Dr. Ila Shrestha

Rapporteur: Dr. Bishnu Dev Das

10.30-10.45AM	<i>Invited Speaker</i> Bamboo culture in Santal and Meche ethnic groups of tarai region of eastern Nepal <i>Seeta Siwakoti (Olee)</i>
10.45-11.00AM	Ethnomedicinal uses of plants among Newah community of Chitlang, Makawanpur District, central Nepal <i>Nirmala Joshi and Mohan Siwakoti</i>
11.00-11.15AM	Phytochemical fingerprinting and cytotoxicity assays of the ethno-medicinal fern <i>Tectaria coadunata</i> (J. Smith) C. Christensen from central Nepal <i>Shyam Sharan Shrestha, Stefania Sut, Serena Barbon Di Marco, Gokhan Zengin, Valentina Gandin, Michele De Franco, Deepak Raj Pant, Mohamad Fawzi Mahomoodally, Stefano Dall'Acqua and Sangeeta Rajbhandary</i>
11.15-11.30AM	A review on trans-Himalayan trade of medicinal and aromatic plants from Nepal to China <i>Arjun Chapagain, June Wang, Srijana Shah and Dipesh Pyakurel</i>
11.30-11.45AM	Traditional herbal remedies used for the treatment of diabetes in South eastern region of Nepal <i>Shila Singh</i>
11.45-12.00PM	Traditional uses of animals as medicine practiced by Dhimal people of Damak, Jhapa <i>Jeevan Kumar Gurung</i>
12.00-12.15PM	Ethnobotanical study of medicinal plants of Banskharka community forest of Kabhrepalanchwok District <i>Rajju Bohaju and Som Prasad Paudyal</i>
12.30-01.30PM	LUNCH

ECOLOGY AND ENVIRONMENT – 4 [10.30-12.30PM]

Hall C (Kanchenjunga)

Chair: Prof. Dr. Hari Datta Bhattarai

Rapporteur: Dr. Chitra Bahadur Baniya

10.30-10.45AM	An assessment of the pollution and its impact on the diversity of phytoplankton in Mahananda river, Malda District, West Bengal, India <i>Sankar Narayan Sinha and Astom Mondal</i>
10.45-11.00AM	Status of arsenic and fluoride pollutants in groundwater of Biratnagar of Morang District, Nepal <i>Bishnu Dev Das, Ranjan Kumar Mishra and Sunil Kumar Choudhary</i>
11.00-11.15AM	Impact of climate change on agrobiodiversity and livelihood in rural communities in Lamjung District <i>D. Bhatta, K.M. Tripathi and I. Bhattarai</i>
11.15-11.30AM	Effect of nematicides on the growth of Cyanobacteria in paddy field of Parsa District (Nepal) <i>K. Bala and A.K. Sinha</i>
11.30-11.45AM	Assessment of heavy metal concentrations in water of Koshi at Kursela, Katihar, Bihar <i>Lalit Narayan Mandar</i>
11.45-12.00PM	Rain-water harvesting in Nepal: a case study <i>S.K. Chakrabarti</i>
12.00-12.15PM	Analysis of hand pump water in Lahan <i>Sachinadra Kumar Singh and Pradip Kumar Chaudhary</i>
12.30-01.30PM	LUNCH

FUNGI AND PLANT PATHOLOGY – 1 [10.30-12.30PM]**Hall D (Makalu)****Chair:** Prof. Dr. Min Raj Dhakal**Rapporteur:** Dr. Hari Prasad Aryal

10.30-10.45AM	Lichens of Nepal <i>Chitra Bahadur Baniya</i>
10.45-11.00AM	Lichen flora of Bajrabarahi Sacred Grove and Ranibari Community Forest of Kathmandu Valley, Nepal <i>Sheetal Vaidya, Rojina Timalisina and Prakash Khadgi</i>
11.00-11.15AM	Depicting the forgotten biological Kingdom: Why should we bring Fungi in biodiversity inventories, assessments and monitoring systems? <i>Shiva Devkota and Ram P. Chaudhary</i>
11.15-11.30AM	Epiphytic lichen diversity as affected by pollution <i>Snigdha Majumder and Sankar Narayan Sinha</i>
11.30-11.45AM	Diversity of macrofungi in Makrahar, Rupandehi, Nepal <i>Anand Prasad Bhattarai and Usha Budhathoki</i>
11.45-12.00PM	<i>Plasmodiophora</i> sp. on Apocynaceae- <i>Thevetia peruviana</i> (yellow oleander 'pila kaner) <i>K.K. Mishra</i>
12.00-12.15PM	Ectomycorrhizae morphotypes found in <i>Alnus nepalensis</i> in Dolkha, Nepal <i>Vijay Chaudhary, Sujan Balami, Martina Vasutova and Lal B. Thapa</i>
12.30-01.30PM	LUNCH

POSTER: ECOLOGY AND ENVIRONMENT – 1 [10.30-11.30AM]

Study and enumeration of wall flora of Pokhara valley, Nepal

Ashmita Khadka and Chandra Bahadur Thapa

Estimation of fine root biomass of Charkoshe Jhadi of eastern Nepal

B. Kafle and Bhabindra Niroula

Soil quality under different land-use type in Bakaiya River of Chure Region, Makwanpur District

Bipana Shiwakoti and Chandra Prasad Pokhrel

Plant diversity and iron bioaccumulation among angiosperms at hematite deposit of Dhaubadi, Nawalparasi (Ba. SuPurba), Nepal

Ishor Parajuli and Mukesh Kumar Chettri

Plant resource of Barju Lake, Sunsari, Nepal

Kedar Prasad Luitel and Bhabindra Niroula

Present status of alien invasive species in Biratnagar, Nepal

*Nabaraj Ghimire, Ashbina Sharma Mainali, Deepak Singh Saud, Reedima Rai, Susmita Parajuli, Ravi Chauhan, Roma Shris Thapa, Sugam Sharma and Bhabindra Niroula*Characterization of Polycotsniger (*Guizotia abyssinica* Cass.)*Reedima Rai and Bhabindra Niroula*

Effect of composts from invasive plant species on soybean in Nepal

Renu Chaudhary and Lal B. Thapa

Hazardous waste and its impact on human health

Srijana Prasai

POSTER: ECOLOGY AND ENVIRONMENT – 2 [11.30-12.30AM]

Effects of abiotic and disturbance factors on forest plant community structure and composition

Pramila Gachhadar, Tej Narayan Mandal and Chitra Bahadur Baniya

Ecological status, diversity and conservation of orchids in Nepal

Madan Bhattarai, Shiva Kumar Rai and Keshab Raj Rajbhandari

Ecotourism management in Jagadishpur Reservoir, Kapilvastu District, Province No.5, Nepal

Devi Kaucha and Shaligram Adhikaree

Possible impacts of Arun- III hydropower project on biodiversity of Sankhawasabha District

Kalpana Chemjong, Sabina Dahal, Namuna Khand, Birendra Bist, Ram Chandra Wagle and Jitendra Sah

Production of solid waste and its management in Rangeli Municipality

Kumari Punam Singh and Damodar Thapa Chhetry

Hatching Success of Gharial (*Gavialis gangeticus*) in Rapti River, Chitwan National Park, Nepal

Mina Shrestha and Shaligram Adhikaree

WILDLIFE DISEASE [01.30-03.15PM]

Hall A (Sagarmatha)

Chair: Dr. Bharat Raj Subba

Rapporteur: Kul Prasad Limbu

01.30-01.45PM	Gastrointestinal parasites prevalence in Rhesus Macaque (<i>Macaca mulatta</i> Zimmermann, 1780) of Devghatdham Religious Site, Nepal <i>Dina Nath Dhakal, Bishnu Prasad Bhattarai and Jagan Nath Adhikari</i>
01.45-02.00PM	Identification of gastro-intestinal parasites from faecal matters of Rhesus monkey <i>Macaca mulatta</i> (Zimmerman, 1870) of Dharan, Nepal <i>Milan Kharel, Ganesh Tamang and Jenisha Thakuri</i>
02.00-02.15PM	Seasonal variation in the infestation of helminth parasites in the Common carp, <i>Cyprinus caprio</i> . <i>G.P. Thakur, A.N. Jha and B.S. Jha</i>
02.15-02.30PM	Prevalence of gastrointestinal parasites in abandoned cattle of Kathmandu District, Nepal <i>Bigyan Thapa and Pitamber Dhakal</i>
02.30-02.45PM	Ectoparasitic infection on domestic mammals of Budol, Banepa <i>Sadiksha Khanal and Punya Ram Sukupayo</i>
02.45-03.00PM	Prevalence of gastrointestinal helminth parasites of domestic mammals in Gairigaun-1, Nagarkot Mandan Deupur Municipality <i>Semsal Tamang and Punya Ram Sukupayo</i>
03.15-03.30PM	TEA BREAK

SPECIAL SYMPOSIUM

REDD Implementation Centre, Department of Environment and DPR/Plant Resource Center, Ilam [01.30-03.30PM]

Hall B (Lhotse)

Chair: Dr. Bishwa Nath Oli

Rapporteur: Mr. Sanjeev Kumar Rai

01.30-01.50PM	REDD Readiness in Nepal <i>Buddi Sagar Paudel</i>
01.50-02.00PM	Discussion
02.00-02.20PM	Economic Prosperity through Medicinal and Aromatic Plants <i>Dhananjay Poudel/Mohan Dev Joshi</i>
02.20-02.30PM	Discussion
02.30-02.50PM	Identification of Environmental issues <i>Aabha Shreatha</i>
02.50-03.00PM	Discussion
03.00-03.10PM	Remark by Guest
03.15-03.30PM	Remark by Chair

ECOLOGY AND ENVIRONMENT - 5 [01.30-03.15PM]

Hall C (Kanchenjunga)

Chair: Prof. Dr. Mukesh Kumar Chhetry

Rapporteur: Dr. K.Bala

01.30-01.45PM	<i>Invited Speaker</i> Evaluation of different non-host plants as trap crops to reduce <i>Orobanche</i> seed bank in infested tomato fields of Lalbandhi, Sarlahi <i>Bipana Devi Acharya, Anjana Bista, Nabin Darai and Sanju Gnewali</i>
01.45-02.00PM	Use of Greater duckweeds as fish feed and manure <i>Bhabindra Niroula and Sasinath Jha</i>
02.00-02.15PM	Use of the Greater duckweed as feed for the Tilapia fish <i>Bindu Pokharel (Bhattarai), Bhabindra Niroula and Sasinath Jha</i>
02.15-02.30PM	Water relations and drought adaptive strategy of <i>Schima wallichii</i> DC. Korth. and <i>Castanopsis indica</i> (Roxburgh Ex Lindl.) A. DC. in Godavari, Lalitpur <i>Sarita Chataut and Kanta Poudyal</i>
02.30-02.45PM	Effect of duckweed manuring on growth and yield of chilli and brinjal crops <i>Madhu Kumari and Sasinath Jha</i>
02.45-03.00PM	Phenology and seed germination of macrophytes at lowland, Province 1, Nepal <i>Praju Panta, Shova Poudel and Bhabindra Niroula</i>
03.15-03.30PM	TEA BREAK

FUNGI AND PLANT PATHOLOGY – 2 [01.30-03.15PM]

Hall D (Makalu)

Chair: Prof. Dr. Usha Budhathoki/ Prof. Dr. Umesh Koirala

Rapporteur: Dr. Sheetal Vaidya

01.30-01.45PM	Optimization of cultural media for mycelia growth of <i>Termitomyces robustus</i> (Beeli) Heim <i>Hari Prasad Aryal</i>
01.45-02.00PM	Mushroom: An overlooked bio-resource of Nepal <i>Jay Kant Raut</i>
02.00-02.15PM	Survey on foliicolous black mildews on Fagaceae at Shivapuri and Phulchoki Hill Forest, Nepal <i>T. Tiwari and M.D. Bhatt</i>

02.15-02.30PM	The ecology and diversity of macrofungi in Sal forest located in Bhabar region, eastern Nepal <i>Sabitri Shrestha, Tilak Prasad Gautam, Tej Narayan Mandal and Hari Prasad Aryal</i>
03.15-03.30PM	TEA BREAK

POSTER: MEDICINAL PLANTS AND ETHNOBIOLOGY [01.30-02.30AM]

Folklore medicinal plants used against typhoid fever in Lwangghalel, Kaski District, central Nepal
Bijay Khadka and Mohan Panthi

Ethnomedicinal plants of Dhankuta District, Province 1, Nepal
Bindu Kumar Lawati

Ethnobotanical study of ferns of Panchase protected forest, central Nepal
Chandrakala Thakur and Sangeeta Rajbhandary

Ethnobotanical study on medicinal plants used by local Tamang ethnic people of Timal, Kavrepalanchok, Nepal
Furbe Lama, Madan Koirala, Dil Kumar Rai and Sabin Shakya

A traditional approach for the remedy of shingles using medicinal plants in rural village of Ilam, eastern Nepal
Homnath Khatiwada, Ajay Neupane and Lal B. Thapa

Ethnomedicinal plants used by Dhimal of Rajghat VDC of Morang district
Indramani Bhagat and Bhumi Raj Baral

Ethnobotanical study of Limbu tribe of Sudap VDC, Tehrathum, Nepal
Jitendra Limbu and Indramani Bhagat

Plants in the rituals of Newa community of Chapagaun, Nepal
Manju Maharjan, Prakash Khadgi and Sheetal Vaidya

Medicinal plants of Dhankuta District, Nepal
Samjhana Rai and Tilak Prasad Gautam

**National Conference on Integrating Biological Resources for Prosperity
6-7 February 2020 / 23-24 Magh 2076
Venue: Hotel Eastern Star, Roadcess Chowk, Biratnagar**

10.00-06.00PM	Registration (5 February 2020)	
DAY 1 Thursday (6 February 2020 / 23 Magh 2076)		
07.30-09.00AM	Registration/Breakfast	
09.00-11.00AM	Hall A (Sagarmatha): Inaugural session	
11.00-12.30PM	Hall A (Sagarmatha) Plenary session	Hall C (Kanchenjunga) Special Symposium: Department of Environment (DoE) and Department of Plant Resources (DPR/Plant Resource Center, Ilam)
12.30-01.30PM	Lunch	
Location	Hall B (Lhoise)	Hall C (Kanchenjunga)
01.30-03.45PM	General	Higher Plant Diversity and Systematics
03.45-04.00PM	Tea Break	
04.00-05.30PM	Lower Plant Diversity: Algae, Bryophyte and Peridophyte	Biological Invasion
05.30-05.45PM	Tea Break	
06.30-07.00PM	Hall A (Sagarmatha): Visit Nepal 2020 Documentary	
07.00-08.00PM	Welcome Dinner	
DAY 2 Friday (7 February 2020 / 24 Magh 2076)		
07.30-08.00AM	Breakfast	
08.00-10.15AM	Faunal diversity	Biological Invasion
10.15-10.30AM	Tea Break	
10.30-12.30PM	Wildlife Conservation	Fungi and Plant Pathology
12.30-01.30PM	Lunch	
01.30-03.15PM	Wildlife Disease	Fungi and Plant Pathology
03.15-03.30PM	Tea	
03.30-05.00PM	Hall A (Sagarmatha): Resolution and Valedictory session	
07.00-08.00PM	Farewell Dinner	

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Keynote Lectures

Biological Resources: An important key for prosperity of Nepal

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Abstract

Human beings have always made use of biological resources for their livelihood and prosperity. Despite being rich in biodiversity and biological resources, Nepal remains economically one of the poorest countries in the world. Once a food-exporting country is now importing agriculture and animal products worth NPR 15 billion per month. In the recent past, the country has also started to import timber wood. The export of bio-products is not up to expectation. Biodiversity and their ecosystem services are remarkable. Unique topography having impressive fauna and flora is a great attraction of tourism in Nepal. The country has not properly used its resources for prosperity. Agriculture and forest sectors have tremendous potential to uplift the living standard of people in rural areas. Rich and varied biodiversity needs to be transformed into resources for economic development. At present, Nepal holds 115th position in the Legatum Prosperity Index (LPI). There is some improvement in LPI in the last few years, however the country's expectations are high. The country has the potential to rise and prosper provided coordinated efforts are done from government institutions, academia and entrepreneurs. In addition to infrastructure and economic development, emphasis should be on good governance, encouraging business policy, quality education and sustainable environment. The government should enhance the budget for R&D as most of the prosperous countries spend more than 1.5% of GDP in research and development. Educational institutions should be strengthened and laboratories should be enriched. It should re-identify their role in the present context. Examples of bioproducts and successful biotrade will be discussed in the presentation.

Biodiversity conservation in Nepal Himalaya from sustainable development and human wellbeing perspective

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Abstract

Biodiversity, the diversity of life at three levels (genes, species, and ecosystem), is the attribute of life and plays an important role in maintaining the resilience of ecosystem

productivity and sustaining the supply of goods and services. Biological resources, the resources of their actual or potential use or values to humans are sources of livelihoods for people, in particular for indigenous peoples' and local communities who suffer most when biodiversity is lost, and economic development. Biodiversity is a very hot topic and the importance of conserving plants, animals as well as microorganisms are getting increasing coverage. The crucial question concerning biodiversity is not whether to conserve; but how best we can conserve diversity at different levels at which conservation is being addressed. Therefore, the human should conserve biodiversity because of its economic, ecological, social and spiritual benefits. Nepal, as a contracting party to the Convention on Biological Diversity (CBD), is committed to making a significant reduction in the rate of loss of biodiversity through conservation, sustainable use, and fair and equitable sharing of the benefits from the utilization of biological resources. The country is disproportionately rich in biodiversity at ecosystem, species and gene levels. It has predominantly adopted conventional approaches to biodiversity management into sectors, such as forestry, agriculture or at the landscape level. These approaches, however, do not fully address conservation and sustainable development issues and have a number of shortcomings. For example, ecosystem concerns are considered different from development concerns; interdependence of ecosystem services and human needs are often ignored, and diverse effects of declining ecosystem services on various social groups are not acknowledged. A more holistic view that links different ecosystem services and human wellbeing can fulfill these deficiencies and focus on maintaining the functioning and resilience of ecosystems and ensuring equitable access to the services. This approach also invites all the relevant stakeholders to take part in collaborative decision making, priority setting and conflict resolution. The presentation will cover: (i) major threats and conservation approach undertaken by Nepal in conserving biodiversity; (ii) conservation needs at national and transboundary scales; and (iii) approaches linking biodiversity conservation with sustainable development and human wellbeing and achieving a good quality of life.

Plenary Lectures

Biocultural diversity

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Abstract

Loss of culture and language diversity greatly affects negatively on biodiversity conservation. The importance of the knowledge of indigenous names has been well-recognized by ethnobiologist for the success of initiatives related to the recovery and restoration of endangered species. Evidently, studies have demonstrated that efforts to preserve biodiversity can greatly benefit from engaging with local communities, anthropologists and linguists. While local communities and anthropologists can share their unique traditional ecological knowledge, linguists can serve as bridges between traditional knowledge and eco-science. It is well-considered that safeguarding of traditional knowledge and the indigenous languages are promising tools for the conservation and sustainable management of biodiversity. Conservation biologists have realized the importance of focused research exploring the relationship between biological and linguistic and cultural diversity for developing integrated strategies designed to conserve species, culture, and languages.

Keywords: Biodiversity, Culture and language diversity, Conservation strategies

Plant science education and society

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Abstract

With the inception of human civilization plants have been used by men for their basic needs. Recent urbanization and other development activities have been found to be responsible for careless and imprudent encroachment of natural habitat. Plant sciences today have to face challenges from global issues including climate change, global warming and increasing the requirement of the growing population of food, shelter, health, fodder, energy and so on. Education that cannot combat such challenges and solve the problems of society will certainly lose its values. People are now aware of the responsibilities of educational institutions towards societies on which they subsist. In order to meet local and global needs, our education of plant science must be able to keep pace with social

needs, global change and technology development. Time has come or rather late to look back on our curriculum of plant sciences in higher education and update it giving much attention to the needs of the societies.

Keywords: Plant science education, social needs, global change, curriculum

Endemic flowering plants of Nepal: Status and distribution

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Abstract

The objective of this paper is to present the status and distribution of the endemic flowering plants of Nepal by revising their existing lists and updating them on the basis of the published literature. Endemic flowering plants of Nepal are those plants whose distributions are confined to Nepal. If the plant is found outside Nepal then it is not endemic to Nepal. In a wider sense, the distribution of any endemic taxonomic unit is confined to a particular country or geographical region. Isolation of geographical areas, such as high mountains and islands, plays an important role in the formation of endemic plants and these areas have shown greater endemism in general. The importance of the endemic plants lies in the fact that if it is lost from a particular country or region it will be lost from the world as well. Therefore, the utmost importance has to be given for the conservation of these plants. Recently, some papers on the endemic flowering plants of Nepal have appeared with their lists. However, they have not been analyzed from the distribution point of view. With the help of the published literature, we revised the list of the endemic flowering plants of Nepal updating them wherever necessary and worked out on the distribution of the Nepalese endemic flowering plants in different climatic and vegetation zones of Nepal as well as different districts of Nepal to see their diversity and distribution pattern. Endemic flowering plant species of Nepal are sometimes represented by a single type specimen. Therefore, we also checked the national and international herbaria where these specimens are preserved to see in how many herbaria Nepalese endemic flowering plant specimens are available. The recent updated list shows that Nepal has 312 endemic flowering plant species to date. In some of their specimen's localities or altitudes are not available thus creating in problem to place them in the proper vegetation zone or in the district as well. Among 307 species of endemic flowering plant species analyzed Central Nepal has 182 species, which is the highest number of species than in west (75 species) and east (50 species) Nepal. In the central Nepal alpine zone contains largest number (74 species) of endemic flowering plants. In the same way

subalpine zone of central Nepal has 52 species (second largest number). Lowest number of endemic flowering plants (6 species) is found in the temperate zone of east Nepal. Endemic flowering plants are found in 38 districts of Nepal. Mustang district (37 species) has the highest number of endemic flowering plants. One species of endemic flowering plant is found in 10 districts of Nepal. 36 herbaria in Nepal and abroad preserve the herbarium specimens of Nepalese endemic flowering plants. Among them Natural History Museum (BM, London), Royal Botanic Garden Edinburgh (E, Edinburgh), University of Tokyo (TI, Tokyo) and National Herbarium of Nepal (KATH, Lalitpur) have more than 50 type specimens of the Nepalese endemic flowering plants. Several herbaria have one type specimen only. The data can help in developing the planning/policy of the conservation of the endemic plants of Nepal.

Keywords: Endemic plants, Conservation, Vegetation zones, Herbaria

Status of aquatic biodiversity in Bangladesh

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Abstract

Data and information sources are used from the direct interview with the individual, publication of the Department of Fisheries (DoF) and related non-published grey literature. The country has an inland water area of about 45,000 km² and about 710 km long coastal belt. The fisheries sector contributes 3.57% to the national GDP, 25.30% to the agricultural GDP and more than 2.0% to the total export earnings. The total production was 4,277 m.mt fish in 2017-2018 whereas inland open water (capture) contributes 28.45% and inland closed water (culture) contributes 56.24% to total production. The overall growth rate of total production in 2017-18 is 3.44%. This sector is contributing significantly to food security through providing safe and quality animal protein; about 60% of animal protein in daily dietary requirement comes from fish. About 11% of the total population is engaged with this sector on a full and part-time basis for their livelihoods. Bangladesh is blessed with huge open water resources with a wide range of enriched aquatic diversity, comprising almost 260 freshwater fish species and other aquatic lives. But due to the decline and degradation of wetland resources, the stock of inland capture fisheries has been reduced remarkably. In recent years, the fisheries sector is faced with challenges posed by numerous natural and anthropogenic causes such as climate change, natural disasters, environmental pollution, industrialization, overfishing, using destructive fishing gear, pesticide and agrochemicals. As a result, commercial important 7 species were Extinct, 16 species were critically endangered, 31 species were endangered, 48 species were vulnerable status, 67 species of fish assessed as lower risk, 91 species as not threatened position from the biodiversity viewpoint. For the development of biodiversity, healthy ecosystem and safety food, improved biological management technology of fish

sanctuary, beel nursery, fingerlings stocking, fish habitat rehabilitation, breeding ground conservation and pen culture, and Fish Regulation Act-1950 and jatka conservation for hilsha production is to be developed to restrict the declination of resources and enhance production and number of population.

Keywords: Aquatic fauna, Biodiversity, Extinct, Endangered, Critically endangered, Illegal fishing, Beel nursery

Oral Session: Biological Invasion

Invasive alien species a curse or boon: an overview

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Abstract

When an alien species has become established as a part of the plant life of a region other than their origin is considered as naturalized species. When a species spread outside of its natural distribution range and threatens ecosystems, habitats and/or other species, potentially causing economic and/or environmental damage, or harm to human health, it becomes an invasive species. Common characteristics of invasive species include rapid reproduction and growth, high dispersal ability, phenotypic plasticity, and ability to survive on various food types and in a wide range of environmental conditions. The invasive species show their impact on agriculture, forestry, fisheries and natural systems, which are an important basis of peoples' livelihoods in developing countries. The impact is aggravated by climate change, pollution, habitat loss and human-induced disturbance. Several alien plant species have become aggressive and rapidly colonized in different ecosystems of Nepal and is considered as one of the major threats to native biodiversity and its natural ecosystems. The knowledge base on IAS is rather limited in Nepal. However, there is a record of about 217 species of naturalized alien plant species, which are considered as potentially invasive species, among these 26 species have been identified as highly invasive in different ecosystems of the country. The majority of these IAS are tropical origin; hence, their invasion is mostly found in Tarai, Siwliks and Midhills regions of the country. Nepal has recognized the threat posed by IAS in different ecosystems and incorporated the issues of IAS in different national legal instruments. Similarly, Nepal being a signatory to many global environmental treaties and conventions (Ramsar Convention; Convention on Biological Diversity; Convention of International Trade in Endangered Species of Wild Fauna and Flora) pertaining to IAS is mandatory to fulfill obligations under these treaties and conventions. Despite, the management of IAS is still not coming under the national priority, similarly, the legal instruments are not effectively implemented. An attempt has been made to analyze the status of IAS and their impacts in native biodiversity and different ecosystems of the country.

Keywords: Naturalized species, Invasive species, Nepal, Legal instruments

Coupled Human Nature Systems: Ecological survey of invasive plant species in community forests of lowland Nepal

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Abstract

Invasive plant species cause impacts on biodiversity, socio-cultural ecosystems, environmental services and human well-beings as a whole. It is crucial to understand the invasion of these species in different community forests for effective management. Thus, an ecological survey was conducted in 21 community forests (CFs) of Chitwan National Park of Lowland Nepal in 2013, 2014 and 2015. The survey mainly focused on investigation of 3 major invasive species namely *Mikania micrantha*, *Chromolaena odorata*, and *Lantana camara*. Among these 3 species, it was found that the highest invasion of *Mikania* and *Lantana* in Narayani CFs and *Chromolaena* in Barandavar CFs. It was also observed that *Imperata cylindrica*, *Ageratum houstonianum* and *Clereodrendrum infortunatum* were the three most dominant understory species. The invasion of these three species is increasing rapidly over the years impacts the human and wildlife ecosystems in the CFs. Further studies on management through utilization of these species for the livelihood improvement such as biogas, fodder and forages are necessary in future.

Keywords: Invasive species, Chitwan National Park

Publishing occurrence data of endemic and alien plant species of Nepal in Global Biodiversity Information Facility (GBIF)

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Abstract

The understanding spatial pattern of biodiversity distribution and drivers of their change at various geographical scales and governance levels help to improve strategies for biodiversity conservation and environmental management. This requires openly accessible geo-referenced distribution data of species from across the world. Global Biodiversity Information Facility (GBIF), an international network and research infrastructure funded

by the world's governments, is publishing such data for all types of life on earth. In recent times, biodiversity data published in GBIF have increasingly been used for analyzing patterns and processes at different geographical scales and governance levels. Despite having rich and unique biodiversity, Nepal's biodiversity data have been poorly represented in GBIF and none of the institutions in Nepal published biodiversity data in GBIF. In this context, we digitized the occurrence data of endemic and alien plant species of Nepal using herbarium specimens maintained at two national institutions – National Herbarium and Plant Laboratories (KATH) and Tribhuvan University Central Herbarium (TUCH) - and published in GBIF during June-July 2019. These two institutions (KATH and TUCH) have also been registered as data publishers in GBIF. We digitized 304 specimens representing 48 species (15% of total 313 species) of endemic plants and 5266 specimens representing 146 species (81.5% of total 179 species) of alien species. As of 17 December 2019, there were 3,462 downloads of these datasets, suggesting extensive use of these data by researchers. A large volume of herbarium data digitized by KATH is awaiting publication in GBIF. Given that basic infrastructure and human resources are available to publish biodiversity data in GBIF, this process of publishing biodiversity data can be continued to support Nepal's commitments to Global Strategy for Plant Conservation, a program of the United Nations Convention on Biological Diversity.

Keywords: Herbarium, TUCH, KATH, Data mobilization, Digitization

Spatial and temporal distribution of *Eichhornia crassipes* in Chitwan Annapurna Landscape (Chal) area, Nepal using satellite imageries

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Abstract

Eichhornia crassipes has become a major threat to the wetland ecosystem. Aquatic weeds in Nepal have been usually monitored, using conventional methods by field surveys. However, it is not possible in large areas due to time-consuming and labor-intensive practice. The study area is Chitwan Annapurna Landscape (CHAL), covering an area of 32,057sq. km. The main objective of this research work was mapping the spatial and temporal distribution of *E. crassipes* by using satellite imageries obtained from Landsat5, Landsat 8 and Digital globe. Maximum likelihood classification was done in Arc GIS 10.5 and Knowledge-Based Classification was done by using Knowledge Engineer and Knowledge Classifier in ERDAS IMAGINE 2014. Variables like spectral value, rainfall, maximum temperature, minimum temperature, slope, aspect and other collateral

information were used in Knowledge Engineer. The total area of the digital globe image of a small portion of Chitwan was 42.83 km² and the area invaded by *Eichhornia* was 0.775 km²(1.8%). Accuracy test was done and Overall Classification Accuracy was found to be 77.00% and Overall Kappa Statistics was 0.5264. The area invaded by *E. crassipes* in CHAL of Landsat 2018 A.D. was 27.58 km²(0.087%), in 2010 was 23.44 km²(0.074%), in 2000 was 2.93 km²(0.0092%) and in 1990 was 5.71km²(0.018%).

Keywords: *Eichhornia crassipes*, Landsat, Maximum likelihood classification, Knowledge-Based Classification

Alien plant invasion in Bajrabarahi religious forest, Lalitpur, Nepal

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Abstract

It is well known that invasive alien plant species (IAPS), have been creating a serious problem in all types of ecosystems worldwide. Various ecosystems in Nepal including forests have been infested by a number of IAPS. A study was carried out in a protected forest (Bajrabarahi religious forest), Lalitpur, Nepal to understand status of natural vegetation and alien plant invasion. A total of 60 plots of size 10m × 10 m was established in the forest in which plant species richness, tree canopy, IAPS cover and seedlings of native species were measured. From the assessment, a total of 113 species of vascular plants belonging to 45 families were identified. A total of 8 species of invasive alien plants were found in the forest. Mainly, *Ageratina adenophora*, *Bidens pilosa*, *lantana camara*, *Ageratum houstonianum* were the major IAPS in the study area. Forest areas near the roadside and inner trails were highly invaded by IAPS in comparison to the inner protected areas. There was a negative correlation between IAPS cover and native species richness and between tree canopy and IAPS cover. The number of seedlings was lesser in the highly invaded plots and picnic spots inside the forest. Hence, there is an urgent need to control and manage IAPS in such a religious forest as the scenario indicates the level of invasion would be severer in the future.

Keywords: Community forest, Species richness, Invasive plants, Control and management

Impacts of invasive alien plant species on ecosystem services in the lake cluster of Pokhara valley, Nepal

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Abstract

Freshwater wetlands, particularly lakes provide ecosystem services viz. provisioning, regulating, supporting and cultural services for the subsistence of human life. We inventoried wetland invasive alien plant species (IAPs) of lake clusters in Pokhara valley, documented ecosystem services of the lakes, and determine impacts of IAPs on ecosystem services provided by lakes. We used tools of social sciences i.e. Focus Group Discussion (FGD), Key Informant Interview (KII) and personal interview to obtain data with the help of checklist and semi-structured questionnaires. Altogether 5 IAPs were found in the lakes of Pokhara valley; they were *Eichhornia crassipes*, *Pistia stratiotes*, *Leersia hexandra*, *Ipomoea carnea* spp *fistulosa* and *Alternanthera philoxeroides*. Twenty-five ecosystem services were recognized. Millions of dollars were provided by these lakes to the pokhareli people in terms of the provisioning services. IAPs in lakes have negative impacts on those ecosystem services evidenced by the decrease in fish production after the introduction of IAs (invasive alien species) in lake systems. Biodiversity loss, decrease in natural beauty, difficulties in recreational boating were the other impacts. Machine purchase for water hyacinth removal from Phewa Lake and labor input was adding costs of almost 134,770 USD per year. Different IAPs and other IAs had negative impacts on different ecosystem services provided by lakes.

Keywords: Questionnaire, Economic valuation, Ramsar site

How an invasive *Ageratina adenophora* affect native vegetations of Nepal

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Abstract

Ageratina adenophora is a highly problematic invasive alien species in Nepal as it has been invading roadsides, fallow lands and forests. Besides studies on distribution and impacts, what specific mechanisms are adopted by *Ageratina* to affect native vegetation should also be studied so that the understanding could be useful for developing its control and management strategies. To understand how *Ageratina* affect native vegetation

seedlings of four native species (*Schima wallichii*, *Alnus nepalensis*, *Osbeckia stellata* and *Elsholtzia blanda*) were grown under treatment with *Ageratina* extracts, fresh leaves and litter. Soil microbial communities and the frequency of soil fungi were also analyzed. Results showed that especially fresh leaves and fresh leaf extracts of *Ageratina* are toxic for growth and development of native plants and soil fungi but the effect depends on where the extracts originated and types of native plants and fungal species. It is concluded that there is a direct negative effect of the extracts from aerial parts of *Ageratina* to native plants and on the other way it alters soil microbial communities and soil fungi to impact native plants indirectly. Based on the results physical removal of *Ageratina* before monsoon can be recommended because the rainwater during monsoon may wash allelochemicals present in the aerial parts of *Ageratina* and mix to the soil which would have negative impacts on growth and development of native species and soil microflora.

Keywords: Crofton weed, Exotic species, Invasion, Soil microbes

Spatial and temporal distribution of *Lantana camara* in Chitwan Annapurna Landscape Nepal using satellite imageries

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Abstract

One of the major concerns in Nepal is the spread of alien invasive plants and its threat to biodiversity. The detection of invasive alien plant species (IAPS) and its satellite population can aid in monitoring and managing their invasion in the ecosystem. Remote sensing has been an important tool for large scale ecological studies of invasive alien plant species. In this study, we employed a knowledge-based classification approach using Landsat images to predict the distribution of *Lantana camara* in Chitwan Annapurna Landscape. The supervised classification technique was used for the extraction of land-use/landcover types from remotely sense data. Eight major variables (Elevation, Aspect, slope, Landuse/Landcover, Digital number (DN), Temperature, Rainfall and NDVI) were used for the Knowledge-Based Classification approach. The percentage distribution of the weed in CHAL area was found to be 2.1, 1.93, 1.63 and 1.25% in the year 2018, 2010, 2000 and 1990 respectively. The coverage of the weed in the Landsat image was found comparatively higher than the Digital globe image. Confusion matrix and kappa index value of *Lantana camara* in a patch in Tanahau and Chitwan districts as a subset of CHAL were calculated for distribution accuracy. Digital globe image of a patch in Tanahau and Chitwan showed a little high overall accuracy of 85 and 83 percent as compared to 81 and 80 percent respectively in Landsat image of the same patch. This investigation

revealed the strength of mapping of shrub weed using Landsat images which is freely available in the archives.

Keywords: Invasive, Supervised classification, Landsat imageries, Digital Globe imageries, Digital Number, Confusion matrix

Distribution of invasive plant species along altitudinal gradient in eastern Nepal

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Abstract

With the main objective of finding the distribution of invasive species along the altitudinal gradient, research was done in Eastern Nepal; Jhapa, and Ilam Districts with Nepal's lower place Kachankawal Rural Municipality which ranges from 60 masl to 960 masl. Data were collected from 9 plots in the agricultural land, 9 plots from the roadside and 6 plots from fallow land of size 1m×1m (altogether 24 plots combining all land patterns). These invasive species possess certain traits that provide them a competitive advantage over the natives and thus aid their fast spread in the alien environment. Even some of the plants introduced for the beneficial purpose were found to acquire a weedy habit. It has greatly altered the structure of the natural ecosystems and caused a dramatic shift in the diversity and dynamics of native flora. Altogether 50 species of invasive alien plants were recorded from the overall study. The data thus obtained were analyzed by using a list of Invasive Species, Important Value Index, Shannon-wiener Index, Distribution pattern, and Species richness. From the analysis, it was revealed that most of the species were reported from the American sub-continent. The majority of the species were found to be introduced unintentionally and the distribution was maximum towards the temperate zone. Mainly from this study, it was found that the invasive species were distributed in the contagious pattern. Proper management strategies are required to understand the invasion and colonization of these alien species in this region.

Keywords: Important Value Index, Diversity, Species richness

Prevalence of *Puccinia abrupta* var. *partheniicola* and its impact on *Parthenium hysterophorus* in Kathmandu valley, Nepal

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Abstract

Parthenium hysterophorus is one of the noxious invasive weeds in tropical and subtropical regions of the world. It has invaded urban areas, agroecosystems, and natural habitats including protected areas in Nepal. Among eleven species of biological control agents used to control *P. hysterophorus* in its introduced range, winter rust *Puccinia abrupta* var. *partheniicola* arrived accidentally and has established in Kathmandu valley. However, the prevalence of this rust and its impacts on *P. hysterophorus* have not been studied. To address this knowledge gap, the roadside survey was done in June 2019 at an interval of 2 ± 0.25 km in Kathmandu valley to assess the rust incidence and severity on *P. hysterophorus*. The degree of infestation was categorized from 0 (no infestation) to 4 (severe infestation leading to death) based on the severity of infestation by *Puccinia* and its impact on the growth of *Parthenium* was studied. Among 81 locations examined where *P. hysterophorus* was present, *Puccinia* infestation was seen in 79 locations. About 50% of total *P. hysterophorus* individuals were found in category-1 with only a few leaves infested but no apparent impact on its growth. At some locations like Tinkune, Kirtipur, Chabahil, Buddha chowk, Dhobighat the impact was severely affecting the growth of *P. hysterophorus*. Aboveground biomass and seed output of *P. hysterophorus* was found significantly reduced by 53% and 27 % respectively due to *Puccinia* infestation. The study indicated that *Puccinia* incidence is widespread in Kathmandu valley with a varied degree of damage to *P. hysterophorus* at different locations. It can damage *P. hysterophorus* during winter and early summer when another biological control agent *Zygomma bicolorata* is inactive. Hence it has the ability to reduce the growth performance of *P. hysterophorus* and can be used as a component of integrated weed management in Nepal.

Keywords: *Parthenium* weed, Winter rust, Biocontrol, Disease incidence, Disease severity

Spatial distribution of an invasive weed *Chromoleana odorata* in Chitwan-Annapurna Landscape Area, Nepal using knowledge-based approaches

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Abstract

Among the number of approaches used for understanding the distribution pattern of species, multispectral satellite imagery can facilitate the identification and assessing invasive plant species. The objectives of this study are - to map the habitat distribution of the *C. odorata* in CHAL area and to identify the high potential spatial location for *Chromoleana odorata* ((L.) R. M. King & H. Robinson) through satellite. Multispectral and medium spatial resolution satellite of LANDSAT 8 TM imagery was used for classification of land use in ArcGIS 10.3 and the classification was incorporated with bioclimatic attributes: slope, aspect, elevation, temperature and rainfall range of the species to set rules for Knowledge Engineer and Knowledge-Based Classification of the species and DNs value to set rules for Knowledge Engineer and Knowledge-Based Classification in ERDAS Imagine 2014. High spatial and spectral resolution satellite data from World View 2 of Nawalparasi and Chitwan and Tanahun was used for mapping actual spatial distribution of the weed. The knowledge-based classification of LANDSAT 8 showed about 1.07% distribution of the weed in the CHAL area. The area of Digital Globe Images extracted on the basis of Knowledge-based classification image of LANDSAT 8 showed about 2.8%, 8.36% and 3.2% of the area for the distribution of the weed in Chitwan, Nawalparasi and Tanahun districts respectively whereas species-level distribution in World View 2 was 0.74% in Chitwan, 2.4% in Nawalparasi and 1.3% in Tanahun.

Keywords: Invasive plants, Supervised classification, Knowledge-Based Classification, Knowledge Engineer

Inventory of naturalized plant species along an elevation gradient in Chure region of Makwanpur district, Nepal

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Abstract

The diverse geography and climatic variation in Nepal bring high biological diversity and furthermore aid for the possibility of invasion by naturalized species. Naturalized

species are that biological entity that is found outside their own habitat causing excessive disturbance to the community. This study was conducted along the elevation gradient of the north-facing slope of Laljhadi Community forest by dividing Chure hill of Makwanpur into six gradient belts between elevations of 400 m asl to 900 m asl using systematic sampling. Sixty different individual species of plants including 25 naturalized plant species and 7 invasive alien plant species from 10 different families were recorded. The quasipoisson error of naturalized species shows significant relation of naturalized plant species along elevation. Regression was plotted to determine the distribution trend of naturalized plant species along elevation. The presence of naturalized plant species indicates the probability of invasion on the Chure area due to its dynamic landscape with the regular intervention of anthropogenic activities and natural disturbance and further light on the possibility of forest degradation due to suppression of seedling regenerative ability.

Keywords: Naturalized species, Chure, Elevation gradient

Spatial and temporal distribution of invasive weed *Mikania micrantha* in Chitwan Annapurna Landscape (CHAL) Nepal with application of satellite imageries

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Abstract

Mikania micrantha is a fast-growing neotropical, and the most problematic terrestrial invasive plant species rapidly invading tropical parts of Nepal. Remote Sensing offers a synoptic view for detecting and mapping invasive plant species and record changes in actual and potential distribution across the wide region's overtime period. A Knowledge-Based Classification approach was used for mapping *M. micrantha* distribution in Chitwan Annapurna Landscape using multispectral Landsat and WorldView-2 imageries. For knowledge-based classification, information on elevation, slope, aspect, maximum temperature, minimum temperature, rainfall, unsupervised classified image based on digital number (DN) value and supervised classified image of land use that is suitable for *M. micrantha* were used as variables for rules. Results show 0.77%, 0.23 %, 0.13% and 0.09% of the total area of CHAL was covered by *M. micrantha* in 2018, 2010, 2000 and 1990, respectively. WorldView-2 image of a patch in Chitwan district showed 3.5% area coverage whereas the same patch of Landsat imagery subset from CHAL showed 3.27% area coverage in 2018. In another patch in Nawalparasi district, 3.29% area was seen covered with *M. micrantha* under WorldView-2 and 2.93% in Landsat imagery subset in the same area. The overall accuracy of WorldView-2 and Landsat image of the patch in Chitwan district was 83.17% and 74.26%, respectively. Similarly, overall accuracy in

the patch of Nawalparasi district of WorldView-2 was 79.54% and Landsat image was 71.89%. WorldView-2 imageries of high spatial resolution are more effective than Landsat imageries in the delineation of *Mikania micrantha* however Landsat imageries can also be useful in detecting the herbaceous weed.

Keywords: Invasive plant species, Knowledge-Based Classification, Supervised classification, Accuracy assessment

Oral Session: Biotechnology and Biochemistry

An in-silico investigation for recent trends of genome editing in rice

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Abstract

Rice (*Oryza sativa*), a crop that provides main food for more than 50% of the world's population, has served as the best model plant for functional genomic studies. Genome editing is a way of rolling out specific changes to the DNA of a cell or organism. An enzyme cuts the DNA at a specific sequence, and when this is repaired by the cell a change or 'edit' is made to the sequence. Knowledge obtained from rice as a model system can also be extrapolated to other cereal crops in particular, to all other crop plants in general and feasibility for Nepalese research. Recent advances in genome-editing technology allow precise, targeted genomic changes, including whole-gene insertion or deletion, stacking or pyramiding of genes, and precise modification of genetic elements that allow scientists to introduce, change or optimize genetic traits of interest. Several classes of edit-enabling technologies have been developed in the past decades, including zinc finger nucleases, TAL effector nucleases (TALENs) and most recently clustered regularly interspaced short palindromic repeats (CRISPR)/CRISPR-associated proteins (CRISPR/Cas). Comprehensive In-silico analysis has been done to understand the technology for competitive advantage in the context of Nepalese research. In conclusion, these technologies have many prospects of collaborative research in Nepal.

Keywords: Rice, Genome editing, TAL effector nucleases (TALENs), Clustered regularly interspaced short palindromic repeats (CRISPR), Cas. Targeted genome editing

Interaction between morin and beta carotene with AOT micelles— Studies with UV–vis at 25°C

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Abstract

The precise measurements of morin and beta carotene absorbance in the presence of surfactant/solvent/water systems at 25°C by UV–vis technique is reported. The surfactant used in the present study was sodium bis(2-Ethylhexyl) sulfosuccinate called Aerosol-OT or AOT. The solvents selected were: ethanol, ethylene glycol, and n- decanol. The

concentrations of AOT were varied between 0.001 and 0.4 mol/kg. Morin and beta carotene concentration in cuvette during UV–vis registration was not equaling in all solvent because of its different solubility and absorption intensity depending on the solvent. Water concentration in the studied systems was defined by R parameter according to the relation: $R=[H_2O]/[AOT]$ and was equal 0, 30 and 40 in ethanol; 0, 10, 20 and 30 in ethylene glycol and 0, 10, 20, 30, and 40 in n-decanol. In the presented work, a Nernstian distribution of morin and beta carotene between the organic and micellar phases was assumed. The intensity of morin and beta carotene absorbance as a function of AOT concentration was analyzed. Using Non-linear Regression Procedure (NLREG) morin and beta carotene binding constant (K_2 [mol/kg]), and morin and beta carotene distribution constant (K) between organic phase and AOT micellar phase have been calculated. The experimental results have shown a significant influence of solvent, surfactant and water presence on morin and beta carotene UV–vis spectrum. Calculated data pointed out on different transfer of morin and beta carotene molecules from the organic to micellar phase depending on the solvent.

Keywords: Surfactant, Solvent, Micellar phase

Antioxidant activity of selected fresh green leafy vegetables cultivated in Dharan sub-metropolitan city

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Abstract

Fresh green leafy vegetables *Brassica juncea* (Broadleaf Mustard), *Chinopodium album* (Lamb's quarter), *Trigonella foenum graecum* (Fenugreek), *Anethum sowa* (Dill greens) and *Amaranthus tricolor* (Red Amaranth) were collected from Basantatar, Dharan, Sunsari district Nepal and were washed with distilled water, fresh leaves of plant were extracted in 99% methanol to carry out the antioxidant assays. The antioxidant assays were determined by three different parameters namely Total antioxidant capacity, Reducing power assay and DPPH scavenging activity. The total antioxidant capacity (TAC) of *B. juncea*, *C. album*, *T. foenum graecum*, *A. sowa* and *A. tricolor* were found to be 33.55 ± 0.65 , 38.78 ± 0.35 , 40.41 ± 0.32 , 50.87 ± 0.28 and 36.53 ± 0.73 mg AAE/100 g fresh weight respectively. Similarly, the reducing power assay of *B. juncea*, *C. album*, *T. foenum graecum*, *A. sowa* and *A. tricolor* were found to be 19.38 ± 0.05 , 18.28 ± 0.08 , 18.06 ± 0.12 , 41.02 ± 0.65 and 19.06 ± 0.13 mg AAE/100 g respectively. Finally, the DPPH scavenging activity of *B. juncea*, *C. album*, *T. foenum graecum*, *A. sowa* and *A. tricolor* were found to be $21.85 \pm 0.61\%$, $26.97 \pm 0.4\%$, $31.55 \pm 1.22\%$, $58.45 \pm 2.22\%$ and $41.38 \pm 1.12\%$ respectively. Overall the study showed that the methanolic extract of fresh *A. sowa* possessed higher antioxidant activity in all three antioxidant assays among the other vegetables selected.

Keywords: Antioxidant capacity, Reducing power assay, DPPH scavenging activity, Green leafy vegetables

Application of plant proteolytic enzymes in non-rennet cheese production

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Abstract

A number of proteolytic enzymes are widely employed in food industries for cheese manufacture. The coagulant which is widely used in cheese production or manufacturing of cheese is animal rennet, which contains chymosin, an aspartic protease that is responsible for milk clotting. Plant extracts have the ability to hydrolyze the κ -casein, leading to curd formation, and they are also the main enzymes responsible for α -casein hydrolysis. The use of these plant proteinases as milk coagulant is very interesting since they are natural enzymes and can also be used for producing cheeses aimed at Lacto-vegetarian consumers and ecological markets. In this context, the present investigation was carried out in order to extract a milk clotting enzyme from different plant sources which can be utilized in cheese production. Eleven plants namely, Papaya (*Carica papaya*), Kiwi (*Actinidia deliciosa*), Ginger (*Zingiber officinale*), Moringa (*Moringa oleifera*), Coriander (*Coriandrum sativum*), Jackfruit (*Artocarpus heterophyllus*), Bayar (*Ziziphus mauritiana*), Khasre (*Ficus palmata*), Aank (*Calotropis gigantea*), Sunflower (*Helianthus annuus*) and Pumpkin (*Cucurbita pepo*) were examined for determining their protease activity, protein content and milk clotting activity (MCA) from their respective latex and, plant juice and seed extract. The highest protease activity was found to be in Papaya latex i.e., 29.34 ± 0.87 Units/mg latex and the highest protein content was found to be in Kiwi i.e., 15.02 mg/ml extract. Also, the maximum milk clotting activity of *Aank* latex was determined to be at milk pH 6.5 and 65! temperature i.e., 109.09 Units.

Keywords: Proteases, Milk-clotting, Cheesemaking, Lacto-vegetarian, Latex, Plant juice, Seed extract

Screening of antioxidant activity, total phenolic content and GC-MS study of *Zingiber montanum* (J.Koenig) Link ex A. Dietr.

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Abstract

The therapeutic values of the rhizome of *Zingiber montanum* (J.König) Link ex A. Dietr. for the treatment of gastritis, stomachache, diarrhea, inflammation has been recognized from the ethnobotanical survey in the Magar community in Hupsekot and Bulingtar Rural Municipalities, Nawalpur, Nepal. The rhizome was also used in massage as analgesic in the study site. Antioxidant activity was evaluated by DPPH free radical scavenging and H₂O₂ scavenging methods. The 70% methanol extract showed DPPH free radical scavenging with IC₅₀ value of 1014.11 ± 2.05 µg/ml and H₂O₂ scavenging (44.21 ± 1.82%) at 0.1mg/ml concentration. Total phenolic content was estimated by Folin-Ciocalteu colorimetric method and found 28.84 ± 0.20 mg GAE/gm dry sample. The GC-MS analysis of 70 % methanol extract revealed total of 20 compounds belonging of Hydrocarbons (72.35%), Esters (9.73%), Phenols (4.55%), fatty acids (2.5%), aldehydes (1.92%), amines (3.63%), Ketone (0.96) and alcohol (0.44%). The therapeutic properties of the rhizome might be due to the presence of these phytoconstituents.

Keywords: Ethnobotany, Antioxidant, DPPH free radical scavenging, GC MS

Antioxidant and cytotoxic activities of plant tissue culture materials of *Dendrobium longicornu*

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Abstract

In Nepal, *Dendrobium* is the second largest genus of the family Orchidaceae. It is widely used in Chinese traditional medicine to treat fever and coughs as well as in tonic. *Dendrobium* species have several compounds, such as phenolic compounds, bibenzyl, phenanthrenes, phenanthraquinone, and lignin glycoside. *Dendrobium longicornu* was selected for plant tissue culture and biological activities. The healthy pod of this orchid was collected from Chitlang of Makawanpur district, central Nepal. The seed of sterilized healthy pod was inoculated on the fungal elicitor supplemented Murashige and Skoog (MS) medium. Among the tested medium, MS with or without supplemented with fungal elicitors TPVL1 (*Bacillus subtilis*, a bacterial elicitor), TPVL2 (*Alternaria* sp), TPVR1

(*Fusarium solani*) were response best growth of seeds into protocorms. The protocorms developed on the medium were subjected to Soxhlet's extraction process using methanol. The extract was subjected to antioxidants using DPPH free-radical assay and cytotoxic activities by MTT assay towards HeLa and U-251 cell lines. The percentage of DPPH free-radical scavenging activity shown by methanol extract of *D. longicornu* was 87.88%. The IC₅₀ (antioxidant capacity) of that extract was found to be 117.56 µg/ml which was found to be higher than IC₅₀ of ascorbic acid (84.47 µg/ml). The percentage of HeLa and U251 cells growth inhibition was found as 49.75 % and 38.83 % respectively. The IC₅₀ (cytotoxic capacity) of the extract was found as 350.06 µg/ml and 507.22 µg/ml to inhibit the HeLa and U251 cell growth respectively. The IC₅₀ value of extract was found as significantly different from that of cisplatin drug (25.00 µg/ml). The *in vitro* plant materials will be further utilized for the production of potential anticancer drugs.

Keywords: *Dendrobium longicornu*; DPPH; Extract; HeLa cells; MTT assay; Protocorms; U-251 cells

Effect of alcoholic fermentation on fos levels and radical scavenging activity of Yacon (*Smallanthus sonchifolius*) root slices

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Abstract

The main objective of the present study was to investigate the effect of alcoholic fermentation on the radical scavenging activities (RSA) and fructooligosaccharides (FOS) of yacon (*Smallanthus sonchifolius*) roots. The experiment was carried out using mature yacon roots locally grown in Pakhribas, Dhankuta (geographic coordinates: 27° 3' 5.93"N, 87° 17' 7.01"E). The said effects were investigated by fermenting thin slices (3 mm) of yacon in 10% glucose solution, using commercial wine yeast (*Saccharomyces cerevisiae* (ex) *bayanus*, Lalvin EC1118, Canada), at ~ 30°C and following the course of changes in FOS, RSA (% DPPH inhibition) and half-maximal inhibitory concentration (IC₅₀) for a period of up to 240 h. Yacon slices exhibited a camel-hump (rise-and-fall) pattern in RSA during alcoholic fermentation, while having no significant effect on FOS content. The maximum values of RSA (91.57% DPPH inhibition, IC₅₀ = 6.48 µg of dry sample) were obtained at 144-h fermentation. The finding implies that fermentation is beneficial but should be carried out only for a limited time period (144 h in the present case) to obtain the benefit of an improved level of RSA. Also, since wine yeasts cannot ferment FOS, it is possible to produce fermented yacon slices (and possibly yacon wine) that is rich in nutraceuticals (prebiotic in particular).

Keywords: Radical scavenging activity (RSA), Fructooligosaccharides (FOS), Half maximal inhibitory concentration (IC₅₀), Nutraceuticals

Formulation of amylolytic starter using yeasts and molds screened from traditional *murcha*

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Abstract

The main objective of the study was to formulate an amylolytic starter (*murcha*) in the laboratory using different ratios of yeasts and molds screened from traditional *murcha*. *Murcha* samples (collected from Saangu, Udayapur, Kerabari, Dhankuta, Laxmimarga, Belbari, Dandaghopa, Bishnupaduka, Panmara, Letang) were screened for amylolytic molds and fermentative yeasts, characterized and preserved for the formulation study. The mold was used in the form of wheat bran *koji* and yeast in the form of actively growing suspension. The experimental design was generated by Design Expert[®] to formulate *murcha* using *koji* (1, 2, and 3 g) and yeast (0.25, 0.50, and 0.75 ml) in 50 g of rice flour (moisture ~ 30% and particle size < 280 μ). Physicochemical analysis, performance test, sensory analysis and statistical analysis were carried out to select the best formula. The best *murcha* was once again used to prepare rice and millet *jand* and physicochemical properties were analyzed. Mold (identified as *Amylomyces rouxii*) and yeast (identified as *Saccharomyces cerevisiae*) from Udayapur *murcha* were found to be the most suitable. The *murcha* formulation with 2 g *koji* (equivalent to 2x10⁸ spores of mold and 0.5 ml yeast suspension (equivalent to 5x10⁵ live yeast cells) per 50 g of rice flour was found to be significantly superior to other *murcha* in terms of physicochemical and sensory quality. In conclusion, the ratio of mold to yeast in *murcha* formulation is critical in the preparation of *murcha* of very good quality. The method thus developed in this work is sustainable (does not depend on harvesting of exotic plants), reliable (in terms of culture purity), consistent (in terms of quality), and applicable even in the rural setting.

Keywords: Amylolytic starter, *Murcha*, *jand*, *Amylomyces rouxii*, *Saccharomyces cerevisiae*

Chromatographic separation of *Everniastrum nepalense* from eastern Nepal and their antimicrobial activity

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Abstract

Lichen is a symbiotic association between algae and fungi. The present study was carried out to separate the lichens constituents by TLC and to determine the antibacterial effect of

lichen powder against bacterial isolates. Edible lichen, *Everniastrum nepalense*, samples were collected from Dhankuta, Panchthar, Bhojpur and Taplejung district of Nepal. The antibacterial activities of lichens extract were tested by agar well diffusion technique. The BLE showed the maximum zone of inhibition (ZOI) against *S. enteria var Typhi*, *B. subtilis* and *Klebsiella spp* (14mm). DLE against *B. subtilis* (17mm). PLE and TLE showed the maximum ZOI against *P. aeruginosa* i.e; 18mm and 15 mm respectively. *E. coli* was not inhibited by different lichen extract. MIC values of lichen against *E. coli* (0mg/ml) indicate *E. coli* was resistant to the lichen extract. MIC value of lichen extracts was 6.25 mg/ml for all the bacteria. Eight antibiotics were used for AST. Vancomycin was sensitive on *S. aureus*, intermediate against *B. subtilis* and rest are resistant. Erythromycin had intermediate on *S. enteric var Typhi* and *Klebsiella spp* but rest are resistant. Trimethoprim was sensitive against *E. coli*, *S. aureus* and *S. enterica var Typhi* and rest were resistant. Streptomycin was sensitive against *S. aureus* and *S. enterica var Typhi*, intermediate against *P. aeruginosa* and *Klebsiella spp* and resistant against *B. subtilis* and *Shigella spp*. Cefotaxime was sensitive on *E. coli*, resistance on *P. aeruginosa* and *Klebsiella spp* and intermediate on remaining bacteria. *P. aeruginosa* and *Klebsiella spp* were resistant against Tetracycline, *S. enterica var Typhi* was intermediate and rest were sensitive. Ampicillin was resistant against *P. aeruginosa* and *Klebsiella spp* and rest are sensitive. Nalidixic acid was sensitive against *E. coli*, intermediate against *B. subtilis* and *Shigella spp* and resistance against *S. aureus*, *S. enterica var Typhi*, *P. aeruginosa* and *Klebsiella spp*. TLC revealed that $R_f \times 100$ values in BLE, DLE, PLE and TLE were 71.4, 78.1, 83.8 and 70.5 respectively. All the bacterial species except *E. coli* were inhibited by different lichen extracts, AST was satisfactory while lichen extracts were separated by TLC.

Keywords: AST, BLE, DLE, Lichen, PLE, MHA, TLC, TLE

Oral Session: Ecology and Environment

Soil microbial biomass and N-mineralization in Sal bearing forests of tropical region in eastern Nepal

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Abstract

Sal bearing forests located in different altitudes in the tropical region of Eastern Nepal were studied for soil microbial biomass, available nutrients, and N-mineralization. Forests are representing from Tarai, Bhabar and Siwalik hill region. Due to variation in altitudes, the functional aspects of soil showed the change in properties. Microbial biomass carbon, nitrogen and phosphorus content in soil were higher in high altitude Sal forests than Tarai Sal forest, thus exhibited an increasing trend with altitude. On the other hand, available nitrogen ($\text{NH}_4\text{-N}$, $\text{NO}_3\text{-N}$) was higher in Sal forest of Tarai region than Bhabar and Siwalik hills. It was correlated with a high rate of N-mineralization in low altitude forests. Due to high soil moisture and temperature in Tarai Sal forest, the microbial activities exhibited a faster rate as it is evident by the higher N- mineralization rate in the rainy season. A distinct seasonality was observed in soil microbial biomass, available nutrients and N- mineralization. Soil microbial biomass and available nutrients were minimum in the rainy season and maximum in the summer season. On the other hand, N-mineralization was maximum in the rainy season and minimum in the summer season. High N- mineralization rate during the rainy season provides higher amounts of available nitrogen which is associated with rapid plant growth. Fast turnover of soil nutrients provides a positive condition for healthy plant production in Tarai Sal forest

Keywords: Sal forest, Altitudinal variation, Available nutrients, Seasonality, Tropical region

Role of trees for reducing heavy metals in the ambient air of Kathmandu valley

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Abstract

Various trees around the ring road have been cleared recently for expansion of the road. Only biomass of the trees has been calculated especially for the valuation of timber/

wood but the valuation of other ecosystem services provided by these trees has been ignored. Though the trees provide many ecosystem services, only one service i.e., bioaccumulation of heavy metals in leaves of polluted as well as less polluted areas of Kathmandu valley have been investigated in this study. Some heavy metals like Pb, Cu, Zn, Ni and Cr were measured in leaves of different roadside trees like *Populus deltoids*, *Grevelia robusta*, *Ficus religiosa*, *Cinnamomum camphora*, *Celtis australis*, *Jacaranda mimosifolia*, *Ficus benghalensis*, *Salix sp.* and *Pinus roxburghii* in different locations of Kathmandu valley. The contribution of these trees for cleansing toxic heavy metals from ambient air through bioaccumulation will be discussed.

Keywords: Bioaccumulation, Zinc, Copper, Lead

Ecology of *Lemna aequinoctialis* Welwitsch (*L. perpasilla* Torrey)

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Abstract

Lemna aequinoctialis had slightly checked growth in winter than summer and rainy seasons. It tolerated 2-10 water pH but displayed optimum growth at pH7, and thalli number increased from 10 (initial number) to 1167 when incubated in habitat water for 30 days. Nitrogen concentration ranged between 1.14 (April) and 3.69% (June) phosphorus between 0.35 (June) and 0.8% January, and potassium between 1.45 (June and October) and 2.8% (January) in the thalli of the plant.

Keywords: Aquatic macrophytes, Biomass, Density, Diversity duckweed

Ecosystem services of plants and human wellbeing

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Abstract

The concept of biodiversity that denotes the variability of life forms on earth offers a functional measure of environmental quality and its sustainability. All living organisms are an integral part of the biosphere and provide invaluable services like nutrient cycling, water purification, replenishment of climate, control of diseases and pests, scenic beauties etc. In the contemporary time, environmental degradation has become a serious threat to the existence of mankind in particular and entire biodiversity in general. Therefore, the need for preserving the ecosystem and environment get the priority amongst all issues in our inhabitable earth. Plants are immensely important for human and animal life. Being

a producer in an ecosystem, the plant provides many ecological services to an ecosystem. The benefits of plants cannot be fully enumerated in words. Besides our general knowledge that plants convert quantum energy to chemical energy; produce oxygen and remove carbon dioxide from the air, plants have immense social, economic and environmental benefits. The plant maintains a microclimate of any possible habitats. Plant support all kinds of animals as well as a few specific plants. Plants prevent erosion of soil, act as wind and sound breaker, absorb pollutants, reduce the overall high temperature and also create attention-grabbing views. Plants produce various types of food and fodder along with economic benefits. Human well-being is a holistic approach apart from biophysical health at an individual level as well as a social level. Its meaning is defined in the World Health Organization's definition of health as "a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity". An individual human requires clean air, adequate safe water, adequate nutrition and shelter from their immediate biophysical environment. This surrounding environment is the result of continued visible and invisible services of global ecosystem. Nowadays, human well-being encountered manifold issues dealt with environment and health regarding high population densities, food hygiene, protection from infectious diseases, proper sanitation, instability for access to resources etc. It is very relevant in today's changing world to aware people about indigenous conservation of biodiversity specially plants and the role of plants as producer/oxygen provider of an ecosystem with their visible ecosystem services to animal lives. Discussion on intrinsically valuable plant group and its potential livelihood issues for sustainable ecosystem, social welfare and human wellbeing is must needed task for a responsible plant lover for maintenance of our green earth and wellbeing of our next generation people with prosperity and cultural identity.

Keywords: Biodiversity sustainability, Environmental degradation, Ecological services

Climate sensitivity pine forests (*Pinus roxburghii*, *Pinus wallichaina*) in the mid-hills of central Himalaya

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Abstract

Pine forests have been key components of vegetation belts across the lower elevations of the great Himalaya range of 3000 km. There has also been a massive plantation of Pine due to its high economic values although the long-term ecological consequences are less explored in terms of its impact on water use efficiency. We have extracted tree cores of two dominant Pine species (*Pinus roxburghii*, *Pinus wallichaina*) from mid-hills of central Nepal from planted (*Pinus roxburghii*), and natural (*Pinus wallichaina*) populations and analyzed the growth-climate relationships of these species and temporal patterns of BAI

(aboveground biomass production) in both forests. Our results indicated that *Pinus roxburghii* did not show any growth-limiting climatic factors from the lower elevation, however, *Pinus wallichiana* showed a positive correlation with total rainfall of January and March, and with a minimum temperature of previous year's September showing that the more moisture in very early growing season contributes positively to radial growth. BAI trend showed that both forests were relatively healthy. However, an unusual decline in BAI was found to be associated with resin extraction in *P. roxburghii*. *P. wallichiana* showed a normal BAI trend with a marked decline in recent decades (2000, 2012-2014), and the cause of decline is yet to be confirmed whether it is climatic or anthropogenic. We infer that Pine forests of mid-hills of central Nepal are sub-healthy and sensitive to anthropogenic activities associated with forest management, and the growth of forest trees may decline in cases of intensified spring season drought in the region.

Keywords: Growth-climate relationship, Pine, BAI, Tree ring width

Decomposition and nitrogen release in leaf litter of leguminous and non-leguminous plant species

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Abstract

The decomposition experiment was conducted, for 365 days. For the study of decomposition, twelve plant species were selected, out of which, two were leguminous. e.g., *Dalbergia* and *Cassia* and the other ten species were non-leguminous, e.g. *Anthocephalus*, *Terminalia*, *Tectona*, *Careya*, *Dillenia*, *Shorea*, *Syzygium*, *Largerstroemia*, *Eichhornia* and *Ipomea*. The study was designed to estimate the rate of decomposition, nitrogen release and variation in carbon concentration in the leaf litter of different species and comparative study of leguminous and non-leguminous plant species. Leguminous with their mutual combining species showed a faster rate of decomposition. The N₂ concentration of fresh leaf litter was higher in *Ipomea* (2.17%) and *Eichhornia* (2.45%). It was low in (*Tectona+Cassia*) and (*Terminalia+Cassia*), 1.37% and 1.58%. During decomposition the C:N ratio increased. It depends on the concentration of Nitrogen. It decreases faster than the concentration of carbon and thus C:N ratio is increased. On the basis of weight loss and nitrogen release, the combining species like *Dalbergia+Anthocephalus* and *Dalbergia+Tectona* were considered as fast decomposing species. Leaves of these plants may be used to synchronize the demand and supply of nitrogen in the cropping system. Plant species like *Eichhornia* and *Ipomea* would be the suitable material for making good quality compost and organic manure. On the other hand combinations of leguminous and non-leguminous plant species showed a slow rate of weight loss and nitrogen release. This may be due to high carbon and low nitrogen content in non-leguminous plant species. These combinations of plant species can be

used to get a slow release of nitrogen for a long time in the sustainable agroecosystem.

Keywords: Decomposition, Leaf litter, Leguminous, Composite

Assessment of air pollution impact on micromorphological and biochemical properties of *Callistemon citrinus* (Curtis) Skeels and *Lagerstroemia indica* L.

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Abstract

In the present study, an attempt has been made to assess the air pollution effect on micromorphological and biochemical parameters of *Callistemon citrinus* and *Lagerstroemia Indica*. There was a decrease in the number of stomata of both species at the highly polluted site compared to the less polluted site (control). The number of clogged stomata was less in control area samples when compared to the polluted sample. The number of epidermal cells was significantly higher at the heavily polluted site. The stomatal index of both species was found to be reduced in the polluted site when compared to control. Leaf surface area in both the plant species decreased from control to polluted area. Chlorophyll a, b and total chlorophyll content and leaf extract pH in both the plants were found to be significantly higher in control sites than in heavily polluted sites. Ascorbic acid, relative water content, and Air Pollution Tolerance index was found to be significantly higher at more polluted plants than at control. Based on the present study results, *Callistemon citrinus* emerged as the most tolerant species with the highest APTI. Hence, *Callistemon citrinus* can be suggested for plantations along the roadside of urban areas for green belt development.

Keywords: Air pollution, APTI, Chlorophyll, Ascorbic acid, Micromorphology

Ecological studies of aquatic macrophytes (with special emphasis on *Nymphoides indica*) of Kashyap lake, Kaski, Nepal

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Abstract

Aquatic macrophytes with special emphasis on *Nymphoides indica*, soil parameters and water parameters of Kashyap lake, Kaskikot, Pokhara was studied in April to January 2019. A total of 15 plant species belonging to 12 genera and 10 families were recorded. All the plants were identified from Tribhuvan University Regional Herbarium, Post

Graduate Campus, Biratnagar. Nitrogen, Phosphorous and Potassium in stem (0.64%, 0.40%, 5.7%) and leaf (1.96%, 1.37%, 11.6%) of *Nymphoides indica* was found highest in rainy season. Similarly, flower (2.10%, 0.06%, 0.08%) and seed (2.53%, 0.07%, 0.08%) were recorded in summer and winter season respectively. The soil showed sandy clay texture whereas water holding capacity (72.88%) and soil moisture (53.92%) were found highest in the winter season. Soil nitrogen (0.18%) was highest in winter but phosphorous (0.003) and potassium (0.015%) were highest in the summer season. The pH of water remained almost acidic throughout the study period. Nitrite nitrogen and Nitrate nitrogen were found the same in three seasons. Conductivity (58.67%) and Total dissolved solid (31.4%) was maximum in the summer season but Turbidity (82.0%) was maximum in winter.

Keywords: Nutrient, Texture, pH

Trees outside forests in Kathmandu valley, Nepal

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Abstract

Trees Outside Forests provide various services including timber and food for local people and are less explored resources of Nepal. Aiming to assess the biomass in trees outside the forest area, this study was conducted in Kathmandu valley of Nepal. Grids of 0.5 x 0.5 Kilometer (n = 2800) were prepared to represent the study area. Circular sample plots with 20 m radius were systematically allocated in each grid and 1046 plots were identified as Tree Outside Forest by google earth image interpretation. Inventory was conducted in 20% (n = 209) of the randomly selected plots with Kathmandu = 83, Lalitpur = 77 and Bhaktapur = 49. This study recorded 150 tree species of 58 families with a density of 255 trees ha and total carbon stock as 30.8 t ha⁻¹. The highest carbon stock was recorded in the tree species of *Cinnamomum camphora* (3.9 t ha⁻¹) followed by *Grevillea robusta* (3.3 t ha⁻¹). The average tree height in the study area was 6.62 ± 3.27 m with 21.68 ± 19.62 cm average diameter at breast height. Total carbon stock was higher in Lalitpur district (37.1 t ha⁻¹, *Cinnamomum camphora* = 5.29 with species richness = 103) followed by Kathmandu district (35.7 t ha⁻¹, *Grevillea robusta* = 4.54 t ha⁻¹ with species richness = 114) than in Bhaktapur district (23.7 t ha⁻¹, *Grevillea robusta* = 3.87 t ha⁻¹ with species richness = 71). The study provided baseline data useful for urban planning and development.

Keywords: Carbon stock, Biomass, Species richness

Variation of vascular plant diversity in two aspects of Narapani-Masina landscape, Arghakhanchi, Nepal

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Abstract

The altitudinal, topographical and pedological variations of vascular plant diversity were studied in Narapani-Masina landscape, Arghakhanchi, Nepal. The study area ranged from 200-2200 masl between 27°45' - 27°57' N and 82°45' - 83° 18' E. The main objective of this study was to know the variation in vascular plant species richness patterns in north and south aspects. Field data were collected by placing four random plots of 10 x 10 m² each at every 100 m elevation at both aspects of the landscape during Sep-Oct, 2018. The number of quadrats varied according to the type of vegetation at each altitudinal band. The occurrence of each species in each quadrat was recorded. A mixture of soil sample was collected from four corners of each quadrat each from below 15 cm from top. Soil variables such as pH, N, P and K were estimated in the laboratory. The regression analysis between species richness and altitude as well as soil variables and RRI were done through a generalized linear model (GLM). Canonical correspondence analysis (CCA) was used to analyze species environmental composition. The RRI ($R^2=0.35$ & $p=0.035$), soil N ($R^2=0.81$ & $p<0.05$), P ($R^2=0.45$ & $p=0.0054$) and K ($R^2=0.52$ & $p=0.0013$) showed the significant positive relation with altitude. In other aspect, the species showed the significant negative relation ($R^2=-0.39$ & $p=0.0173$) against altitude. The species richness pattern found a significant decreasing trend ($R^2=0.53$ & $p<0.05$) against altitude in the north aspect but showed an insignificant pattern in the south aspect. The result showed that aspect played a major role in species richness patterns.

Keywords: Species richness pattern, RRI, Soil variables, GLM

Study of leaf morphology and anatomy of *Cinnamomum camphora* L. plants growing in different regions of Kathmandu, Nepal

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Abstract

Various studies indicate that *Cinnamomum camphora* L. possess intermediately air pollution tolerant index (APTI) value. These plants were planted on roadside areas previously as well as in newly constructed and expanded roadside areas. So, the current study was done to examine morphological and anatomical parameters of leaf in

Cinnamomum camphora L. growing in two different areas of Kathmandu, Nepal. The two different regions were ring road area and Raniban forest area of Kathmandu. The ring road area was found disturbed with high vehicular emission and dust particles and Raniban forest area is the part of the preserved Shivapuri Nagarjun National park area. Morphological characters like specific leaf dry mass content, specific leaf area, leaf length, leaf breadth and petiole length were examined. Similarly, anatomical characters like the stomatal frequency, the thickness of the lower cuticle, the thickness of the palisade tissue and thickness of the spongy parenchyma were examined. The specific leaf area, the specific leaf dry mass content and the length of leaf lamina were found more in the leaves of plant growing in ring road area of Kathmandu whereas, the leaf breadth and the petiole length were observed more in the leaves of plant growing in Raniban forest area. The stomatal frequency was found less in the leaves collected from ring road area than the leaves from Raniban forest area. The thickness of palisade tissue and the spongy parenchyma were found more in the leaves collected from Raniban forest area than the leaves from ring roadside area. The thickness of the cuticle was measured equal in both study areas.

Keywords: National park, Ring road area, Leaf lamina, Leaf dry mass, Stomata frequency, Cuticle

Use of Greater duckweeds as fish feed and manure

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Abstract

Greater duckweed (*Spirodela polyrhiza* (L.) Schleiden – Lemnaceae) is a small, fast-growing, simple, free-floating plant of nutrient-loaded ponds and ditches. The biomass of freely available plants has great potential for soil quality improvement and animal feed. Aquarium culture of Nile tilapia fish as feed and earthen pots culture as manure on chilli and brinjal was tested in Biratnagar from February 2017 - August 2018. The number of leaves, number of branches, fruit yield and dry weight per plant were significant ($p < 0.01$) under 7-D and 14-D in the test crops. Phosphorus content in the soil was increased at the time of harvest. Commercial feed had the highest increment in the fish weight but it had the probability to partially substitute the costly commercial feed.

Keywords: Fruit yield, Phosphorus content, *Spirodela* biomass, Tilapia culture, Vegetable crops

Physicochemical properties of forest topsoil in relation to depth and management practice

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Abstract

Understandings of soil properties are important for the sustainable management of forests. The present study investigated the vertical pattern of the top (0-30 cm) soil physicochemical properties in relation to management practice in three forests under two management practices, viz. protected (Terai *Shorea* Forest and evergreen Riverine Forest in the south-western sector of Bardia National Park) and community-managed (Puraina Community Forest, Kailali). The soil texture was loamy sand to sand. Bulk density ranged from 1.33-1.63 gm cm⁻³ and slightly increased with increased depth. Soil pH values ranged from 5.77-7.36. Soil organic carbon, total nitrogen, available phosphorus, and available potassium were in the range 0.54-1.64%, 0.04-0.14%, 4.84-31.72 kg ha⁻¹, and 204.35-557.44 kg ha⁻¹, respectively, and all these values decreased with increased soil depth in both the protected forests; however, this decreasing trend of soil nutrients with increased depth was not observed in Puraina Community Forest. Soil nutrients at all depths were highest in protected Terai *Shorea* Forest. The values of soil nutrients were lower at 0-10 cm in Puraina Community Forest.

Keywords: Soil; Physicochemical properties; Management practice; Vertical distribution; Soil nutrients

Use of the Greater duckweed as feed for the Tilapia fish

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Abstract

The fresh weight gain of the Nile tilapia individuals reared on different feeds for 21 days occurred in the order: conventional feed (65 %) > conventional feed and duckweed powder in equal proportion (37 %) > duckweed powder (09 %). The conventional feed and duckweed powder were insignificantly different from each other in protein and phosphorus, but significantly different ($P < 0.05$) in fat, total ash, and calcium contents. The tilapia individuals reared on the mixture of the conventional feed and duckweed powder had significantly ($P < 0.05$) highest concentration of proteins (50.3 %) than those reared on either conventional feed (45.34 %) or duckweed powder (45.79 %) alone.

Keywords: Greater duckweed (*Spirodela polyrhiza*), Nile tilapia (*Oreochromis niloticus*), Nutrients

Evaluation of different non-host plants as trap crops to reduce *Orobanche* seed bank in infested tomato fields of Lalbandhi, Sarlahi

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Abstract

Orobanche species, commonly known as broomrape, are root holo-parasite of the family Orobanchaceae. In Nepal, two species *Orobanche aegyptiaca* and *O. cernua* are causing a threat to a wide range of important vegetables and field crops of family Brassicaceae and Solanaceae. To evaluate non-host plant as potential trap crops 22 different plant species were tested in the polybag and *Orobanche* infested fields of Lalbandhi, Sarlahi, where tomato is grown as a major cash crop. *Orobanche* seed density in soil samples collected from poly bags and plots before planting and after harvest of each crop species were recorded and compared. On the basis of *Orobanche* seed reduction, the investigated crop species like *Capsicum annum*, *Cicer arietinum*, *Fagopyrum esculentum*, *Lens culinaris* and *Vicia faba* were classified as high potential trap crops. Crops like *Coriandrum sativum*, *Cuminum cyminum*, *Daucus carrota*, *Phaseolus vulgaris*, and *Trigonella foenum-graecum* were classified as moderately potential trap crops.

Keywords: Parasitic weed, Seed density, Broomrape

Status of arsenic and fluoride pollutants in groundwater of Biratnagar of Morang District, Nepal

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Abstract

Evaluation of arsenic and fluoride pollution status of groundwater in Biratnagar, Nepal has been carried out to assess the water quality. The value of arsenic (As) ranged from nil (ward no 3) to 0.17 ± 0.21 mg/L (ward no. 1), from 0.01 ± 0.00 mg/L (ward no. 13) to 0.23 ± 0.25 mg/L (ward no. 1), from nil (ward no. 3) to 0.17 ± 0.21 mg /L (ward no. 1), from 0.01 ± 0.01 mg /L (ward no. 13) to 0.37 ± 0.00 mg/L (ward no. 6) during the period of post-monsoon 2015, pre-monsoon 2016, post-monsoon 2016 and pre-monsoon 2017 respectively. Out of 110 analyzed samples, the arsenic concentrations in 42 water samples (38.18%) during post-monsoon 2015, in 58 water samples (52.72%) during pre-monsoon 2016 (N = 110), in 37 water samples (33.64 %) during post-monsoon 2016 and in 59 water samples (53.64%) during pre-monsoon 2017 period exceeded the WHO permissible limit of 0.01 mg/L. As per BIS and NDWQS-Nepal guideline values for As in drinking

water, only 10 water samples (9.09%) during post-monsoon 2015, 22 water samples (20%) during pre-monsoon 2016, 7 water samples (6.36 %) during post-monsoon 2016 and 24 water samples (21.89%) during pre-monsoon 2017 (N = 110) exceeded the prescribed limit. The concentrations of arsenic were relatively higher during the pre-monsoon period than the post-post-monsoon period throughout the study. The status of fluoride was below the detectable level in all the analyzed groundwater samples.

Keywords: Arsenic, Fluoride, Groundwater, Tube wells, Biratnagar, Nepal

Impact of climate change on agrobiodiversity and livelihood in rural communities in Lamjung District

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Abstract

Nepal is 4th vulnerable country towards climate change. In this regard, the study was conducted on Bajhakhet and Simpani VDC of Lamjung district during the period of July to September 2016 to assess the impact of climate change on agriculture; people's health; economy and on biodiversity. Interview survey, key informant interview, focus group discussion were conducted in collecting primary information. 120 HH were sampled out of a total of 1538 households (i.e. 60 from each VDC) with random sampling for interviews survey. The data were analyzed using SPSS computer software. The study area (Simpani and Bajhakhet VDCs) lies in western Nepal. The Simpani VDC with 820 households was dominated by Bahun/Chettri (75%), Gurung (6.7%), Dalit (15%) and several others (3.3%) and the Bajhakhet VDC with 718 HH was dominated by Gurung (81.7%), Bahun/Chettri (5%), Dalit (6.7%) and several others (6.6%). Temperature and precipitation data analyzed between 1987 and 2015 showed some changes. The maximum mean temperature was increasing at 0.057°C/year and the minimum mean temperature was increasing at 0.0075°C/decade. Total rainfall was decreasing by 25.22 mm/yr. 50% of respondents believed that the rainfall amount was decreasing in the recent past with direct impacts on agricultural production and water resources. Also, the community members had experienced different new diseases resulting from climate change. On the other hand, the changing climate of the area is showing the effect on the flowering time of different species including wheat, rice, maize etc. and so was the germination, harvesting and maturing times of different crops had changed.

Keywords: Climate Change, Agriculture, Biodiversity, Temperature, Rainfall

Climate change and its impacts on grain protein, potassium, calcium and iron content of *Fagopyrum* spp along elevation gradient in central Nepal

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Abstract

Fagopyrum is unique pseudo-cereals with higher nutritional content and has famous properties as a subsistence food crop in Nepal. This study was carried out to investigate the impact of climate change on grain protein, calcium, potassium and iron contents of sweet buckwheat local landraces along different elevations of Chitwan Annapurna Landscape (CHAL), Nepal. Grain samples were collected from five different local landraces of sweet buckwheat cultivated in RCBD experiment along four different elevations (500m, 1000m, 2000m and 4000m) under the farmer management system without manipulation except frequent monitoring. Is the nutrient quality of sweet buckwheat local landraces changes with increasing temperature due to climate change? was the main research question of this study. Both annual and buckwheat growing season temperature and rainfall trends were analyzed for 36 years (1980-2016) from all stations lie in CHAL through Mann-Kendall and Sen's slope method along different elevations. Both annual and growing season temperatures showed increasing trend which is more in higher elevations ie at tropical climatic region (TCR), Upper tropical to the subtropical climatic region (UTSCR) than the lower tropical climatic region (LTCR). The growing season maximum temperature was increased at the rate of 0.047°C, 0.046°C and 0.04°C annually in LTCR, UTSCR and TCR, respectively. But the rainfall showed decreasing trends in all elevations. Significant variations were observed in grain protein, potassium, calcium and iron contents of all landraces in different elevations. The grain nitrogen, potassium and iron content were found decreasing along increasing elevation but grain calcium content did not show a particular trend. This result clearly indicates the rising temperature due to climate change plays a crucial role to reduce the quality of the grain of sweet buckwheat landraces.

Keywords: Elevation, Grain nitrogen, Nutrient quality, Sweet buckwheat, Temperature

Effect of nematicides on the growth of Cyanobacteria in paddy field of Parsa District (Nepal)

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Abstract

Cyanobacteria present in the rice field act as biofertilizers, thereby enriching the fields with additional nutrients. In view of the established beneficial role of cyanobacteria in paddy cultivation, the persistent effects of commonly used nematicides- Phosphamidon on the wild strains of two cyanobacteria nitrogen-fixing *Anabaena oryzae* as well as non-nitrogen fixing *Synchocystis equatilis* as most common to rice field of Parsa district Nepal, was studied. The effect has been studied following the treatment employed for thirty minutes and one hour; with four concentration- 100, 250, 500, 1000 ppm of (1) survival and lethality, (2) growth performance, (3) heterocyst frequency, (4) Increase of *Anabaena oryzae*). Nematicides have not been proved completely lethal in any of the four-concentration treated either for thirty minutes or for one hour. However, the sign of partial lethality has been noted in the form of reduces survival of inhibited growth. The rice plant standing in a depth of water develops roots that are vigorous and physiologically active. That phosphamidon is a dysenteric, water-soluble organophosphorus insecticide nematicide also used by farmers to eradicate parasite nematodes, as the rice field is waterlogging.

Keywords: Nematicides, Cyanobacteria, Rice-field, *Anabaena oryzae*, *Synchocystis equatilis*

Effects of altitude on fine root decomposition and nutrients release in Sal (*Shorea robusta* Gaertn.) bearing forests of Jhapa and Ilam Districts in eastern Nepal

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Abstract

The present study was conducted to understand the effect of altitude on the decomposition and nutrient release in fine root in Sal forest of Jhapa and Ilam districts of eastern Nepal. Sal forest of Jhapa district is addressed as Tarai Sal forest (TSF) and of Ilam district as

Hill Sal forest (HSF). Altitude ranges from 62 to 129 m amsl in the forest floor of TSF, and 500 to 850 m amsl within HSF. The climate of the study area is tropical monsoon type. The nylon net bag technique was used to determine the decomposition rates of root litter in TSF and HSF. During decomposition weight loss of fine root was faster in TSF than HSF. Initially, the decomposition was fast up to 120 days, followed by a slow decomposition rate from the middle to the last phase of the experiment. At 365 days of decomposition, mass loss in <2mm size fine root was 71% and 62% and in 2-5mm size, it was 57% and 45% in TSF and HSF, respectively. Nutrient release in fine root decomposition was faster in TSF than HSF. At the end of the experiment, the release of N, P, K in <2mm size was faster than 2-5mm size in both forests. In conclusion, TSF located at lower altitudes showed a higher rate of root decomposition due to higher soil temperature and soil moisture as compared to HSF because altitudinal variations differ in the microclimate of the forest. The release of nutrients from fine roots was higher in TSF which was influenced by rapid mass loss. These phenomena may help to regulate the higher production and faster nutrients cycling which are essential for better forest management.

Keywords: Tarai Sal forest, Hill Sal forest, Microclimatic condition, Mass loss, Forest management

Assessment of heavy metal concentrations in water of Koshi at Kursela, Katihar, Bihar

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Abstract

Assessment of heavy metal concentration in water resources from any region is an important aspect for the development activities of the region because the rivers, lakes and manmade reservoirs are used for water supply to domestic, industrial, agriculture and fish culture use. The Koshi river at Kursela, Katariya, Koshikipur, Bintoli Tinghatiya and Simara of Katihar, Bihar was selected randomly by considering the population, location and source of pollutions. Periodic samplings were carried out in two consecutive years 2016-2017 and 2017-2018. River water samples were collected at depths varying from 15 to 30 cm and the water was then transferred into pre-cleaned polypropylene bottles. These samples were used to determine heavy metal concentrations by Atomic Absorption Spectrophotometer (Perkin-Elmer model 800, USA), the standard methods recommended by APHA. Metals in the water exhibited a significant seasonal and regional variation. The minimum concentration of Co, Cu, Cr, Ni, Cd, Zn and Pb was found 0.0, 0.016, 0.001, 0.003, 0.009, 0.017, 0.007 mg/l and maximum concentration was found 0.036, 0.037, 0.008, 0.018, 0.038, 0.012, 0.027 mg/l respectively in the various sites. Most of the above values were found either below or closed the permissible limit set by

the World Health Organization (WHO) and the United States Public Health Services (USPHS).

Keywords: Kursela, Koshi river water, Heavy metals, AAS

Effect of duckweed manuring on growth and yield of chilli and brinjal crops

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Abstract

The height, branch number, leaf number, leaf area, and leaf weight (dry) were highest in both chilli and brinjal plants treated with duckweed manure at 7- day intervals. The best frequency of manuring for fruit production was 7- day intervals for chilli and 14- day intervals in brinjal plants. The soil under manure treatment accumulated a high concentration of phosphorus.

Keywords: *Capsicum annum* L., *Solanum melongena* L., Duckweed manure

Soil properties and retreating status of Bhimthang Glacier, Manang, central Nepal

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Abstract

Glacier forelands are considered a unique type of field laboratories and are sensitive and 'high-confident' indicators of climate change. This present work is attempted to study the variation in the content of soil properties along a spatiotemporal gradient along Bhimthang glacier foreland, Manang, Central Nepal. Five transects, representing a particular geological time period and stage of soil development were laid on the southwest aspect of the foreland. The perpendicular distance between the two transects was 50 m each. Along each transect, 12 quadrats of 2 m × 2 m each were laid down at an interval of 30 m. A total of 14 variables were analyzed in this research. Soil depth showed a strong positive correlation with T1 and a negative correlation with soil pH. Soil depth didn't show any significant relationship with soil nutrients (N, P, K and SOC). Soil pH didn't show an increase in content with increasing distance away from the glacier. Soil bulk density showed a moderately positive correlation with altitude and T1 whereas showed a strong negative correlation with N, P, RRI, SOC and T5. Out of tested soil nutrients, N, P, K and SOC showed a significant correlation with T5 and showed an

increase in content with increasing distance away from glacier terminus. Rock cover didn't explain a significant correlation with other variables except with RRI and vegetation cover with which it showed positive and strong correlation. Vegetation cover was positively significant to increase the distance from glacier terminus and had a negative correlation with open space. Landsat imagery and sentinel data showed that the glacier region in Bhimthang is continuously retreating from 1988 till now (2018). Glacier foreland represents a unique platform for research on study chronosequential changes in ecosystems and soil development patterns during primary succession.

Keywords: Climate change, Chronosequence, Physico-chemical, Glacier retreat

Effect of different environmental conditions on seed germination and seedling growth of two crops and some weed seeds

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Abstract

Seed germination of some crops (*Brassica campestris* and *Triticum aestivum*) and weed seeds (*Ageratum conyzoides*, *Bidens pilosa*, *Cyperus rotundus*, and *Galinsoga parviflora*) was studied under different environmental conditions (moisture, temperature, light and pH). Seed germination experiment was conducted on environmental conditions like moisture (concentrations 3, 6, 9, 12, 15ml), temperature (5, 10, 15, 20 and 25°C), pH (value 4, 5, 6, 7, 8 and 9) and light (normal, red, yellow, blue, green and dark color). For the crops too much lower or higher moisture was not favorable for germination and growth. Experiments under different moisture conditions showed that *Cyperus rotundus* and *Galinsoga parviflora* do not require more moisture to germinate and grow. Seed germination of both crops enhanced insignificantly at 15 to 20°C treatments. Seed germination of all weed seeds was insignificantly high at 10 to 15°C. The percentage of seed germination of both crops *B. campestris* and *T. aestivum* increased significantly in normal and green light. Seed germination of *A. conyzoides*, *C. rotundus* and *G. parviflora* were insignificantly different in normal white, red, yellow and green light. Germination of all weed seeds was completely inhibited by blue and dark light. The shoot and root length of weed *A. conyzoides* was found to be significantly high ($P=0.05$) in yellow light treatment, but in *B. pilosa*, it was high in red and green light. Similarly, in *C. rotundus*, shoot and root length were high in normal light but in *G. parviflora* it was high in green light treatment. Seed germination and seedling growth were higher in pH 5-7 in most cases.

Keywords: Temperature, Moisture, Light, pH

Improvement of water quality of aquatic eco-system through macrophytes

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Abstract

Macrophytes play a potential role in balancing the Lake Ecosystem. They have the capability to improve the water quality by absorbing nutrients with their effective root system. At the same time, death and decay of the macrophytes increase nutrients concentration; this leads to eutrophication. A rational set up between these two simultaneous activities is required to maintain the water quality of an aquatic ecosystem. The objective of the study is to evaluate the usefulness of different macrophytes species (Bio-filter) in reducing the nutrient content of the water i.e., to reduce the pollution level of water. The paper is to observe the outcome of ex-situ experiments conducted on the samples collected from Chupisar Lake of Purbasthali, Burdwan. Two macrophytic species *Eichhornia crassipes* and *Hydrilla verticillata* were selected for ex-situ study. Both the plant species indicated that macrophytes are capable of improving water quality by reducing nutrient concentration.

Keywords: Macrophytes, Water quality, Nutrient concentration, Pollution level

Diversity and distribution pattern of lichens in Kathmandu Valley

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Abstract

This study documents the Lichen species and its diversity in Kathmandu Valley. Three different areas including clean areas, residential areas, and high traffic areas were selected for the study. The lichen specimens were enumerated from 20 study sites and identified them on the basis of their morphology, anatomy, colour spot test and thin-layer chromatography (TLC). A total of 99 species of lichens belonging to 38 genera and 20 families were identified. Among them, 52 species of lichens belonging to 15 families and 24 genera are new records from Nepal. Among the lichens reported, Physciaceae, Parmeliaceae and Graphidaceae are the largest families. To understand the impact of different study areas on lichen diversity, coverage of lichen species was analyzed by the random quadrat method. Ordination, species richness and Shannon Wiener Index were analyzed by using 'R'. The result showed that the species richness and Shannon Wiener

Index of lichen species are correlated. They have a linear relationship with highly significant value.

Keywords: Quadrate, Morphology, Anatomy, Coverage

Change in forest volume and biomass: a revisit study at Annapurna Conservation Area, Nepal

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Abstract

A study was carried in Mardi watershed inside Annapurna Conservation Area, Nepal to estimate changes in stem volume and biomass over 13 years (1999-2012) in three forest types, namely mixed hardwood forest (MHF), oak forest (OF), and high mountain mixed forest (HMMF). Diameter at breast height and tree height were measured. A significant variation in stem volume and biomass were found between and among forest types. OF had highest stem volume and biomass ($755.9 \pm 53.2 \text{ m}^3\text{ha}^{-1}$, $1166.2 \pm 113 \text{ tons ha}^{-1}$) followed by HMMF ($557.5 \pm 31.1 \text{ m}^3\text{ha}^{-1}$, $766.4 \pm 53.8 \text{ tons ha}^{-1}$), and MHF ($282.5 \pm 32.2 \text{ m}^3\text{ha}^{-1}$, $302.5 \pm 32.1 \text{ tons ha}^{-1}$). The estimated stem volume and total biomass were in general higher than other parts of Nepal. Comparison of volume and biomass estimates between 1999 and 2012 according to forest types, however, was not significant. The present study exhibited marginal growth in stem volume, in MHF ($+ \text{m}^3\text{ha}^{-1}$), OF (from 711 to $755.9 \text{ m}^3 \text{ha}^{-1}$), and HMMF (from 512.7 to $557.5 \text{ m}^3 \text{ha}^{-1}$) since 1999. Similarly, total biomass was also increased during this period in MHF (from 270.8 to $302.5 \text{ tons ha}^{-1}$), OF (from 1026.7 to $1166.2 \text{ tons ha}^{-1}$), and HMMF (from 675.1 to $766.4 \text{ tons ha}^{-1}$). A significant change in volume and biomass in forests at the higher altitude and low accessibility was observed for 13 years.

Keywords: Stem volume, Biomass, Conservation area, Biomass change

Morphological variations in Niger (*Guizotia abyssinica* Cass.)

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Abstract

A phenomenon of polycotyledony was observed in niger seed germination in the natural population. In the present study, an attempt has been made to find out the variation of seed attributes, morphology, phenology, and oil content of dicot, tricot and tetracot plants.

The cotyledonary variants at isolated conditions were grown in earthen pots at the premises of science building, Post Graduate Campus, Biratnagar, Province 1, Nepal from July 2017 to February 2018. Higher net assimilation rate, seed output and oil content in the tricot niger plants seem useful for cultivation. Further research work on the tricot plant for isolation and characterization of the pure line is inevitable.

Keywords: Net assimilation rate, Oil content, Phenology, Seed output, Tricotyledon

Phenology and seed germination of macrophytes at lowland, Province 1, Nepal

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Abstract

Phenology, seed morphology, seed viability and germination behavior of wetland plants in control at moist filter paper in Petri dishes was carried out in wetland plants- *Aeschynemone aspera* L. (Fabaceae.); *Eragrostis uniolooides* (Retz.) Nees exsteudel (Poaceae); *Hygrophila auriculata* (K. Schum) Heine (Acanthaceae); *Polygonum barbatum* (L.) Hara (polygonaceae); *Rumex dentatus* L. (polygonaceae); *Mikania micrantha* H.B.K. (Compositae); *Eclipta prostrata* (L.) L (Compositae); *Sphaeranthus indicus* (Compositae) and *Spilanthes iabadicensis* A.H. Moore (Compositae) were studied at Biratnagar. The number of seeds per gram ranged between 161-29829. Viable seeds of *A. aspera* (98%) and *P. barbatum* (55%) had no germination but *E. uniolooides* had cent percent germination; *E. prostrate*; *H. auriculata* and *R. dentatus* showed 96% germination. *M. micrantha*; *S. micrantha*; and *S. indicus* showed 93%; 83% and 73% germination respectively. *A. aspera* and *E. uniolooides* germinated in early rainy; spent vegetative phase up to August-September; and completed flowering, fruiting and seed maturation before winter.

Keywords: Phenology, Seed germination, Viability, Wetland

Diversity and regeneration of forest along altitudinal gradient in Yangshila Morang, eastern Nepal

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Abstract

Forests are an important part of the biosphere serving many valuable ecological services including timber, wood and NTFPs for human welfare and in the global carbon cycle.

The natural regeneration of forest is an imperative process that is determined by the sufficient number of young trees, saplings and seedlings in a specific forest population. Sustainable forestry and conservation management and practices cannot be implemented if the regeneration status of any particular forest area is insufficient. The main aim was to study diversity and regeneration of forest along the altitudinal gradient of Yangshila in Morang district, Eastern Nepal. Yangshila is one of the VDCs in Morang district that forms the Chure-Bhawar belt, one of the most threatened regions of Nepal. Based on dominant vegetation types, the study site was categorized into three forest types- lower altitude LA (200 m-700 m) with dominant forest of *Shorea robusta*, middle altitude MA (700 m- 1100 m) with mixed broad-leaved forest of *Shorea robusta*, *Schima wallichii*, *Castanopsis indica*, *Castanopsis tribuloides*, and upper altitude UA (1100 m-1600 m) with dominant vegetation of *Alnus nepalensis*, *Schima wallichii*, *Engelhardia spicata* and *Castanopsis indica*. To study the regeneration status, the nested quadrat method was adopted for the enumeration of trees (10 m × 10 m), saplings (5 m × 5 m) and seedlings (1 m × 1 m). The quantitative analysis showed that the tree species diversity has a positive correlation with increasing altitude as described by Shannon-Wiener Diversity Index, Simpson's Index of Diversity, Pielou's Index of species Evenness and Margalef's Index of species Richness. Simpson's Concentration of Dominance showed the opposite trend than other ecological indices describing the tree species diversity. The forest has higher saplings and seedlings density than adult trees. The density of saplings and seedlings of tree species goes on increasing along the altitudinal gradient whereas the density of adults decreases with increasing altitude. The size-class distribution diagram showed inverse-J shaped model indicating the good regeneration status of the forest in the studied area.

Keywords: Tree, sapling, seedling, Diversity index, J-shaped model, Chure-Bhawar

Pattern of tree species richness along the altitudinal gradient of Modi River basin in Annapurna Conservation Area, Central Nepal

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Abstract

The elevational diversity gradient is an ecological pattern where biodiversity changes with elevation. The main aim of this study was to find the relationship between tree species richness along the elevational gradients in the southern aspect of Modi River basin, Annapurna Conservation Area (ACA), Nepal. The study was carried out from 1000m to 3800m at an interval of 200m. A total of 30, two transects having size 25m × 2.5m were laid on each plot at an interval of 50m horizontal distance on each aspect most likely along the main trail. All together 30 tree species belong to 27 genera and 21

families have been identified. Species richness of tree plants showed a bi-modal pattern with altitudinal gradients. The tree species richness significantly differs along the elevational gradients within different sites. *Alnus nepalensis* and *Bombax ceiba* were dominant in the lower elevational zone; *Rhododendron arboreum* and *Alnus nepalensis* were dominant in middle and *Betula utilis*, and *Rhododendron arboreum* was observed dominantly in upper elevational sites. The Canonical Correspondence Analysis (CCA) diagram shows the complete relationship of species with environmental variables (Altitude and Slope). Our findings clearly showed that the number of tree species has decreased with increasing altitude, thus trees in Modi River basin eschewed higher elevation levels.

Keywords: ACA, Species richness, Aspect, Elevational gradient, Bi-modal pattern, CCA

Spatiotemporal variations of hydrogeochemistry and its controlling factors in the Koshi River Basin, central Himalaya

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Abstract

The aim of this study is to identify the sources of major ions and acquire a comprehensive understanding of spatiotemporal variations and characteristics of hydrogeochemistry in the Himalayan Koshi River Basin, (KRB). A total of 117 water samples were collected from 39 sites during pre-monsoon (PoM), monsoon (Mon) and post-monsoon (PoM) seasons in 2017 and 2018 from the KRB. The pH, EC values and TDS concentrations were measured in-situ and the concentrations of major ions (Ca^{2+} , Mg^{2+} , K^+ , Na^+ , F^- , Cl^- , SO_4^{2-} , NO_3^-) and Si were analyzed in the laboratory. Correlation matrices (CM), paired t-test, cluster analysis (CA), principal component analysis (PCA), the Piper, Gibbs, and Mixing plots were applied to the measurements for evaluating the spatiotemporal variation of the major ions and their link between environmental factors. In addition, Pollution Index (PI) was applied to figure out the level of contamination at different sites of KRB. The results reveal mildly alkaline pH values of grand mean 8.26 with markedly high calcium and sulfate in upstream region and noticeable differences of other ions having the order: $\text{Ca}^{2+} > \text{Na}^+ > \text{Mg}^{2+} > \text{K}^+$ for cations and $\text{SO}_4^{2-} > \text{HCO}_3^- > \text{Cl}^- > \text{NO}_3^-$ for anions in the Pengqu region, and $\text{Ca}^{2+} > \text{Na}^+ > \text{Mg}^{2+} > \text{K}^+$ for cations and $\text{HCO}_3^- > \text{SO}_4^{2-} > \text{Cl}^- > \text{NO}_3^-$ in the mid-and downstream tributaries. Source analysis of the ions indicates that rock weathering is the main source of ions, followed by anthropogenic activities such as farmland fertilizations. Even though the results of PCA, Gibbs plot and the ionic relationships of $\text{Ca}^{2+} + \text{Mg}^{2+}/\text{Na}^+ + \text{K}^+$, $\text{Si}/\text{Na}^+ + \text{K}^+$, Cl^-/Na^+ and $\text{HCO}_3^-/\text{Ca}^{2+}$ ratios displayed the predominance of geogenic weathering with carbonate dominant lithology, the distinct spatial variation was observed as evaporite dissolution, carbonate and silicate

weathering are predominant in upstream, mid-downstream, and east side tributary, respectively. Analyses of the PI and the suitability of the water supply for drinking and irrigation reveal that the river has mostly retained its natural water quality but poses safety concerns at some of the sampling locations.

Keywords: Major ions, spatiotemporal variations, controlling factors, PI, Multivariate statistical analysis, KRB

Rain-water harvesting in Nepal: a case study

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Abstract

Nepal is a Himalayan republic. It is endowed with a strip of the plane along the southern boundary only—the rest is hilly or mountainous. Nepal is rich in water resources. In this aspect, it is the second richest country in the world. But even in such a country, almost one-fifth of the people remain out of water especially during the winter season. In winter season the depth of water in the rivers, especially in the hilly region, considerably decreases. There the springs are often found to dry up. In different parts of the country, there happens an acute shortage of potable water. To combat this situation rain-water harvesting is a fruitful and effective way. It is a technique to collect and preserve the rain-water for future use especially at the time of scarcity of water. Rain-water is pure enough. However, it is not so tasty due to the lack of minerals and salts. Besides drinking rain-water can serve the purpose of cooking, washing, kitchen gardening etc. For a small or medium-size family, the requirement of water is also small. But what is a concern like a large office or school? There the requirement of water is obviously quite high. How could the situation be tackled by them? In this paper, we have dealt with a school at the hilly district of Syangja in western Nepal has more than six hundred students and shown how the rain-water harvesting has come as a boon for them.

Keywords: Water resource, Hilly region, Rain, Potable water, Kitchen gardening

Air pollution tolerance index of some tree species of Pashupati and Budhanilkantha area, Kathmandu

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Abstract

The present study aims to assess the air pollution tolerant trees from the roadside of Pashupati area of Kathmandu exposed to vehicular air pollution. This area with heavy

traffic density was considered as the polluted site and Budhanilkantha, lying at the outskirts of Kathmandu with very less traffic density was considered as the less-polluted site and was selected as the control site of the study. Commonly available 21 roadside same tree species from both polluted and control sites were chosen. Air pollution tolerance index (APTI) values of the trees were calculated considering the biochemical parameters - leaf relative water content, total leaf chlorophyll, leaf extract pH and ascorbic acid by using the standard method. The result of the study showed higher APTI values in the tree species of polluted sites than in those of the control site. These changes were an adaptive response to the stress created due to pollution, possibly an important survival strategy among plants. Significantly higher APTI values ($P \leq 0.05$) were obtained in *Cinnamomum camphora*, *Ficus elastica*, *F. religiosa*, *F. benghalensis* and *Grevillea robusta* indicating that they are tolerant tree species. These tolerant plants can be planted near roadsides in order to control and reduce air pollution. *Phyllanthus emblica* and *Schima wallichii* were found to be sensitive tree species that can be used as a bioindicator in pollution monitoring.

Keywords: Air Pollution Tolerance Index, Relative water content, Leaf extract pH, Chlorophyll content, Ascorbic acid

Analysis of hand pump water in Lahan

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Abstract

The present work investigated the physical, chemical and microbiological study of hand pump water samples (n=5) around JSMM Campus, Lahan, Nepal. The work was conducted based on the national drinking water quality standard guideline, 2062 B.S. The experiment was also performed by taking the guideline of WHO and APHA (American Public Health Association). The investigative value of manganese (1-1.5 mg/l) found to be more than the WHO recommended value (0.2 mg/l). The study has tried to explore the elements of hand pump water which have negative impacts on public health and find the solution to minimize the effects as well. This level of manganese gives black spots in our cloths and teeth which can be removed by the filtration method. Thus, this technique should be used to remove manganese and other impurities from hand pump water.

Keywords: Chemical, Physical, Microbiological, Quality, Hand pump water

An assessment of the pollution and its impact on the diversity of phytoplankton in Mahananda river, Malda District, West Bengal, India

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Abstract

The present study focuses on the pollution and its impact on the phytoplankton in Mahananda River, Malda District, West Bengal, India. The water quality was investigated for a period of one year from November 2018 to October 2019. The surface water samples were collected monthly from the three sites of Mahananda River namely one from the apparently non-polluted area, and two from sewage-mixing areas in the north bank of the river. The physico-chemical parameters evaluated were pH, temperature, acidity, alkalinity, calcium and magnesium hardness, total hardness, salinity, chloride, sulfate, nitrate, DO, BOD and COD and their correlations were also assessed. The physico-chemical parameters exhibited clear-cut spatial and seasonal fluctuations. 57 species of phytoplankton were identified during the study period which comes under 29 genera belonging to four taxonomic classes namely Cyanophyta, Chlorophyta, Bacillariophyta and Euglenophyta. The class Bacillariophyceae was the dominant group of algae in all the three sites of Mahananda River throughout the study period. The present study revealed the presence of 11 pollution tolerant algal genera namely *Oscillatoria*, *Lyngbya*, *Nitzschia*, *Navicula*, *Cocconeis*, *Cymbella*, *Cyclotella*, *Melosira*, *Synedra*, *Stauroneis*, and *Euglena* which indicated that the quality of the water was deteriorated at all the selected three sites in the Mahananda River and are polluted due to human interventions. The analysis of physico-chemical parameters indicated that the water quality of Mahananda River was deteriorated at all the three sites studied during the period of study.

Keywords: Non-pollutant area, Sewage-mixing area, Physico-chemical parameters

Water relations and drought adaptive strategy of *Schima wallichii* Dc. Korth. and *Castanopsis indica* (Roxburgh Ex Lindl.) A. Dc. in Godavari, Lalitpur

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Abstract

This study on water relations and drought adaptive strategy of *Schima wallichii* and *Castanopsis indica* was performed from July 2017 to May 2018 at the monthly interval in Godavari, Lalitpur, Nepal. Water relation parameters like Pressure-Volume (PV) curve analysis, Huber value (H_v), specific conductivity (K_s), leaf specific conductivity (K_l) and

hydraulic conductivity (K_h), specific leaf mass (SLM), twig starch content, phenology and leaf area were recorded. Relative water content at zero turgor (RWC_z) showed the lowest value during November in *C. indica* and March in *S. wallichii*. Osmotic potential (Ψ_s) decreased with increasing pressure potential (Ψ_p) during the dry season. High elasticity in *S. wallichii* was found in February facilitated to make ongoing phenological activities smooth. Phenological activities such as bud break, leaf emergence, twig emergence, shoot elongation in both species started with the onset of dry months except flowering in *C. indica* which took place during September. The low osmotic potential at zero turgor (Ψ_{sz}), a high index of desiccation tolerance (IDT) despite low hydraulic conductance (K_h and K_t) were found in *C. indica* and *S. wallichii* during the water-stressed months. Specific leaf mass (SLM) was low during December in *C. indica* and during March in *S. wallichii*. The average leaf area in *S. wallichii* was highest during July and lowest during March, but *C. indica* showed the lowest value in July and highest in January. Mean starch₀ and starch₁ were highest during February and lowest during September and November in *S. wallichii* and *C. indica* respectively.

Keywords: *Castanopsis indica*, Elastic adjustment, Osmotic adjustment, Phenology, *Schima wallichii*, Twig conductance

Leaf litter decomposition and nutrient release pattern of five selected tropical tree species

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Abstract

Leaf litter decomposition in terrestrial ecosystems has a major role in recycling the nutrients to the soil. Various biotic and abiotic factors affect the rate of litter decomposition. Nutrient dynamics is the way nutrients cycle in an ecosystem. The present study was conducted for five selected tropical tree species viz. *Shorea robusta*, *Ficus hookeri*, *Mallotus philippensis*, *Artocarpus lakoocha* and *Dillenia pentagyna* in Hetauda, Makawanpur. This paper aims to determine the decomposition rate and nutrient mineralization pattern of leaf litter of the selected species. The leaf litter-bag method was used to assess the decomposition and nutrient dynamics for one year. The organic matter in the residual litter decreased continuously with time for all species. Both decomposition rate constant and weight loss were highest for *M. philippensis* (% weight loss = 73.49; $k = 0.33$) and lowest for *S. robusta* (% weight loss = 54.01; $k = 0.18$). In general, weight remaining showed a strong negative correlation with nitrogen (N) and phosphorus (P) concentration but a slightly negative with potassium (K). However, the remaining weight of litter showed a strong positive correlation with carbon (C): N ratio thus indicating a good predictor of mass loss of litter and net N mineralization. The study showed that there was no net release of nitrogen during the one-year study period, however,

net phosphorus release was highest for *S. robusta* followed by *D. pentagyna* and net potassium release was highest in *F. hookeri* followed by *A. lakoocha*. Thus, there is a need to analyze the properties of leaf litter while using it as compost to get better production.

Keywords: Leaf-litter decomposition, Nutrient dynamics, Immobilization, Biogeochemistry

Water relations, phenology and drought adaptations of *Alnus nepalensis* D. Don and *Myrica esculenta* Buch.-Ham. Ex D. Don at Godavari, Kathmandu

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Abstract

In the Central Himalaya, forests grow in a strongly seasonal climate with several dry months, thus developing moisture stress in plants. Variation in water relations, phenology and their response to drought in Himalayan tree species, *Alnus nepalensis* and *Myrica esculenta* were studied in a natural ecosystem of Godavari, Kathmandu, Nepal. To understand a general mechanism involved for adaptation to the seasonal patterns of rainfall, different parameters such as pressure-volume analysis, twig conductance, twig starch content, SLM, phenology and correlation between all these variables were measured from September 2017 to May 2018 at monthly interval. Most of the water relations parameters were related to phenology and leaf dynamics. Variations were found in tissue water relations for turgor maintenance as osmotic potential at zero turgor (Ψ_{sz}) and full turgor (Ψ_{sf}) declined in dry months. Both species maintained turgor by osmotic adjustment during the dry months and showed a high drought tolerance index. Some attributes of twig conductance were related to phenology and leaf damages as Huber value (H_v) often increased during leafing. Starch content in twigs showed high seasonal variation and had a strong effect on phenological activities. SLM decreased at the time of senescence and increased when leaves were fully expanded and mature.

Keywords: *Alnus nepalensis*, *Myrica esculenta*, Osmotic adjustment, Phenology and twig conductance

Variation of selected hydrological properties in forest, cultivated land and grassland in Makawanpur, Nepal

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Abstract

Variation in the soil properties may occur in soils of different land-use types. It is important to study the soil properties for the better management of the land. This research was carried out in Hetauda sub-metropolitan city of Makawanpur district of Nepal to quantify and compare soil porosity, soil moisture content and infiltration amount in a forest, cultivated land and grassland. Soil samples were collected from 0-30cm soil depth using the standard procedures. A double-ring infiltrometer was used for quantifying the infiltration amount. Soil samples were analyzed in the laboratory. The highest porosity was found in cultivated land with 55.50% followed by the forest with 53.74% and grassland with 51.63%. The highest moisture content was found in the grassland with 26.94% followed by the forest with 10.17% and cultivated land with 9.92%. The mean cumulative infiltration amount was higher in the cultivated land with 39.27 cm followed by the forest with 33.47 cm and grassland with 8.4 cm. One-way ANOVA at 5% level of significance of Porosity revealed that there is no significant difference between different land-use types ($p=0.636$). The moisture content among the land use types is significantly different at 5% level of significance as revealed by one-way ANOVA ($p=0.00$). LSD test at 5% level of significance revealed that there is a significant difference in moisture content between grassland and forest and between grassland and cultivated land but no significant difference between forest and cultivated land. The Cumulative infiltration amount among the land use types is significantly different at 10% level of significance as revealed by one-way ANOVA ($p=0.060$). LSD test at 10% level of significance revealed that there is a significant difference in Cumulative infiltration amount in between grassland and cultivated ($p=0.029$), and forest and grassland but no significant difference between forest and cultivated land. Hydrological properties were found varying with land-use types.

Keywords: Soil porosity, Soil moisture content, Infiltration

Population status and new conservation challenge for endangered *Nardostachys jatamansi* from alpine habitats in Langtang National Park

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Abstract

Nepal Himalayas is facing severe threats due to climate change and increasing anthropogenic disturbances in the alpine habitat that creates the biggest challenge to conservationists for protection and restoration of endangered and rare species in their natural habitats. This research aims to better understand demographic parameters, life-history traits variation with fire gradients for species in-situ conservation of Himalayan medicinal plants with increasing disturbances in alpine habitat. We studied *Nardostachys jatamansi*, a himalayan endemic, highly medicinal plant from alpine habitat having habitat-specific distribution; listed in CITES Appendix II, Critically Endangered category by IUCN Red List Data and banned by Government of Nepal to export in unprocessed form. The study was conducted in Langtang National Park in June- October 2019 with the sites having different fire histories and other disturbance gradients. Stage based population projection matrix models and life history response experiment analysis was carried out to explore variation in demographic and trait parameters in response to the different level of disturbance. The population density was calculated by using 3m ×3m plots and 10 random fully matured individual ramets were subjected for life-history trait analysis from different habitats. The demographic information coupled with life-history trait variation data and habitat distribution result will provide the baseline information of *N. jatamansi* in the natural habitats and their resilience capacity towards increasing level of disturbances, particularly fire gradients in alpine habitats that will be directly helpful to design a species-level in-situ conservation approach of highly important rare plant species in high Himalaya.

Key Words: Fire, Medicinal plant, Jatamansi, Functional traits, Variations

Vegetation patterns at different management regimes of Barandabhar forest, Chitwan, Central Nepal

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Abstract

Variation in plant diversity in terms of community composition and richness patterns at four different management regimes: buffer zone, buffer zone protected, community and

protected studied in Barandabhar forest of Chitwan, Central Nepal. Each forest management regime was studied after following transects with standard circular plots. A total of 15 transects each with 20 circular plots were studied. Coverage data of each species that occurred inside each circular plot was estimated. The diameter of each tree species (diameter ≥ 5 cm) at breast height measured and the height of each tree species was measured. Five soil samples (four corners and one centre) collected separately from each plot for further analysis of bulk density, pH and moisture. The axis length value (3.8) calculated after applying Detrended Correspondence Analysis (DCA) from the data matrix clearly indicated a unimodal relation of each species along the main underlying gradient. There was an acceptable level of variance (0.54) explained by the first axis of the DCA. A significant negative correlation was found among soil bulk density, pH and soil moisture. The species richness found in buffer zone community forest was significantly different from all remaining forest regimes. Similarly, the species richness found inside the Saal forest was significantly different from the Sal-mixed forest. The canonical correspondence analysis (CCA) differentiated plant species composition with their ecological niches.

Keywords: Diversity, Richness, Niche, Tarai, Buffer zone, Community, Diameter, Hardwood, Forest

Oral Session: Faunal Diversity

Faunal diversity of Tapli Rural Municipality, Udayapur, Province 1, Nepal

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Abstract

The study of faunal diversity is an important attraction for biologists and conservationists around the globe. As habitat change issues caused by both anthropogenic and climate change are active to impose threats on fauna and flora. Many species of animals have already been either uncommon or endangered by the time rest are on the same race. Considering the study of whole faunal diversity as a vague topic because of its coverage, for the present study only selected animals viz. mammals, birds, reptiles, fish and butterflies were chosen. Tapli Rural Municipality lies in the rain shed area of Udayapur District, within the lowest elevation 307msl and highest 2000msl. The total study area covered is 119.11sq km in which five wards of the Rural Municipality lie. On the basis of altitudinal gradients, transect lines were drawn and points were fixed at each ward to be visited and observed thereof faunal diversity. The survey was carried from 7th to 22nd August 2018. For each ward survey, three days' time was allotted. Total fieldwork was accomplished on foot. Altogether 17 species of mammals belong to 13 families, 74 bird species belong to 39 families, 10 species of reptiles belonging to 6 families, 3 amphibian species belong to 3 families, 22 fish species belong to 8 families and 34 species of the butterfly under 8 families were recorded. Because of the physiographical condition of the place and climate change, only one species of slug representing phylum Mollusca was procured.

Keywords: Faunal Diversity, Rain shed area, Altitude gradient, Anthropogenic impacts

Altitudinal distribution of herpetofauna in Ghandruk Region of Annapurna Conservation Area, Nepal

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Abstract

Herpetofaunal study was performed on Ghandruk region of Annapurna Conservation Area to explore species composition and abundance and their distribution pattern along the elevational gradient. Diurnal and nocturnal distance and time constrain, a visual

encounter survey was applied on randomly selected 11 transects. An opportunistic survey was also adopted to increase survey efficacy. The survey was performed in May for pre-monsoon and October for the post-monsoon season. A simple linear regression was performed to obtain the result. Ghandruk lies in the southern part of ACA which has an area of about 2,141,297.7 hectares. Six hundred and sixty-two individuals of herpetofauna belonging to 12 species of amphibian and 13 species of reptiles were recorded during this study. An irregular distribution pattern of herpetofauna was found on the elevation gradient. There was a declining trend in species richness and abundance with the increase in altitude. Significant linear pattern of species abundance was found with altitude ($r^2=0.09321$, $p < 0.05$) but species richness does not show significant linear relation with altitude ($r^2=0.009018$, $p=0.9256$). There was the mid-elevation peak in species richness pattern of herpetofauna with altitude.

Keywords: Elevational gradient, ABC, Paha, Amphibian, Reptile

Species diversity and conservation practices of turtle and tortoises in Betana wetland area

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Abstract

Betana wetland area is situated in Belbari municipality of Morang District (26°20' to 26°53' N and 87°16' to 87°41'). Wetland receives water from own natural water sources from the upper catchment area. The pond covers 22 hectares and includes a hundred and seven species of macrofauna. Three species of turtle and one species of tortoise are distributed in this wetland. *Indotestudo elangata* is critically endangered and *Nilssonina hurum* has threatened species in this area. Trade and exploitation, is the main threat in Nepal, turtles and their eggs are hunted for food and ethnomedicine. In the case of Betana wetland area domestication (external food supply), pollution, disturbance and poaching are main threats. Four species and 150 individuals of turtles and tortoises were listed between May 14, 2017, to May 12, 2018, from Betana wetland area. During the time of the survey, 22 individuals of turtle and tortoise were rescued.

Keywords: Betana, Turtle, Conservation, Threats, Pollution

Distribution of *Phlebotomus argentipes* sand fly (Diptera: Psychodidae) in areas with visceral leishmaniasis in Nepal

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Abstract

Phlebotomus argentipes sand fly is the only incriminated vector of visceral leishmaniasis (VL) in Nepal. VL is officially endemic in 18 so-called 'programme' districts. The majority of VL cases, however, are currently being reported from 31 non-programme districts, including mid-hill and mountainous regions. The status of the vector species in most of these districts is either unknown or under-reported. Our main research objective was to explore the vector sand fly species in selected districts with reported VL cases in Nepal. Sandflies were collected with the help of CDC miniature light traps and mouth aspirators from 12 programme and 6 non-programme districts encompassing diverse geographical regions. From 2017 to 2019, each district was visited once and collections were done for two consecutive nights. Specimens were identified using standard regional morphological identification key and preserved in 80% ethanol. In most of the surveyed areas, *Phlebotomus argentipes* sand flies were predominant species followed by *Sergentomyia* spp. and *Phlebotomus papatasi*. We captured *P. argentipes* from all programme districts and from 5 non-programme districts. In Bajura, one of the non-programme districts, *P. argentipes* was not collected, instead *P. longiductus* and *P. neglectus* like sand fly species were found. The evidence of the presence of *P. argentipes* in the areas with VL cases is key to vector control programs and policymakers and indicative of the need for regular vector surveillance and implementation of appropriate vector control strategies in districts irrespective to programme or non-programme to sustain the VL elimination in Nepal.

Keywords: Sand fly, *Phlebotomus argentipes*, Visceral leishmaniasis, Endemic, Non-endemic

Amphibian species richness in different habitats of Kapilvastu District, Nepal

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Abstract

Amphibians as poikilothermic vertebrates can spend their life span in almost all habitat types for nesting, hibernating, aestivating, dispersal, and biological functions. The study

was conducted in the habitat of agricultural fields, forests, human habitats, riparian and wetlands in Kapilvastu district, Nepal from March 2016 to July 2018. The aims of the study were to identify amphibian species, analyze the richness and abundance of amphibian species in different habitats. Data were collected by quadrat, pitfall and opportunistic survey methods randomly. In total, 707 individual amphibian species belonging to 4 families, 8 genera and 12 species were recorded. The richness of amphibian species in the agricultural field ($S=10$) was higher in number compared to the richness of the forest ($S=5$). Shannon-Wiener diversity index (H') was 2.08 in the agricultural field and 1.80 in riparian, whereas Simpson's diversity indices (\bar{e}) were 0.85, 0.80 in the agricultural field and riparian habitat, but lower (0.77) in the forest. Comparison of relative abundance and equitability index/Pielou evenness (J) of individuals among the species showed that species diversity of agricultural field (0.37) and riparian (0.38) habitat were abundant and numerically similar to the other habitats. Among habitats, abundance was greatest in the wetland with 223 (31.28) followed by riparian with 158 (22.16%), human habitats with 106 (14.87) and in agricultural fields with 183 (25.67%) individual amphibians. The lowest amphibian abundance was documented in the forest with 37 (5.19%) individuals. Among these habitats, agricultural fields were the best habitat of species richness and abundance of amphibians. The presence of exclusive species in forest reinforces the importance of preserving different habitats for the maintenance of richness and diversity of local species.

Keywords: Species richness, Species abundance, Habitats, Diversity index

Status and diversity of indigenous small fish species (SIS) in Tarai wetlands of Province 1, Nepal

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Abstract

Fish is one of the most important aquatic natural resources in the globe. Fish diversity comprises both economically important and trash fishes inhabiting existing wetlands such as rivers, lakes, ponds, reservoirs, canals, pools, creeks, etc. The present study was concentrated on the understanding of the present status of indigenous small fish species of Tarai of Province No1. For this study, fish-catching sites and fish markets were visited season-wise and indigenous fish species were observed and identified and counted the representatives of species belonging to each genus recorded. When there occurred chances of procuring more amount of SIS, purchasing up to two kg was done and sorting out fishes' species wise and counting was done. Capturing of fishes placed in spread state in the fish market, in the camera and studying them on the computer screen helped mostly. The study revealed that among *Puntius* species, *P. sophore*, *Channa* species, *Channa striatus*, *Barilius* species, *Barilius bendalensis* were found to have been dominant

belonging to the same genus, whereas rest species were either rare or locally absent. The most common species viz. *Acanthocobitis botia*, *Brachydanio rario*, *Danio* spp, *Mystus* spp, *Nandus nandus*, *Chanda nama*, *Pseudambassis baculis*, *Hara* spp., *Colisa* species, *Channa marulius*, *Clarius batrachus*, *Heteropneustes fossilis*, *Schistura* and *Nemacheilus* species were common a decade back but are uncommon now.

Keywords: Wetland, Indigenous, SIS

Soil fauna of Ranibari Community Forest (RCF), Kathmandu, Nepal

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Abstract

Ranibari Community Forest (RCF) is important refugia for animal taxa within the crowded urban area of the Kathmandu valley. This study explored poorly investigated soil meso- and macro- fauna. The fortnight field data were collected from leaf litter sampling from May to July, 2019. The collected soil fauna comprised mesofauna (Collembola, Protura, Diplura and Acari) and macrofauna (Haplotaxida, Hemiptera, Lepidoptera, Diptera, Dictyoptera, Orthoptera, Hymenoptera, Coleoptera, Araneida, Isopoda, Amphipoda, Julida, Polydesmida, Scolopendromorpha, Geophilomorpha and Lithobiomorpha). The study showed that the fauna is highly diverse and evenly distributed in the soil layer (Shannon index (H) = 0.1982; Evenness = 0.715) than in leaf litters. Furthermore, the association of abundance of fauna with the moisture and pH was found positive and that with temperature negative.

Keywords: Soil fauna, Kathmandu, Mesofauna, Macrofauna

Status and threats to waterbirds: a case study of birds of Phewa Lake, Pokhara, Nepal

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Abstract

Phewa Lake, the second largest lake in Nepal, is rich in biodiversity and supports a number of wetland and wetland-dependent birds. The study was carried out in Phewa lake to evaluate the status and diversity of wetland and wetland-dependent birds from April 2018 – February 2019. A total of 25 points were fixed around the Phewa lake for point count. In each point, 10 minutes' time was spent to observe bird species and their

numbers. The bird's monitoring was performed early in the morning (7.30 to 10.30 AM). A total of 40 wetland bird species belonging to 17 families of 5 orders was recorded. The maximum number of species (29 species) was recorded in the winter season while 17 species of the birds were recorded in the summer season. Out of 40 species, 16 species were winter visitors, 20 resident and 4 vagrants. During the field study, we also found that the lake faces a number of threats such as soil erosion, construction of roads near the lake, trapping/hunting of birds, fish farming using nets, sedimentation, the encroachment of the area of lake by local elite people, human disturbance, water pollution and eutrophication. This study explores the present status of birds and major disturbance factors (anthropogenic and natural) that affects bird diversity.

Keywords: Winter birds, Phewa lake, Pokhara, Bird diversity, Nepal

Population assessment of CITES-listed Golden Birdwing Butterfly (*Troidesaeacus*) in central Nepal

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Abstract

Of the three species of CITES II listed butterflies, *Troidesaeacus* (Golden Birdwing) was assessed for its current status and associated threats in central Nepal. This study revealed its population of 39 individuals in four potential districts of Kathmandu Valley which included the districts of Lalitpur, Kavrepalanchok, Bhaktapur, and Sindhupalchok. This butterfly is restricted to the elevation range of 333 m to 2030 m in Nepal and prefers flying around tall trees of the open forest. This study was conducted for 30 days following the appropriate months for its appearance. Increasing pressure on forest resources in these districts and tourism promotion activity with clearing its forest habitat in Nagarkot of Bhaktapur district are some noticeable threats for this species. Godavari-Phulchoki forest at Lalitpur still remains the least impacted area representing its better population comparative to other sites.

Keywords: CITES, Districts, Forest, Habitats, Population, Status

Oral Session: Fungi and Plant Pathology

Diversity of macrofungi in Makrahar, Rupandehi, Nepal

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Abstract

Macrofungi are the macroscopic fruiting bodies. The main objective of the paper is the preliminary study and documentation of macrofungi from the study area. The fieldwork was conducted in Makrahar located in Devdaha of Rupandehi, Nepal. The present study was made from August-2012 to June-2013. The sample plots methods were taken by thirty quadrats (10m × 10m). Spore prints were taken to identify the collected species. Diverse species were collected together with ethnomycological knowledge of local people was also incorporated. All together thirty-three species were identified and enumerated with nine families and fifteen genera belong to Basidiomycotina. Most species were poisonous follows edible and medicinal. Four medicinal species such as *Agaricus arvensis*, *Boletus subtomentosus*, *Fomes fomentarius* and *Pycnoporus cinnabarinus* were found in the studied area. Among the surveyed species, *Russula* was the most widely distributed of the studied area. The investigation was concentrated on macrofungi and ethnomycological study in Tharu and Magar ethnic groups of Makrahar. The further study and identification of few species are still under process. There should be required for the conservation of the forest because some species of mushrooms are going to extinct.

Keywords: Mycophagous groups, Mycoflora, Riverine forest, Therapeutic use

Lichens of Nepal

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Abstract

This study about lichens of Nepal has been initiated to know the diversity and distribution of lichen families, genera, species, life-form and altitudinal ranges. The updated data on the lichen database of the whole country as well as information about the direct field observation have been utilized by this study. A total of 550 lichen species under 45 families and 130 genera found distributed from 100 to 7400 m above sea level (m asl) in Nepal so far published till recent and deposited in different lichenological literature and herbaria of the world. Parmeliaceae was found as the richest family with 110 species and 32 genera followed by Physciaceae with 64 species and 11 genera. Among them, 213

were crustose followed by 245 foliose and 92 fruticose. The highest richness of lichen species (249) i.e., 45.3% of the total, occurred between 3100 to 4000 m asl, matched the subalpine forest zone in Nepal. There were 207 species i.e., 37.6% of the total present in between 2100 to 3000 m asl which represented the temperate forest zone in Nepal. This high diversity of families, genera and species matched with diversity among vegetation types, high humidity and less human disturbance.

Keywords: Cloud, Conifer, Crustose, foliose, fruticose, Himalayas, Life-form, Mountain, Sub-alpine

Optimization of cultural media for mycelia growth of *Termitomyces robustus* (Beeli) Heim

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Abstract

This research was objectively carried out *in vitro* cultural characteristics, were determined the effect of various sources of carbon, nitrogen, amino acid, vitamins and carbon: nitrogen ratios. They were inoculated in a culture tube from Pathari Forest, Eastern Nepal for the process using semi-solid medium and submerged conditions. Data were used to showing a significant test. One-way ANOVA followed by Tukey HSD test was performed to compare the result of different treatments. Out of six carbon sources, the best growth was observed in maltose with somewhat compact mycelial density and lactose showed the least ($p < 0.05$). While the fresh and dry weight in submerged condition did not show significant. The best growth in both media was seen in organic nitrogen as yeast extract with compact mycelial density. Serine provides to be the best amino acid having somewhat thin mycelia density and Aspartic acid medium showed least with thin mycelia density. Out of five vitamins tested, thiamine showed the best and in the folic acid, the least growth having somewhat thin mycelia density, in both semisolid and submerse medium. The combination of C: N ratio, the best growth was in 1:4 and 1:5 and least in 1:1, while in the liquid medium, maximum fresh weight was observed in 5:1 and least in 1:1 whereas, in dry weight, maximum growth was observed in 4:1 and least in 1:1.

Keywords: *In vivo*, Lignocellulose, Mycelial density, Nutrients, Termitophilous fungi

Effect of plant extracts on *Sclerotium rolfsii*, the collar rot of tomato

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Abstract

Thirty plant extracts were screened against the pathogen (*Sclerotium rolfsii*) *in vitro* to examine the inhibitory effect on mycelial growth and sclerotial germination on the tomato plant. Among the 30 plant extracts tested *in vitro* against *S.rolfsii*, the extracts of *Acorus calamus* dried root showed significantly the highest reduction in mycelial growth, inhibition of sclerotial formation. It was also observed that as the concentration of extracts increased in the medium the effectiveness of extracts also increased and maximum growth inhibition was recorded at 10% concentration. Significantly, the highest inhibition was recorded in plant extracts of *Acorus calamus* (80%). The next effective plant extracts were from *Agave americana* (68%), *Allium sativum* (67%) and *Nerium indicum* (54%).

Keywords: *Sclerotium rolfsii*, Plant extract, *Acorus calamus*, *Agave Americana*, *Allium sativum* and *Nerium indicum*

Mushroom: An overlooked bio-resource of Nepal

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Abstract

Mushroom is a macro fungus with a distinctive fruiting body which can be either epigeous or hypogeous and large enough to be seen with the naked eye and to be picked by hand. It is neither plant nor animal belonging to its own separate biological kingdom Fungi. Fungi are diverse and distributed worldwide though they have received less attention than animals and plants. It is the second-largest group of organisms in the biosphere after the insects. The number of mushroom species on Earth is currently estimated at 150,000, yet perhaps only 10% are known to science. In the context of Nepal, mushrooms are considered as one of the most important NTFP and bio-resource which has been used by Nepalese peoples from the time immemorial. However, investigation about the mushroom resource of the country and its potential applications are greatly ignored so far. Due to limited scientific study only 1150 mushroom species have been recorded till now. Among them, 147 are said to be edible, while 100 species are poisonous and 73 have medicinal values. Most of the parts of the country are still virgin and yet to be explored. On the other hand, there is significant trade and revenue from the collection of *Ophiocordyceps sinensis* (yarsagumba), *Morchella* spp (guchhi chyau), and *Ganoderma* spp. (rato chyau). They play an important role in the national bio-economy. There are vast gaps in the knowledge about mushroom diversity and how these bioresources are affected by trade, land management practices, pollution, habitat loss and global climate change.

Keywords: Bioeconomy, Conservation, Forest, Fungi, MAPs, NTFPs, Trade

***Plasmodiophora* sp. on Apocynaceae- *Thevetia peruviana* (yellow oleander 'pila kaner)**

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Abstract

Thevetia peruviana was planted in a pot in the year 1991. The plant used to give yellow flowers continuously and became dried without any branches except the main stem in Feb. 2016. The main stem also bearing the different scales of lichens i.e., fully covered morphologically and microscopic study was done in the Department of Botany, M.M.A.M. Campus, Biratnagar, T.U., Nepal on Date 12/09/2016 at 12:00-12:20 P.M. and it confirmed the cyst on root-hair and presence of zoospores in inner portion of root system & the confirmation was done obeying the criteria given by Ainsworth (1966, 1973) and Kole and Grielink (1963) that the parasitic pathogen is *plasmodiophora* sp.

Keywords: *Thevetia peruviana*, *Plasmodiophora* sp.

The ecology and diversity of macrofungi in Sal forest located in Bhabar region, eastern Nepal

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Abstract

Macrofungi are an important component of forest ecosystems and play a major role in ecosystem dynamics, such as litter decomposition, nutrient cycling, and nutrient transport. Sal forests play an important role in the sustenance of biodiversity and the local environment of the region. The vegetation and climatic conditions of Bhabar Sal forest possess prime location for the biodiversity of macrofungi. The study was done to explore the ecological diversity of macrofungi. The frequent survey was carried out in the mushroom growing season (June-September). The present study describes the diversity and distribution of different macrofungi. A total of 30 mushroom samples were collected belonging to different genera. Russulaceae and Amanitaceae were the most dominant families in this study.

Keywords: Biodiversity, Ecosystem dynamics, Climatic condition, Explore

Growth and yield performance of Oyster Mushroom (*Pleurotus ostreatus*) on water hyacinth as a substrate

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Abstract

Cultivation of oyster mushroom (*Pleurotus ostreatus*) on the aquatic weed water hyacinth is an eco-friendly way of controlling and management of such a problematic weed. In the present work, water hyacinth has been used as a low-cost substrate in combinations with rice-straw of ratio 3:1 for the cultivation of *P. ostreatus*. The objective of this study was to cultivate oyster mushroom in water hyacinth compost degraded with lingo-cellulolytic fungi. The experiment was performed in control, before fungal treated compost and fungal treated compost. The data was analyzed on various aspects like completion of mycelium growth in different media like Potato dextrose agar media and water hyacinth media, the duration for spawn run, appearance of pinheads, fruiting bodies and number of fruit bodies produced. The nutrient analysis was done in all types of fruit bodies. *Aspergillus flavus* treated compost took short duration (24 ± 1 days) and control sample compost took a long duration (27.3 ± 1.53 days) for fruiting. The highest production was recorded in *Trichoderma* sp. treated compost (68.8%) and lowest in control compost (30.7%). This study has successfully demonstrated the possibility of water hyacinth as a substrate in mushroom production and management of water hyacinth.

Keywords: *Pleurotus ostreatus*, Water hyacinth, Mycelium growth, NPK analysis, Biological efficiency

Lichen flora of Bajrabarahi Sacred Grove and Ranibari Community Forest of Kathmandu Valley, Nepal

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Abstract

This research deals with the enumeration and identification of lichen flora present in Bajrabarahi Sacred Grove (BSG) and Ranibari Community Forest (RCF) of the Kathmandu valley, Nepal. These study sites are selected based on their contrasting air quality indices. The lichen inventory is utilized to establish different lichen genera as bio-indicators of air quality of the study areas. Lichens collected from the study sites are identified by their morphological characteristics and were enumerated up to the genera. The genera *Caloplaca*, *Dirinaria*, *Heterodermia*, *Lepraria*, *Parmelia*, *Pertusaria*, and *Pyxine* are present in the two study sites. Among these, only *Dirinaria* and *Pyxine* are

present in RCF, whereas *Caloplaca*, *Heterodermia*, *Lepraria*, *Parmelia*, *Pertusaria* are present only in BSG. The genus *Pyxine* is present in both the sites. Regardless of the fact that both study sites are situated in the subtropical region, *Caloplaca*, *Dirinaria*, and *Pertusaria*, which have been otherwise reported as the tropical genera, are also recorded in this study. This habitat shift over time probably shows the effect of climate change in the area. The presence of *Dirinaria* and *Pyxine* in the more polluted study site indicates their toxin tolerance, hence they can be recommended as suitable bio-indicators of air pollution and can be considered for further bio-monitoring studies. The presence of *Pyxine* in the less polluted BSG indicates the onset of air pollution in this area, because of the fact that both the sites have identical environmental conditions except the air quality.

Keywords: Air Quality Indices, Bajrabarahi, *Dirinaria*, Lichen, *Pyxine*

Depicting the forgotten biological kingdom: Why should we bring Fungi in biodiversity inventories, assessments and monitoring systems?

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Abstract

Biodiversity is a complex phenomenon having crucial roles of each and every biological entity. Reducing the rate of loss of biodiversity is one of the key global challenges in achieving UN Sustainable Development Goals (SDGs), Aichi Biodiversity Targets (ABT) and Nationally Determined Contributions (NDCs). Intergovernmental Panel on Climate Change (IPCC), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and other regional, local assessments and monitoring processes help to understand the state of the art of biodiversity, future challenges in their sustainable management and conservation of such resources either presenting their current status, values or projecting future scenarios in terms of existing climate and global changes. Such assessments also support to bridge acquired knowledge informing science-policy nexus. Having reflections on such assessments, very little has been done to amplify the economic and environmental values of fungal resources and in most of the inventories, they are not mainstreamed or almost neglected in comparison with higher plants and flagship animals in both landscape and seascape levels. The current known global diversity of fungi is about 100,000 species whereas the expected number is even more than 3 million species. The economic value of wild mushrooms complex in the global market already exceeded US\$2 billion. It is therefore, a number of challenges now need to be identified and addressed to bring fungal knowledge on limelight as they are not only vital to ecosystem functioning but also to deliver food security and nutrition for present

and future generations of wider communities and moreover being important livelihood component of Indigenous Peoples' and Local Communities (IPLCs).

Keywords: Fungi, assessments, Expertise, Mainstream, Ecosystem services

Epiphytic lichen diversity as affected by pollution

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Abstract

Diversity and abundance of five species of epiphytic lichens were assessed in Malda Town, India. The significant correlation between the abundance of lichen species and the volume of vehicular traffic in the town suggested atmospheric pollution load in the heart of the town. *Parmelia caperata* (L.) Ach. and *Graphis scripta* (L.) Ach. exhibited greater abundance among the five lichen species studied indicating their high tolerance level of to air pollution. Significant correlations between levels of heavy traffic and diversity as well as the abundance of all lichen species were also observed. These findings indicated a potential threat to the survival of the lichen communities in Malda. Further study regarding the effectiveness of lichen species in accumulating heavy metals like Pb, Zn, and Cu was conducted. This was achieved by analyzing the most abundant lichen species (*Parmelia caperata*) collected from different sites in winter, summer, and monsoon seasons. Metal content in lichen thalli, as analyzed by AAS, showed their elevated levels in the order of Pb [Zn [Cu. The relationship between metal content and volume of vehicular traffic suggested that co-associated, metallic elements are emitted as vehicle-derived pollutants as well as diffuse industrial emissions. Accumulation of these metals is higher in winter which is proportionate with a higher degree of metabolism due to higher humidity in this season. The study also revealed the dynamics of metal uptake by lichen at various stations influenced by different degrees of vehicular traffic. Overall results ensure the applicability of lichen with their important role in the sequestration of atmospheric metal contamination.

Keywords: Air pollution, Heavy metals, Sequestration of atmospheric metals

Survey on foliicolous black mildews on Fagaceae at Shivapuri and Phulchoki Hill Forest, Nepal

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Abstract

The present investigation involves in the general survey and taxonomic characterization of black mildew found in Fagaceae at a different altitudinal range of Shivapuri and Phulchoki hills of Kathmandu valley. A total of eleven species of black mildew fungi were collected from different host plants belonging to the class Ascomycetes and Deuteromycetes. In the majority of cases, it was found that more than two genera of fungi occurred in the same host. In *Castanopsis indica*; *Meliola*, *Paraphialocephala*, *Sarcinella*, *Stenella*, *Verrucispora* species and in *Castanopsis tribuloides*; *Asterina*, *Fulviomyces*, and *Meliola* species were found from an altitude of 1800m-1900m at Phulchoki hills only. Similarly, in *Quercus glauca*; *Asterina*, *Asterotexis*, *Meliola*, *Stenella*, *Tripodsporium* and *Tretospora* species were found from an altitude of 1800-2300m and 1600m-2100m at Phulchoki and Shivapuri hills, respectively. Likewise, in *Quercus lanuginosa*; *Appendicullela*, *Meliola* and *Asterina* species from an altitude 1600-2300m and in *Quercus lineate*; *Meliola* and *Sarcinella* species were found from 2000-2500m in both sites. In *Quercus semicorpopolia*; *Asterina*, *Meliola* and *Sarcinella* species were found up to 2700m. The single genus *Meliola* species was found in *Lithocarpus spicata*. The highest degree of infestation was observed between 1900m-2300m altitude while less degree of infestation was below 900m and above 2300m comparatively. The present investigation was carried out with the goal to enumerate the foliicolous black mildew and the effect of altitude on their distribution.

Keywords: Altitude, Host, Pathogen, Black mildews, Infestation

Ectomycorrhizae morphotypes found in *Alnus nepalensis* in Dolkha, Nepal

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Abstract

Mycorrhizae are the prime component of root-associated underground biota that enhance plant growth by providing essential minerals and also help in tolerate various environmental stresses. *Alnus nepalensis*, a native to Nepal is a nitrogen-fixing non-leguminous tree that grows in landslide areas, disturbed and abandoned land as well as near or even in the crop fields. Besides the nitrogen-fixing ability of this species its roots

are colonized by several mycorrhizae and characterization of such mycorrhizae could be interesting research. For this, a study was conducted in Dolkha District by sampling 5 plots of size (500 m²) in each short term abandoned land (SA), long term abandoned land (LA) and forests (regenerated and natural). Fine roots of altogether 15 *Alnus* tree individuals from each land use type were collected and Ectomycorrhizae (ECM) morphotype was analyzed. Altogether 6 ECM morphotypes (Black, Brown, Milky-White, Creamy-White, Brownish-White and Yellow) were found and described by microscopic analysis of the fine roots. Moreover, 9 types of ECM fruiting bodies (*Alnicola* sp., *Cortinarius* sp., *Paxillus* sp., *Inocybe* sp., *Lactarius* sp., *Laccaria* sp., *Russula* sp., *Hygrocybe miniata*, and *Suillus* sp.) were also collected from the study plots which may belong to these mycorrhizae. Identification and characterization of such mycorrhizae in detail would be helpful for understanding plant-microbe interaction and the effect of land use or soil type and climate change on them.

Keywords: Uttis, Mycorrhizae, Morphotype, Land use type, Fruiting body

Oral Session: General

Chemical safety of herbal medicines

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Abstract

Hundreds of herbal products are used as medicines in Nepalese market. Sixty percents of the population and especially 80% of rural are solely dependent on herbal medicines. Almost all herbal medicines are used in raw form without any processing. The medicinal plants are rich in diverse phytochemical constituents. People blindly believe that all herbal products are safe without any side effects. But there is no scientific research on the Phyto-constituents of Nepalese herbal medicines and their biological activities. Who knows some of those phytochemicals may have deleterious effects on human health. In recent years, about 30,000 to 40,000 new cancer patients are reported every year. Most of them are from rural areas. Similarly, the numbers of patients with high blood pressure and Kidney failure are also increasing sharply. There may be some relations on the increment of such patients and the used of uncontrolled herbal products will be presented and discussed.

Keywords: Chemical safety, Phytochemical, Herbal medicine

Botanical gardens of Nepal and their roles in plant conservation and livelihood

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Abstract

There are 11 botanical gardens in different ecological regions of Nepal which cover an area of 694.7 ha. Among them first established botanical garden is National Botanical Garden, Lalitpur established in 1962. These botanical gardens conserve native, ornamental, rare, endangered, endemic and exotic plant species. They also documented the collection of living plants for the purpose of scientific research, *in-situ* and *ex-situ* conservation, display and education. These botanical gardens are under the Department of Plant Resources, Ministry of Forests and Environment, Government of Nepal (Federal Government). Programs implemented in these botanical gardens are Plant Conservation and Garden Development and Medicinal Plants Development and Plant Research. The activities of Plant Conservation and Garden Development are mainly focused on *in-situ*

and *ex-situ* conservation of plant species while the activities of Medicinal Plants Development are mainly concentrated with the sustainable use medicinal plants by producing and distributing seedling of Medicinal and Aromatic Plants (MAPs) to the farmers for cultivation and their livelihood development.

Keywords: In-situ, Ex-situ, Medicinal plants, Aromatic plants

Biodiversity of Dipang Lake Basin Area on lake cluster of Pokhara Valley, Kaski

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Abstract

Dipang is one of the lakes in the Lake Clusters of Pokhara valley, enlisted as the Ramsar site in February 2016 (Ramsar site no: 2257), located at Pokhara metropolitan city on Gandaki province, Nepal. An assessment was conducted for the enumeration of biodiversity, water quality, ecosystem services and local use of the resources. A water quality assessment was conducted on three different seasons. In the Dipang Lake, 254 floral and 415 faunal species were recorded. Among the recorded floral species 57 were trees, 25 were shrubs, 17 were climber, 62 were herbs. Faunal species includes 207 vertebrates that comprised mammals of 16 species (10 families), the avifauna of 152 species (47 families), reptiles of 19 species (6 families), an amphibian of 5 species (2 families) and Pisces of 15 species (7 families). The invertebrate species (208) included 52 species of butterfly and 156 species of other insects. The parameter like dissolved oxygen, pH, total nitrate, chorine and ammonia was found sufficient for the bottom feeders and surface feeders (fishes and other animals); but free carbon dioxide concentration was higher. Lake and its basin provided a wide range of ecosystem services like forest products, fishery, drinking water which were vital for livelihood for 888 people of 182 households. From Lake Basin area 73 species of non-timber forest products were recorded.

Keywords: Biodiversity, Water quality, Ecosystem services, Fishery

Aquatic phytodiversity and macroinvertebrates in lakes and rivers of Setikhola watershed, Kaski, Nepal

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Abstract

Water quality and other physical environmental factors determine the considerable variations in the distribution and composition of aquatic species in freshwater ecosystems. This paper explains the aquatic phytodiversity (Phytoplankton and Macrophyte) and macroinvertebrate and Physico-chemical parameters of water in lakes and rivers of Setikhola watershed. Among all studied water parameters, conductivity was found most important influencing factors for causing variations in species composition of macrophyte, phytoplankton and macroinvertebrates species while the influence of nitrate, phosphate and ammonia concentration in all lakes and rivers of studied area was found to be more or less similar. Altogether 39 macrophyte species belonging to 29 families were recorded with the dominance of emergent species, 105 Phytoplankton species belonging to 4 families with the dominance of Bacillariophyceae and 9 order belonging to 35 families of macroinvertebrates with the dominance of order Diptera were recorded from the study area. *Navicula* sp, *Ghomphonema* sp and *Cymbella* sp of phytoplankton were dominant in lakes as well as in rivers. The family Nepidae was commonly found in most of the lakes and rivers while the family Hydropsychidae and Heptagenidae were found to be dominant in most of the rivers. Most of the macrophyte species showed a strong but negative affinity with all studied water parameters while phytoplankton showed a positive affinity with all studied water parameters and macro-invertebrates showed an affinity with ammonia and conductivity.

Keywords: Physico-chemical parameters, Macrophytes, Phytoplanktons, Emergent, Bacillariophyceae, Diptera, Conductivity

Importance of molecular study and its application for flora of Nepal

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Abstract

Molecular biology is a branch of biology that concerns the molecular basis of biological activity between biomolecules in the various systems of a cell including the interaction among DNA, RNA, Protein and their biosynthesis as well as regulation of their interaction.

Much of molecular biology is quantitative, and recently much work has been done at its interface with computer science in bioinformatics and computational biology. In the early 2000s, the study of gene structure and function, molecular genetics has been among the most prominent sub-fields. However, this is developed now as in fields in evolutionary biology such as population genetics and Phylogenetics. The developed countries around the world, which accomplished their biological documentation very timely has been focusing on gene level (whole genome) of each genus or species. The countries which have recently completed their flora or fauna have verified the morphological work with molecular evidence. The developing countries like Nepal are still struggling for flora and fauna records mainly based on morphology. However, sooner or later, our destination is the same. Ultimately, we need to verify or investigate all biological resources at the molecular level for future research and their exact and proper utilization. So, this paper will emphasize how we can link molecular work for the support of floral documentation in Nepal and what strategies can be adopted ahead.

Keywords: Molecular study, Application, Importance, Taxonomy, Phylogeny

Wetlands environment for the integrated development of Taltalaiya (TTL) in Itahari Metropolitan City, Sunsari District, Province 1, Nepal

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Abstract

This article is based on the study done by CODEFUND under the program of Department of Forests and Soil Conservation, Kathmandu, Nepal following the prescription of Integrated Lake Basin Management (ILBM) tool adopted by International Lake Environment Committee Foundation/Japan in the process of developing Integrated Lake Basin Management Plan of the Taltalaiya. The expert conducted a socio-economic and environmental assessment of TTL in June/July 2019. TTL is a lowland freshwater perennial compound lake with a subsurface drainage basin situated at 135m asl across the coordinates 2641'59.93"N and 87 29'00.42"E in wards 2 and 3 of the Itahari Sub Municipality City. Its basin is stretched to 352 in two community forests; the Shantinagar and Saraswoti. Core wetlands hold 20.2 ha (5.7% of total area), marshland is the key domain (83% area). The area is resided by the heterogeneous population of the Terai Brahmin and Chhetri, hill and Terai indigenous ethnic groups, Dalit of hill and Terai, and other groups (Number: 21, 834, HHs: 4,551) with an average HHs size of 4.75 and Male/female sex ratio of 106.2. TTL is an interface of lowland Terai and foothill of the Siwalik environment with the subtropical climate [Average Max-Min temperature: 11.5⁰ C, Minimum: 4.5°C and Maximum: 36.5°C, Average rainfall: 100.4 mm in June]. It is featured with the lotic system of the *Buddhi Khola*, which does not touch directly but influences TTL in many ways and the *Sera Khola* in the west which remains dry in

winter but gains water and turns perennial once it passes downstream to Itahari where it is named as the *Tengra Khola*. The *Tengra-cum-Sera Khola* originates from the Mahabharat range and runs down 3.46 Km to south. The 2nd feature is the slow-motion water, the marshland and many water-tanks, *Tengra* and *Tengri* the key ones. Water quality shows the spectrum of pH as 6.68, Turbidity: 2,25 NTU, TSS: 88 mg/l, TDS: 239.2 mg/l, nitrates: < <0.05 mg/l, Chlorides 2.4 mg/l, Total Hardness: 121.4 mg/l, Fe: 0.59 mg/l, Ar: <0.005 mg/l, total Coliform: 27.67 CFU/100 ml, faecal Coliform: 5 CFU/100 ml, SO₄: 21.4 mg/l, P: <0.05 mg/l, Na: 8.39 mg/l, K: 4.612 mg/l, Pb: 0.03 mg/l, BOD: 25.494 mg/l, COD: 48 mg/l, and OD: 5.63 mg/l. Water quality fully comply with the Nepal Water Quality Guidelines for Irrigation Water 2065, Nepal Water Quality Guidelines for Aquaculture 2065 (except alkalinity; ammonia; magnesium; copper; and fluoride), Nepal Water Quality Guidelines for Livestock Watering 2065, and the National Drinking Water Quality Standard 2062 (except color, cadmium and fecal coliforms). The physical color of lake water is greenish-brown. Water is non-arsenic and slightly acidic but suitable for the wildlife, domestic use, aquaculture and irrigation. Such water destiny is resultant to four types of forests with Tropical and Subtropical features i.e., Sal forest, Teak forest, Riverine forest and Garden forest; all with a low canopy cover of about 44%. The stock of hardwood is more than 2,333 ft³, fuelwood stock > 34,529 Kg/ha, merchantable wood 49 m³ and carbon stock 489.56 ton/ha, all these the indicators of forests' wealth in view of bio-resources as well as the economy that forests may contribute if properly planned. The combination of climate, hydrology networks, physiochemical parameter, and vegetation condition together forms the ecological background for biodiversity wealth of TTL, which holds 85 species of flora (Family: 55, Genera: 78, Species: 70 (dicot) + 10 species (monocot) + 4 species (pteridophyte) + 4 species (unknown category)). Dicot-monocot ratio is 7:1, 86 % of species are from terrestrial habitat, whereas 14% from wetlands, and of the total, 42 species belonged to trees, 16 to shrubs, 21 to herbs and 6 to the climber. Among fauna, it is reported to hold 111 species of vertebrates and 14 sp. of invertebrates (Mammalia: 19 species, Avifauna: 63 species, Herpetofauna: 21 species and Pisces: 8 species). Species enumeration of both the flora and fauna would go higher if the survey at different intervals is conducted. Besides, there is adequate evidence of invasive plants such as *Lantana camera*, *Parthenium hysterophorus*; *Mikania macrantha*; *Eichornia crassipes*, *Ipomea carnea* and *Pistia stratiotes*. TTL holds 1 endangered plant *Rauwolfia serpentina*, 2 endangered mammals *Elephas maximus* (Asiatic Elephant) and *Manis crassicaudata* (Indian pangolin), 1 endangered herpetofauna i.e., *Indotestudo elongata* (Elongated Tortoise), and 1 Vulnerable bird i.e., *Leptoptilos javanicus* (Lesser adjutant). Wetlands, vegetation, and wildlife biodiversity are such a great bio-wealth that TTL becomes a representative wetlands 'The ultimate destiny of all, socio-ecologically wholesome, untainted and heavenly' place in the eastern Nepal which has been under active management under the umbrella of the Taltalaiya Development Conservation Committee since 1998. After this, the erstwhile District Development Committee and municipality, and now the Local, State and Federal governments have been providing financial and regulatory inputs in TTL. As a result, the vicinity of TTL has been evolving as the tourism market with accommodation and communication facilities. Now, TTL is furnished with a full-time secretariat and amenities for the

recreation such as wetlands and lakes, stone-sculpture park, Children Park, plantation area, mini-zoo-cum-wildlife rescue center, flower garden, picnic spots and so on, which has inclined trend of annual visitors >100,000 in 2019 generating revenue of NPR >9.95 million a year. The integrated management of these wetlands following the prescription of ILBM may result in the sustained wetlands' productivity having pronounced potential contributing to the tourism economy of State-1 in Nepal.

Keywords: Wetland, Biodiversity, Integrated development, Taltalaiya

Translating access to genetic resources and benefit-sharing into practice: Prospects and challenges in Nepal

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Abstract

Access to genetic resources and benefit-sharing (ABS) has been regarded as a market-based approach aimed at conservation and sustainable use of biodiversity. The Convention on Biological Diversity (CBD) and its Nagoya Protocol provide clear guidelines for establishing *sui generis* systems to regulate access to genetic resources and associated traditional knowledge and benefit-sharing. ABS remain the priority programme of the Government of Nepal. Despite stakeholders' willingness to cooperate and government's readiness to translate ABS provisions into practice, lack of policy and institutional mechanisms and inadequate capacity have hindered the overall process. However, the recent accession of Nagoya Protocol has opened the opportunities to enact the ABS Law and prepare the Rules and Strategy to implement the Law. The ABS Bill is in the final draft form and is in the process of adoption. Different collaborating partners including the Government of Nepal, Tribhuvan University, IUCN and ICIMOD have contributed to capacity development, awareness-raising, and policy dialogue. This paper will present the preparedness of the Government of Nepal on ABS and discuss the complexities for implementation. Finally, the areas for potential collaboration and cooperation among the government, private sector, and researcher will be discussed.

Keywords: Access and Benefit Sharing, Biological Resources, Bioprospecting, Conservation, Traditional Knowledge

Oral Session: Higher Plant Diversity and Systematics

Bio-economic development in Nepal: Opportunities and challenges

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Abstract

Nepal Himalaya is unique and well recognized globally for its rich biodiversity. Along with multicultural, multilingual and multi-religious country is a good example of having rich bio-cultural diversity as well. Its rich biodiversity has been a unique wealth as the source traditionally of a great variety of herbal medicines, wild food, fodder, biofuel, as well as raw material for handicraft industries, etc. In the recent perspective, these resources have been used for the economic growth of the country as well. 'Bio-economy', which describes the idea of a new industrial order that relies on biologically-based materials, technologies and 'services', may best be described for these resources. But it seems that 'Bio-economy' is now threatening biodiversity, fueling land grabs and enabling new corporate claims on nature. For instance, Nepal's forests are mostly located in rural areas. With increasing road access and mobility, rural communities are now getting opportunities to stimulate and diversify their economic opportunities both in the national and global markets. But at the same time the resources are highly being threatened due to and illegal trade especially of the medicinal plant, massive extraction of caterpillar fungi "Yarsagumba, raw material like Himalayan wild nettle, bamboo, lokta, etc. Switching the cultivation of food crops to bio-fuel displaces food crops resulting in a significant increase in food prices. These biofuel crops (*Jatropha*) compete with valuable and fertile land used for growing crops. The pressure on land for food and biofuel crops has speed up deforestation and disturbance to the natural habitat which may be one reason for climate change. Climate change is already threatening ecosystems with severe consequences in loss of biodiversity and crisis of local livelihood across the world. This paper will discuss some of the important cases of biodiversity base industries in Nepal, its global opportunities and the challenges that they are facing now and will face in the future.

Keywords: Bio-Economic, Opportunities, Challenges

Aquatic and semi-aquatic angiosperm diversity of Marchwary rural municipality of Rupandehi with special reference to ethnobotanical survey

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Abstract

As producers, aquatic and semi-aquatic plants are the most important components in the wetland ecosystem. It is therefore, necessary to record and assess the diversity and potentiality of these aquatic and semi-aquatic plant communities. In the present study on aquatic and semi-aquatic angiosperms of Marchwari rural municipality of Rupandehi 45 species belonging to 37 genera of 26 families were identified. Out of total 45 species, 27 were dicot species belonging to 22 genera of 16 families while 18 species were monocot belonging to 15 genera of 10 families.

Keywords: Aquatic, Semi-aquatic, Marchwari, Rural municipality, Ethnobotanical

Herbarium specimens of the endemic flowering plants of Nepal

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Abstract

Endemic plants of Nepal have been collected more by foreign researchers than Nepalese botanists. The Herbarium of national institutions (KATH, TUCH) also lacking the herbarium specimens of the majority of endemic species described from Nepal. Furthermore, a comprehensive database dealing with the herbarium specimens of the Nepalese endemic plants is also lacking in Nepalese institutions. An attempt has been made for the first time to prepare a comprehensive database of herbarium specimens of Nepalese endemic plants housed in Nepal and abroad managed by 50 institutions of 19 countries. Scattered information about type specimens and other specimens were gathered together. All the information was extracted from the online database, published literature and deposited herbarium specimens. Altogether 2043 records of 312 species of endemic flowering plants of Nepal were compiled with information on holotype, isotype, paratype, syntype as well as other type specimens and other herbarium specimens deposited in different herbaria of the world. This information could be a milestone for the research and conservation of endemic flowering plants of Nepal.

Keywords: Biodiversity database, Botanical explorations, Conservation, Herbarium specimens

Higher plant diversity of Annapurna Rural Municipality of Myagdi district, Province Four (Gandaki State), Central Nepal

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Abstract

Chandra Samsheer, Prime minister (1901-1929) of Nepal got to Major Lall Dhwoj Sunuwar to collect herbarium specimens and seeds for King George V of England. In 1931, Major Sunuwar collected herbarium specimens along the edge of Kali Gandaki and in the area of Mustang (Central Nepal). Then after many researchers have done plant exploration work in Mustang and Myagdi district. But there is no information about plant species distributed in Myagdi district particularly in between east of Kali Gandaki and southwest area of Annapurna Himal first. This area belongs to Annapurna Conservation Area (ACA), within Annapurna Rural Municipality-4 of Myagdi district. In 2017-18, five in number field trips were carried out there to document higher plant exploration. In fieldwork, photos of flowers from different angles and herbarium specimens were taken. A total of 252 species of Angiosperms (Flowering Plants and Gymnosperms) belonging 83 families and 187 genera were identified. Endemic species *Begonia tribenensis*, *Hypericum cordifolium*, *Rhododendron lowndesii*, *R. cowanianum* and *Roscoea nepalensis* were very first time recorded in Myagdi district. Similarly, 12 ferns and fern-allies species were identified. This research tells Annapurna Rural Municipality-4 of Myagdi district is important for endemic species distribution. Further exploratory work is essential to carry out there.

Keywords: Kali Gandaki, Annapurna Conservation Area, Biodiversity

Garden flowers in Tansen Municipality, Palpa

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Abstract

Floriculture is a branch of horticulture that deals with the cultivation, management and production of flowering and ornamental plants for home gardens, offices, institutions as well as floral industries. Flowers are most commonly used for decoration purposes and necessary to all communities and religious groups to celebrate various ceremonies. The demand for floriculture products is increasing day by day in the national and international markets. This study is carried out to identify the major garden flowers in Tansen Municipality which lie in the altitudinal range of 700 m to 1500 m asl. A total of 70 garden flowers belonging to 60 genera and 35 families were recorded from the study area. Among these, herbaceous species were most dominant comprising 58% of species while shrub comprises 30% and both trees and climber consist of 6% each. The perennial plants are found most commonly cultivated in gardens which include 73% of plants. The annual plants are found 24% and the biennial is very least consisting of only 3% of total plants. The highest number of species (11 sp) is found in Asteraceae family. Similarly, 5 species occurred under Malvaceae and 4 under Solanaceae. The genus *Hibiscus* and *Petunia* comprises 3 species each. The genus *Chrysanthemum*, *Dracaena*, *Euphorbia*, *Pelargonium*, *Sedum* and *Tagetes* includes 2 species in each.

Key words: Floriculture, Herbaceous, Market, Ornamental, Perennial

Emerging values of Kiwifruit (*Actinidia* Lindl.) with emphasis on *Actinidia chinensis* Panch. and *Actinidia deliciosa* (A.Chev.) C.F.Liang and A.R.Ferguson

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Abstract

Fruits consumption has a reduced risk of chronic diseases. Kiwifruits are key sources of many nutrients, vitamins, proteins, carbohydrates, fats, minerals, energy, organic acids, enzyme, and medicine. The different parts are used as food and in traditional medicine. The plants are also a good source of triterpenoids, phenolic compounds (flavonoids, polyphenols, anthraquinones, and coumarins), glucosides, volatile compounds and essential oils, and also have a wide range of pharmacological properties including antitumor, antioxidant, anti-inflammatory, immune-regulatory, hypolipemic, anti-diabetic, and cardiovascular defensive. It may be beneficial in the reticence and treatment of

pathologies linked to cancer, oxidative stress and aging. In this paper, we mainly focus on the diversity, distribution, medicinal and food values, including the phytochemicals constituent, and pharmacological activities to provide the reference for its in-depth research. The various health benefits of kiwifruit offer attention to their regular use.

Keywords: Diet, Edible plant, Health benefit, Nutritional importance

Floristic composition of Eastern Mid-Hills of Nepal

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Abstract

Exploration, identification, characterization, and conservation of floristic genomes are major sights of plant systematics. Anjejung-Jorpokhari area has a unique landscape with a religiously protected forest, community forests and national forests in the temperate and sub-alpine climate with wetland Jorpokhari in Midhills of Eastern Nepal. The floristic study was conducted during the year 2014/2015 aim to enumerate flowering plants within an elevation range of 600 to 2500 m asl. Altogether 489 species of flowering plants were recorded belonging to 79 families 346 genera; among them, 60 families, 272 genera and 382 species were dicotyledons, 18 families, 73 genera and 105 species of monocotyledons and 2 species of Gymnosperms. Lamiaceae family was the most dominant family with 29 species followed by 29 species of Asteraceae and 10 species of Ericaceae. There were 254 herbs, 40 shrubs, 116 trees, 51 climbers, 27 epiphytes and 1 other species of tropical and temperate plants. Among these lists 25, wild edible fruits and 50 traditional medicinal plants were reported. Three endemic plant species, 12 species included in CITES appendices and 2 invasive plants of Nepal have matched the governmental list. The study mirrored the significance of every landscape of the mountain ecosystem; a repository of biodiversity, ecosystem services.

Keywords: Beta-diversity, Biodiversity, Floristics, Ecosystem services, Species richness, Panchthar

Diversity and conservation of *Senecio* Linn. in Nepal

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Abstract

Nepal houses 14 species of *Senecio* Linn. from family Asteraceae. Species exhibits a remarkable amount of morphological variations and occurs in extremely diversified

habitats from tropical to alpine zones of different phytogeographical regions of Nepal. Among the 14 species, 11 species viz. *S. albopurpureus* Kitam., *S. candolleanus* Wall. ex DC., *S. echaetus* Y.L.Chen & K.Y.Pan, *S. graciliflorus* Wall. ex DC. *S. kumaonensis* Duthie ex C.Jeffrey & Y.L.Chen, *S. nudicaulis* Buch.-Ham. ex D.Don., *S. panduliformis* Kitam., *S. ramosus* Wall. ex DC., *S. raphanifolius* Wall. ex DC., *S. royleanus* DC. and *S. topkegolensis* Kitam. are endemic to the Himalayas and 2 species viz. *S. panduliformis* Kitam. and *S. topkegolensis* Kitam. are endemic to Nepal. Global and national conservation status for the species are unknown but 10 species out of a total of 14 species are reported from the different protected areas of Nepal. However, there are no reports of the occurrence of 4 species viz. *S. candolleanus* Wall. ex DC., *S. panduliformis* Kitam., *S. ramosus* Wall. ex DC. and *S. topkegolensis* Kitam. from any of the protected areas assigned in Nepal. The species, *S. panduliformis* Kitam., endemic to Nepal had been reported only as of the type specimen in 1969 from Aisyalu kharka, Khotang, east Nepal and *S. topkegolensis* Kitam., another species endemic to Nepal, was reported as the type and a voucher specimen only. Scarce reports of species endemic to Nepal from unprotected habitats, some Himalayan endemics inhabiting outside the protected areas and present trend of habitat destruction due to natural processes and anthropogenic activities indicate the situation as alarming and signals the need to conserve the species.

Keywords: Conservation, Habitat destruction, Endemic species

Wall flora of Mahendranagar municipality

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Abstract

Wall florae are the plants growing on the manmade habitats' like walls, fences buildings, temples, etc. A total of 111 species belong to 87 genera and 33 families of angiosperm are found on the walls of Mahendranagar municipality. All the types i.e. herbs, shrubs, and trees are reported, among them herbs are dominant. The major wall florae associated with different walls are *Ficus*, *Amaranthus*, *solanum*, *Adiantum*, *Dryopteris*, mosses, some monocotyledonous grasses, etc.

Keywords: Wall flora, Habitats, Herbs, Shrubs, Tree

Oral Session: Ichthyology

Endemic fish species of Nepal

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Abstract

A recent report on fishes of Nepal indicates 252 species among them 236 species are indigenous while 16 species are exotic. Seventeen endemic species of fishes so far reported with some duplication should be upgraded to 19 on the basis of their existence in Nepal. Further inclusions of the species are *Pseudecheneis eddsi*, *Pseudolaguvia assula*, and *Neoanguilla nepalensis*. Schizothoracine fishes' endemic to Lake Rara and *Psilorhynchus pseudecheneis* are considered as endemic to Nepal. These endemic fishes are included under the families Cyprinidae, Psilorhynchidae, Balitoridae, Nemacheilidae, Bagridae, Sisoridae and Anguillidae. A greater part of these species is vulnerable and insufficiently known.

Keywords: Nepalese endemic fishes, conservation

Food and feeding behaviour of Tank goby *Glossogobius giurius* (Hamilton and Buchannan, 1822) of Singhiya River, Biratnagar

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Abstract

In the present study, an attempt has been made to investigate the food and feeding habits of *Glossogobius giurius* collected from Singhiya River, Biratnagar. During this study, 60 specimens were collected on a monthly basis from March to August 2019. On the basis of percentage of occurrence of gut content analysis most preferred food item was small fish (41.80%) followed by Crustaceans (24.60%), Insects (11.50%), Mollusca (9.80%), detritus and debris (6.50%) and Protozoans (5.70%). The relative gut length shows an increasing trend from size 6.6-7.6 cm SL having the highest peak at size 11.6-12.6 cm SL and suddenly decreased from size 12.6-13.6 cm SL, which is due to its maturity age. The gastro-somatic index was highest at size 5.6-6.6 cm SL, which indicates the voracious nature of fish at the smaller size. The total body length and body weight shows a positively significant with alimentary canal length ($r=0.9077$) and alimentary canal weight ($r=0.8963$)

respectively. The food and feeding behavior of this fish showed that it is carnivores in nature.

Keywords: Relative gut length, Gastro-somatic index, Carnivores, Gut content, Food and feeding habits

EUS infected fishes and its isolated bacteria in eastern Nepal

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Abstract

The present study deals with isolation, characterization and identification of bacteria from EUS infected fishes and pathogenicity of isolated bacteria from EUS affected fishes from eastern Nepal. Out of six water bodies EUS outbreaks were recorded in three fish farms S₁, S₂ and S₃ from 2008-2015. Generally, the outbreak of EUS takes place in the month of December and persists up to March. Altogether 444 naturally EUS affected fishes were collected and examined. The order of susceptibility was about 60% *Cirrhinus mrigala*, 30% *Labeo bata* / *L. rohita*, 7% *Catla catla*, 3% *Channa striatus*, *Puntius* sp., *Heteropneustes fossilis*, *Mystus tengara*, *Clarias batrachus* and *Lepidocephalichthys guntea* (rarely) among affected fishes. Bacteria were isolated from the ulcers of naturally infected *Cirrhinus mrigala*, *Catla catla*, *Channa striatus*, *Puntius* sp., *Mystus tengara* and *Labeo bata*. Among 23 isolates, 2 belong to *Pseudomonas* sp. from Lb₁ and Cc₄, 2 belong to *Micrococcus* sp. from Cm₂ and P₄, 14 bacteria were of *Aeromonas hydrophila* isolated from Cm₁, Cm₃, Cs₁, P₁, P₃, Lb₂, Lb₃, Cc₁, Cc₂, Cc₃, Mt₁, Mt₂, Mt₃ and Mt₄. 1 belongs to *Moraxella* sp. from P₂, 1 belongs to *Aeromonas veroni biovar sobria* from Lb₄ and 3 belong to *Aeromonas caviae* from Cm₄, Cs₂ and Cs₃. All together 20 bacterial isolates were pathogenic and 3 were non-pathogenic. EUS (Epizootic Ulcerative Syndrome) is the major microbial fish disease in eastern Nepal.

Keywords: EUS, Fish disease, Bacteria, Pathogenicity, Baidya, Babiya Birta, Tarahara

Anthropogenic impact on fish of Tamor River, Nepal

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Abstract

Rivers of Nepal have long been affected by different types of human interventions of negative impacts. Considering the existing trends of human activities to impose pressure

on fish species in the Tamor River, a survey was carried out to identify the types of impacts the fish are suffering from. Seven stations were fixed along the river course approximately at equal distances to make observations. All stations were visited three times in one year, in March, July and October in 2019, representing three seasons. The questionnaire and direct interview method were suitably used. In Tamor River, due to many human activities like construction of the dam in the upper reaches for generating hydroelectricity, uses of pesticides in the agriculture lands, burning dead bodies near riversides, all these activities alter the quality of water from time to time and affect fish species whatever ways the chemicals can. Uncontrolled uses of modern fishing techniques such as electrofishing, gill net, poisons illegally were found to have been efficient means for fish population decline. As per local fishermen, the fish population in Tamor River has declined sharply within five years, after the modern fishing techniques brought in use. Above all, lack of public awareness about their accountability using the natural aquatic resources sustainably seemed to play a great role in creating many more problems in the present and future.

Keywords: Tamor River, Human impact, Fish fauna, Electrofishing, Pesticides

Toxicity of heavy metal Cadmium Chloride to an airbreathing fish *Anabas testudineus* with behavioural response, blood glucose and plasma protein

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Abstract

The effect of heavy metal Cadmium Chloride on air-breathing fish *Anabas testudineus* was worked out. Bioassay to determine LC50 value of Cadmium Chloride for 24,48,72 and 96 hours was conducted following the procedure given by APHA (1985). Fish anesthetized with 1:4000MS222 (Tricane methane sulphonate, Sandoz), blood was collected with the help of 1ml disposal syringe and centrifuged. Serum was collected in different vials and stored at 20°C until analyzed. The optical density of both blood sugar and plasma protein was measured with the help of a spectrophotometer. Behavioural response of test fish observed was jumping tendency, high opercular movement in sublethal treatment whereas at higher concentration of CdCl₂ fishes were restless, secreted more mucus, loss of pigmentation of skin were observed. Blood sugar level at 10 days and 20 days treatment period showed an increase of 7.009% and is significant at p<0.05 for 10 days and depletion by (33.43%) and highly significant (P<0.001) in 20 days. Plasma protein at 10 days and 20 days treatment showed a loss of 23.78% and significant at P<0.001 in 10 days whereas loss of 51.57% in 20 days, which was significant at P<0.001.

Keywords: Bioassay, Behavioural response, Air

Oxygen uptake in relation to body weight in Hill stream long-tail catfish *Olyra longicaudata* (McClelland, 1842)

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Abstract

The present investigation was carried out to predict the relationship between oxygen consumption (VO_2) and body weight (W) in hill stream long-tail catfish *Olyra longicaudata* from Chisang river basin, Letang, Nepal. The experiment was conducted at $27 \pm 1^\circ C$ using a cylindrical glass respirometer in fifteen fishes. The oxygen uptake in *Olyra longicaudata* varied from 0.7044 to 2.032 ($mlO_2 \cdot h^{-1}$) within the weight range of 0.8 to 5.2g. The estimated value (VO_2) for 1.0 g of fish is 0.7493 $mlO_2 \cdot h^{-1}$. The relation between oxygen uptake (VO_2) and body weight was determined by performing regression analysis using logarithmic transformation. The graph between the oxygen uptake per unit time and body weight gave a straight line with the slope 'b' value of 0.5806. The relationship between oxygen uptake and body weight was found to be positively correlated ($r=0.95$) indicating that as body weight increases, oxygen consumption also increases. But the weight-specific oxygen uptake decreases by a power of -0.419 showing a significant but negative correlation.

Keywords: Oxygen uptake, Bodyweight, Hillstream, *Olyra longicaudata*

Gonadosomatic index-based size at first sexual maturity of the Copper Mahaseer, *Neolissochilus hexagonolepis* (McClelland, 1839) from the mid-reaches of the Tamor River

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Abstract

This study depicts the size at first sexual maturity of a population of *Neolissochilus hexagonolepis* (McClelland, 1839) secured from the mid-reaches of the Tamor River, eastern Nepal. Sampling was done with the help of traditional fishing gears including cast nets and gill nets, between December 2014 and November 2016. A total of 105 specimens (82 males; 103 females) were sorted out according to their sex and total body weight (TW) and total length (TL) measured for each individual. Gonadosomatic index (GSI) was calculated by the equation, $GSI (\%) = (\text{Gonad weight in g} / TW) * 100$. The association between the gonadosomatic index and TL was used for the estimation of the

size at first sexual maturity. Spearman's rank correlation test revealed a significant correlation between GSI and TL for females ($r_s = 0.44177$; $p < 0.05$), but an insignificant correlation for males ($r_s = -0.21089$; $p > 0.05$). The sizes at first sexual maturity of male and female *N. hexagonolepis* were 15 cm TL and 30.2 cm TL, respectively. The data assembled during the present study is an important indicator of the minimum permissible capture sizes which could be assimilated in management plans for making sustainable conservational efforts for the near-threatened *N. hexagonolepis* population in Tamor River.

Keywords: *Neolissochilus hexagonolepis*, Tamor River, Sex ratio, Gonadosomatic index, Sexual maturity

An updated account on bryophytes of Nepal

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Abstract

Bryophyte still remains the least familiar plant in Nepal which has not been attended yet to conserve its rare, endangered and endemic status so far. These plants carry significant values being diversified and distributed at differentiated geographical pockets under varying degrees of gradient's effects. The entire diversity record of this plant in Nepal reveals a total of 323 genera and 1217 species. Of the total records, the hornworts (Anthocerotae) counts 4 genera and 11 species, liverworts (Hepaticae) 107 genera and 435 species and 771 species of mosses (Musci) till date. This also includes 31 endemic species recorded at different geographical regions of the country. The altitudinal habitats at 2000-3000 m of elevation represented rich diversity with 465 species which declined subsequently on elevation rise. The current scenario of deforestation has imposed a direct impact on many valuable species of this plant which are neither documented before nor monitored for their present status. Many potential areas of the country are losing significant habitats of this plant by human encroachments and road expansions. It has been felt necessary to conduct a detailed survey of this plant country wise which may help to add more species to the list. Many species of this plant can be used for human benefits which still remained least familiar among Nepalese society. Community-based awareness programs are an utmost need that not only safeguard many rare and endangered species also help to increase the socio-economy of the village peoples if used in a sustainable way.

Keywords: Anthocerotae, Bryophytes, Diversity, Endemic, Hepaticae, Musci, Nepal

The freshwater red alga *Compsopogon caeruleus* (Compsopogonophyceae, Rhodophyta): A new report for Nepal

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Abstract

Most of the red algae are marine and there is a very limited number which occurs in freshwater environments like small streams, rivers, ponds and lakes as well. In Nepal,

studies on freshwater algal flora, especially on desmids and diatoms are well-known, but only four species of freshwater red algae i.e., *Batrachospermum gelatinosum* (= *Batrachospermum moniliforme*), *Nemalionopsis shawii*, *Sheathia indonepalensis* and *Sheathia dispersa* were reported till date. *Compsopogon caeruleus* (Belbis ex C. Agardh) Montagne is the fifth red alga reported for the first time from Nepal in this study. The genus *Compsopogon* is monospecific and it is widely distributed throughout the world, mostly in the tropical and subtropical regions. We collected an abundant quantity of this species growing attached to stones in a shallow flowing water of Budhi Khola river at Sundarharaicha Municipality, Morang during February and March 2018. Thallus morphology and structure of the Nepalese specimens are described and illustrated in detail. The alga is characterized by macroscopic filamentous thallus, epilithic or epiphytic in the Budhi Khola river, bluish-green or reddish-brown colour; filaments entangled, slender, branched repeatedly and profusely, up to 40 cm long and 20-350 mm in width; main axis multiseriate, corticated; young branches uniseriate, forming acute angle with main axis, with rounded ends; axial cells barrel-shaped, without colour; cortical cells spherical, polygonal to cuboidal in shape, smaller than the axial cells. Reproductive structures like monosporangia were not observed.

Keywords: Rhodophyta, *Nemalionopsis shawii*, *Sheathia indonepalensis*, *Sheathia dispersa*, Cortical cell

Seasonal variation of phytoplankton diversity with water quality at the shoreline of Beeshazar Lake, central Nepal

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Abstract

Shoreline ecotone is a transitional zone between wet and dry environments where the vegetation depends upon regular fluctuations in water characters. This paper determined the seasonal fluctuation in physio-chemical parameters of shoreline water such as temperature, pH, dissolved oxygen, total dissolved solids and conductivity which had brought variations in phytoplankton diversity seasonally. A total of 42 plots with quadrat sized (1 x 1) m² was laid down at the shoreline of Beeshazar Lake each plot being 30 meters apart from the adjacent plot for the quantitative analysis of phytoplankton and to measure water parameters digitally. The value of pH (7.92 ± 0.05), DO (10.72 ± 0.26 mg/l), TDS (45.98 ± 0.34 mg/l) and conductivity (83.95 ± 0.59 μ S/cm) were recorded high during winter while temperature ($31.01 \pm 0.26^\circ\text{C}$) during monsoon season. A total of 45 phytoplankton genera was recorded during both the seasons. Chlorophyceae was the dominant class followed by Bacillariophyceae and Cyanophyceae during monsoon and followed by Bacillariophyceae, Cyanophyceae, and Euglenophyceae during the winter season. Shannon-Wiener Index ($H = 2.776 \pm 0.021$) was high during monsoon. *Closterium*

sp. and *Glaucocystis* sp. (both $F = 88.095$) were more frequent and *Gomphonema* sp. ($D = 11.667$) was highly dense during monsoon while *Gomphonema* sp. ($F = 95.238$) was more frequent and highly dense ($D = 15.857$) during winter. Phytoplankton species richness showed week negative correlation with and week positive correlation with temperature during monsoon. Similarly, it had a strong negative correlation with TDS and week positive correlation with DO during winter.

Keywords: Density (D); Frequency (F); Physico-chemical parameters; Shannon-Wiener Diversity Index (H); Species richness; Evenness (E)

Pteridophytes of Phulchowki Mountain, central Nepal

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Abstract

The present paper provides a list of pteridophytes found in Phulchowki mountain, Central Nepal, based on examination of herbarium specimens housed in National Herbarium and Plant Laboratories (KATH) and International Herbaria (BM, E, K, KYO, TI and MICH). A total of 102 pteridophytes are recognized. Important specimens are cited for each species. Ecology and key to the species are provided for the identification of species.

Keywords: Ecology, Key, Herbarium specimens, Pteridophytes

Dynamics of red bloom algae of *Euglena sanguinea* in earthen ponds

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Abstract

The present study evaluated the dynamics of red bloom algae of *Euglena sanguinea* in earthen ponds with or without the presence of sunlight. An experiment was conducted in naturally occurring non-red and red algal bloom ponds with and without plastic cover in earthen ponds from November 20 to 25, 2016. The water sample was collected two different pond depth in three time periods, the light intensity measured from morning to evening by using lux meter and red blooming intensity monitored by using a video camera. Results showed that maximum red bloom algae, i.e. *Euglena sanguinea* abundance were significantly higher ($p < 0.05$) in red algal bloom pond at 10 cm pond depth of afternoon shift (1190 ± 30 cells⁻¹) than morning (470 ± 10 cells⁻¹) shift but statistically similar ($p > 0.05$)

with evening shift (650 ± 10 cells⁻¹). Influence of light on *E. sanguinea* was only seen in red algal bloom pond and maximum red blooming was observed from 11.30 to 13.30 hours with light intensity 1720 to 1734 Lux. *E. sanguinea* population was found to be more than 80% in red algal bloom pond which plays the role in red blooming. Water quality parameters such as TP, nitrite, TDS, and conductivity in the red pond were significantly higher ($P < 0.05$) than non-red ponds but significantly ($p > 0.05$) lower than the red covered pond.

Keywords: Dynamics, *Euglena sanguinea*, Light intensity, Water quality

Studies on diatoms (Bacillariophyceae, Algae) of Tamor River, Mulghaat, Dhankuta

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Abstract

Freshwater diatoms of Tamor River, Dhankuta has been studied in 2018-19. Samples were collected by Plankton net, quadrat method (10×10 cm²), and brushing the slimy surface of the stones from three localities along the river edge during October, December and April. A total of 44 diatom taxa belonging to 24 genera under 17 families and 12 orders were enumerated. The maximum occurred genera were *Ulneria*, *Gomphonema*, *Navicula* whereas least occurred genera were *Achnanthes*, *Amphora* and so on. The maximum number of diatoms was collected during October whereas the minimum number of diatoms was collected during December. The algal flora of Tamor River (Mulghaat) is rich and diverse. It needs further extensive exploration to document and conserve the algal flora.

Keywords: Freshwater algae, Phytoplankton, *Gomphonema*, *Craticula*

Study of ferns and fern-allies of Dharan, eastern Nepal

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Abstract

The study was conducted to provide an overview of fern and fern-allies present at Dharan sub-metropolitan city. Plants were identified at National Herbarium and Plant Laboratories, Godawari (KATH). A total of 27 species, belonging to 20 genera and 11 families were recorded. Out of these, the dominant families are Pteridaceae, Thelypteridaceae, Dryopteridaceae and Polypodiaceae. The dominant genera are *Pteris* (three species),

Thelypteris (three species). Among 27 species, 4 species have food value, 3 have medicinal value and 5 have ornamental value. Ferns used as green vegetables are *Thelypteris prolifera*, *Diplazium eaculentum*, *Dryopteris cochleata* and *Tectaria coadunata*. Similarly, ferns with medicinal values are *Adiantum incisum*, *Adiantum philippense* and *Aleuritopteris bicolor*. Fern and fern-allies with ornamental values are found *Onychium siliculossium*, *Polysticum lentum*, *Nephrolepis cordifolia*, *Phymatosorus cuspidatus* and *Pyrrosia costata*.

Keywords: Pteridophytes, Dharan, Fern and Fern-allies

A case study of *ex-situ* conservation on *Zanthoxylum armatum* DC. in Khokana village, Lalitpur District, Nepal

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Abstract

Zanthoxylum armatum, a native medicinal and aromatic plant of Nepal is a globally valuable natural resource and economic plant distributed in the mid-hills of Nepal. The species is listed in prioritized high valued and market demand medicinal plants by the Department of Plant Resources, Government of Nepal. The plant is disappearing at a high speed in the natural habitat because of deforestation and infrastructure development. Successful propagation and *ex-situ* conservation of this species is compulsorily needed for improving ecological balance and livelihood improvement. We conducted experiments to study propagation requirements of native tree species in Khokana village which lies at an altitude of 1300 m. Seeds were propagated in 2015 at a medicinal plant nursery in Khokana village. Seed germination and seedling growth of this species in nursery environmental conditions were observed. Germination percentage of seeds ranged from 50-70% and the length of germination time ranged from four to eight weeks. Nursery grown seedlings were distributed to the educational institutions, local people, Non-government organizations for educational purposes, one house one tree concept and obviously for *ex situ* conservation. On the basis of observation in 2018, about 99 % of seedlings were successfully conserved and the plants produced fruits after three years of seed germination. This is one of the pioneer projects in Khokana, supported by the Department of Plant Resources, Thapathali, Kathmandu. On the basis of this experiment, we recommend that this type of research is necessary for the development of the medicinal plant's area in Nepal. This is one of the suitable species for propagation and *ex-situ* conservation.

Keywords: Medicinal and aromatic plants, Seed propagation, Germination, Conservation

Bamboo culture in Santal and Meche ethnic groups of tarai region of eastern Nepal

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Abstract

Bamboo is one of the important forest products which provides food, raw material, shelter and play an important role in the rural community of Nepal. The plant is equally important for all castes and ethnic groups of Nepal including Santals and Meche communities. Among the ethnic groups, the Santals live in Jhapa, Morang and some in Sunsari districts, whereas, the Meches live in Jhapa district of Eastern Nepal who relies on bamboos for their subsistence. The population of Santals and Meches is 42,698 and 4867 respectively. Majorities of both communities are landless and tenants and built their houses in the middle of agricultural land and on either side of the village road near the stream. Usually, they have a small mud-made house, thatched with hay straws of paddy or Kas/reed grass and frame materials consist of bamboos, including some Sal wood and jute fibers. Both ethnic groups have been maintained their traditional skills and knowledge on bamboos for domestic and ritualistic purposes including house construction, handicrafts, furniture, fencing, hunting and fishing tools, etc. Bamboos have also used as food and other cultural and aesthetic values. An attempt has been made to document how bamboo culture is integrated into the daily life of Santals and Meches of Nepal.

Keywords: Bamboo, Socio-cultural uses, Meche and Santal communities, east Nepal

A review on trans-Himalayan trade of medicinal and aromatic plants from Nepal to China

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Abstract

The present study aims to explore the history of Nepalese Medicinal and Aromatic Plants (MAPs) trade to Tibet, and China, estimate the share of Nepalese MAPs traded to China, record the MAPs at species level in trade from Nepal to Tibet, China since ancient time to present, and reveal the threat status of those traded species. Most of the MAPs trade studies are focused on the domestic level and export to India. Few are focus on China in terms of volume and values but very few studies on the species level. For this, we review the existing literature related to Nepal-China trade relations including MAPs, track the

government reports and data, and conduct interviews with Tibetan bordered harvesters, local traders and exporters trading to Tibet, China. The study reveals the Nepalese MAPs were in trade to Tibet since the 8th century as a part of essential raw ingredients since the establishment of Tibetan medicine. In the present context, 11.76% volume of MAPs traded to China that worth 38.84 % value. The study records 46 MAP species traded to China, out of which around 17 species are annually traded. Out of them, 22 species are in one kind of threat categories. About 6 species of Orchids are traded, and all orchids are kept under CITES Appendix II. Though the mobility of high valued MAPs under the regulatory policy to China worth more, at the same time high demand from limited supply results the threat to depletion of resources in the Himalayan region. The pull and push factors in the mobility of Himalayan MAPs should be identified and managed properly for the trade sustainable.

Keywords: Medicinal and aromatic plants (MAPs), History, Trade, Threat category, Nepal, China

Efficacy of *Ocimum sanctum* (Tulsi) leaf extract as an anti-hyperglycemic agent in albino rats

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Abstract

This study aims to explore the potentiality of *Ocimum sanctum* (Tulsi) leaf extract as an anti-hyperglycemic agent with albino rats (Wistar strain) as an experimental animal model. Adult male rats, weighing between 117.0±12.0 g, were randomly divided into 3 groups, each having 6 rats, designated as control, diabetic and diabetic plus Tulsi leaf extract treated ones respectively. The diabetes was induced by giving an intravenous injection of alloxan monohydrate (70mg/kg body weight), dissolved in 0.9% solution of sodium chloride. A two week (14 days) oral supplementation of the freshly prepared aqueous suspension of Tulsi leaves (4.0 mg/kg body weight/day) to rats of Group3 brought significant recovery in the profiles of blood glucose, serum cholesterol and serum protein. Highly significant increase in blood glucose (242.84 ± 1.23 mg/dl against the control value of 94.98 ± 0.7; p<0.001) and serum cholesterol (194.32 ± 1.86 mg/dl against the control value of 117.83 ± 1.24, mg/dl; p<0.001) with a concomitant decrease in serum protein level (4.92 ± 0.34g/dl against the control value of 6.94 ± 0.62 g/dl; p<0.001) were registered in alloxan-induced diabetic group of rats. Group3 rats showed significant improvement (p<0.01) in all the above parameters with respect to Group 2 rats (blood glucose 163.42 ± 1.07 mg/dl; serum cholesterol 138.72 ± 1.26 mg/dl and serum protein 5.14 ± 0.72 g/dl) thereby reflecting anti-hyperglycemic property of *Ocimum sanctum* leaf extract. However, our study concludes that either longer duration or a higher dose of

Tulsi leaf extract treatment than those selected in this study are required for protection against diabetes.

Keywords: *Ocimum sanctum*, Diabetes, Rat, Blood glucose, Serum protein, Serum cholesterol

In vitro evaluation of *Rhododendron arboreum* (Sm) Trautu for potential antibacterial activity

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Abstract

In the present study, angiospermic medicinal plant *Rhododendron arboretum* (Sm) Trautu with traditional folklore values were selected to assess their antimicrobial properties against pathogenic bacteria. Different parts of the plant studied showed considerable antibacterial properties against the bacteria (*Staphylococcus aureus*, *Escherichia coli*, *Vibrio cholerae*, *Shigella dysenteriae* and *Shigella flexneri*) tested. *R. arboretum* possessed strong antibacterial potential. It is also evident that ethanol extract of leaf, stem and flower of *R. arboretum* were found to be potent in inactivating various Gram-positive and Gram-negative bacteria. From this study, the result obtained to confirm the therapeutic potency of *R. arboretum* used in traditional medicine. In addition, these results from a good basis for selection of the plant for further phytochemical and pharmacological investigation. The results of the present study support the folkloric usage of the studied plant and suggest that the plant extract possesses certain constituents with the antibacterial property that can be used as an antimicrobial agent in new drugs for the therapies of infectious disease caused by the pathogen.

Keywords: *Rhododendron arboretum*, antimicrobial properties

Inventory of non-timber forest products in Annapurna Conservation Area

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Abstract

Non-Timber Forest Products are goods of biological origin other than timber derived from the forest or associated ecosystems, which are, consumed either directly as food, drugs or medicine or which contribute non-consumptive values to human welfare. The first conservation area and largest protected area (7,629 km²) of Nepal, Annapurna

Conservation Area is one of the 10 most popular tourist destinations of the world. The study was conducted to identify and quantify Non-Timber Forest Products of the Annapurna Conservation Area and assess the status and distribution of prioritized species. Field inventory, consultative workshop, focus group discussion, key informant interview, preference mapping were the main tools used for the data collection. Annapurna Conservation Area included 179 species of plant-based Non-Timber Forest Products. Non-Timber Forest Product's species richness was found higher in Conservation Area Management Committees of Bhujung, Lwang and Jomsom Unit Conservation Offices and was lower in Lomanthang and Sikles. The higher number of socially prioritized Non-Timber Forest Products are available in Sikles (n = 33) followed by Lwang (n = 31) and Manang (n = 29) respectively. Yarsagumba (*Cordyceps sinensis*), timur (*Zanthoxylum armatum*), nyuro (*Dryopteris cochleata*), Ban Lasun (*Allium wallichii*) and kutki (*Neopicrorhiza scrophulariifolia*) are more demanding Non-Timber Forest Products. For local consumption, almost half the number (49.4%) of prioritized species was used. Yarsagumba and Timur were more preferred Non-Timber Forest Products in Annapurna Conservation Area. They are preferred by 52.6% (n = 30) and 49.1% (n = 28) of the existing Conservation Area Management Committees respectively.

Keywords: Conservation Area Management Committees, Unit Conservation Offices, Field inventory, Preference mapping

Extraction of natural surfactant from the bark of *Persea odoratissima* (Nees) Kosterm.

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Abstract

Increasing awareness of human health and the environment is concerned with the efficient selection of good quality natural cleansing products for clothing and beauty care products. Natural surfactants from the bark of *Persea odoratissima* (Nees) Kosterm. [Syn. *Machilus odoratissima* (Nees)], of family Lauraceae was extracted by using different solvents to evaluate some physical parameters like conductivity, pH, surface tension, viscosity, cleaning action in different concentrations. Foaming ability and foam stability were also observed to show that plant-based natural surfactants can be used as green alternatives for safe industrial preparations of soap, detergents, and home and beauty care products.

Keywords: Natural soap, Detergent, Biochemicals, Lauraceae

Cultivation and trade perspective of rosemary aromatic oil in Khotang district

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Abstract

Nepal is a producer, consumer and traders of essential oils derived from wildcrafted and cultivated indigenous and exotic plants. World estimated production of essential oils is 120,000 MT worth of 4 Billion US\$ and Nepalese share is negligible. Its emergence in the global market is limited by many constraints. Due to the diverse agro-climatic situation, it provides a niche for plants based high- value crops and production of essential oil. Besides the indigenous plant products, based on the market situations there is equal demand for the essential oil derived from exotic varieties presently cultivated in many mountainous and Tarai area of Nepal. Rosemary (*Rosmarinus officinalis* L), exotic aromatic crop, cultivation was initiated in Nepal involving private sector for essential oil production from a few years back. In context to the rural economy of province 1 of Nepal, the high-value (NPR 9000/kg) essential oil of rosemary could be new drivers of economic growth and competitiveness if it meets the international standard. Following Rosemary oil annual global consumption (300 MT) in the international market, it is expected to develop speedily in Nepal too, though its trade scale is narrow (<100Kg). Rosemary, as a high-value cash crop is considered by smallholder farmers of Khotang district to be profitable based on the performance of pilot-scale production (about 12-15Mt/Ha/Year of herbage and oil yields 1.0 – 2.0% of about 85 to 100 kg/Ha/Year can be obtained and major constituents are: α Pinene (35.10%), Eucalyptol (27.72%), Verbenone (5.99%), Camphene (4.73%), Isoborneol (3.73%), Camphor (2.88%) and Linalool (2.21%). Rosemary production could be an economic propeller to reduce poverty on the account of the farmers, who are engaged in this activity. The present paper aims to explore the cultivation and trade perspective of Rosemary in Khotang district of eastern Nepal. If the proper way is followed, mountain lives of province 1 will be improved, communities remain vibrant, and benefited through the trade of rosemary oil.

Keywords: Rosemary, Nepal, Essential, Production, Market, Exotic

Pattern of β -thalassemia and other haemoglobinopathies: a cross-sectional study in the ethnic groups of eastern terai Nepal

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Abstract

Thalassemia and structural haemoglobinopathies, the emerging global health problems are the major erythrocyte formation disorders prevalent in certain parts of the world including Nepal. Any population-based data on the prevalence of β -thalassemia and haemoglobinopathies are lacking in Nepal. The disease requires lifelong blood transfusion accompanied by iron chelation therapy. Therefore, prevention of births of homozygotes constitutes a major armament in the management of thalassemia. The main objective of this study is to find out the prevalence of haemoglobinopathies by screening a large population in Eastern Terai Nepal. The population of Musahar Dalit, Koch Rajbanshi, Kochila Tharu, Muslim and Santhal ethnic groups of Jhapa, Morang and Sunsari districts were studied. In this cross-sectional study, haematological parameters of 1500 blood samples of all age groups were estimated by an automated electronic cell counter. Peripheral Blood Smear was observed microscopically for red cell morphology. The cases with Hb, MCV and MCH less than 15 gm/dL, 80 femtolitres and 27 picograms respectively were analyzed for Haemoglobin pattern and quantification. The Haemoglobin quantification was done by capillary electrophoresis (Sebiamicap flex printing). Out of the 1500 cases 35 (2.33%) HbE homozygotes, 31 (2.06%) HbE heterozygotes and 51 (3.4%) β -thalassemia heterozygotes was diagnosed based on HbA₂ quantification. The haemoglobin disorders diagnosed were β -thalassemia heterozygote, HbE homozygote and HbE heterozygote. The presence of HbE gene in the Koch Rajbanshi of Nepal is being reported the first time. This study shows that haemoglobin disorders are prevalent in Nepal. The prevalence of HbE gene (3.8%) in the Koch Rajbanshi and β -thalassemia heterozygote (3.4%) in the Kochila Tharu, Musahar and Santhal ethnic groups is significant. Since the cost of lifelong treatment is beyond the reach of the common people. The control and management programmes for the birth of homozygotes and β -thalassemia/ HbE heterozygote must be promptly implemented.

Keywords: β -thalassemia, HbE homozygote, HbE heterozygote, Ethnic groups, Haemoglobin

Traditional uses of animals as medicine practiced by Dhimal people of Damak, Jhapa

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Abstract

Nepal is a multiethnic and multilingual country. There are more than 50 ethnic groups in Nepal. Among them, Dhimals are also an ethnic group having own tradition, culture, language and indigenous skills. They are found to be settled mainly in two districts of Nepal-Jhapa and Morang. The study was carried out from May 2004 to April 2005. The main purpose of the study was to document the animals used by Dhimal people for medicinal purposes. Direct involvement, interview and questionnaire methods were applied during the research work. Dhimals have preserved their traditional culture and indigenous knowledge to some extent. Overall 26 species were used in medicine. Dhimals used wild animals more than domesticated. They have sound indigenous knowledge about traditional medicine against various diseases.

Keywords: Indigenous, Ethnozoology, Jaundice, *Varanus flavescens*, Conservation

Effect of plant extracts on mortality of mosquito larvae

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Abstract

Mosquito is a great problem in tropical and sub-tropical regions which function as a vector of many diseases eg. malaria, meningitis, encephalitis, dengue, etc. Chemo pesticides have become dominant in pest control but it gives many chemopesticidal hazards. Botanical pesticides are an attractive alternative to chemo pesticides. This project was carried out on 2061 B.S. (2004 A.D.). Twenty plants were collected and observed pesticidal nature. Only nine plants had shown pesticidal nature so that nine plants were selected for this experiment. Experiments were conducted in the laboratory using earthen pots(containers). The plant extract was extracted from a fixed mass(100g) of the plant by grinding on an electrical grinder machine and soaked in water. The mortality concentration is 100% in 1% concentration of both *Euodia fraxinifolia* and *Zanthoxylem armatum* within 48hrs. The mortality rate is high in *Euodia fraxinifolia* in 24hrs. So that *Euodia fraxinifolia* is more effective to control the mosquito larvae.

Keywords: Common mosquito, Different concentration, Sewage water, Earthen pots, Triplicates

Ethnomedicinal uses of plants among Newah community of Chitlang, Makawanpur District, central Nepal

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Abstract

Diverse ethnic groups of Nepal rely on plant resources for cultural rites to relief from different ailments. The research was carried out from 2009 to 2011 in the Chitlang area of Makawanpur district where Newah (Newa:) community was dominantly inhabited. Ethnomedicinal use of wild and cultivated plants was documented through the open interview with local knowledgeable respondents. Altogether 95 medicinal plant species belonging to 92 genera and 53 families were recorded. Out of total species, 50 species were in natural habitat, 35 species cultivated in farmers' home garden and 10 species from both cultivated and natural habitats. The 95 medicinal plant species were used to treat 23 types of ailments including cough and cold, diabetes, skin diseases, cuts and wounds, blood pressure burns, itching, gastric, diarrhea and dysentery, rheumatism, bone fracture and jaundice etc. The common mode of application of drugs was decoction and paste. The commonly used plant parts were bark, leaves, fruit, root, tuber, rhizome and bulb. The traditional knowledge related to health care by using medicinal plants helps to aware people and concerned institutions for conservation of such important plants before they lost forever.

Keywords: Medicinal plants, Conservation, Illnesses, Traditional knowledge, Utilization

Ethnobotany on Musahar community in Dhanusa district central Nepal

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Abstract

Ethnobotany is the science of the study of the relationship between plant resources and their utilization by local culture and human. It is the medium of exploration, documentation and conservation of tribal knowledge that has been using by ethnic people since ancient history. This study was carried in 2018 on Musahar Community in Dhanusa district of central Nepal. The Musahar community is an indigenous people, they inhabit in the southern tarai region of Nepal. The semi-structured questionnaire was taken with key-informants between the age group of 25 to 70 years. A total of 87 species of plants belonging to 84 genera and 49 families has been using in Musahar community of Dhanusha district, Nepal. Among the total species, 35 species were herbaceous, 15 shrubs, 27 tree

and 10 climber habit. Musahar community people have been used to cure more than 25 health problems. Among these plants, 11 species used to cure diarrhoea, 10 species in cold and cough, 7 species to cure skin diseases, 6 species in jaundice, 5 species in dysentery, fever, urine related problem, kill roundworm and headache, 4 species in toothache, sinusitis and gastritis, 3 species in constipation, scabies, piles, fracture, skin ring, high blood pressure. Similarly, 2 species in-ear, throat problem and scorpion sting, 1 species in eye burn and weakness. So, generally, Musahar people of Dhanusha district has been using traditional medicinal practices to cure different kinds of disease as an alternative to allopathic medicine.

Keywords: Musahar community, Dhanusha district, Ethnobotany

Ethnobotanical study of medicinal plants of Banskharka community forest of Kabhrepalanchwok District

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Abstract

Ethnobotanical study of medicinal plants of Banskharka Community Forest of Kabhrepalanchwok District was conducted to identify medicinal plants in the study area. The study was carried out at Banskharka Community Forest user group (CFUG) Mandandeupur Municipality, ward no.12, Kabhrepalanchwok district of Central Nepal. The main characteristic features of the study area were the endowment of medicinal resources. The data to require the objective of the study consists of resource data and socio-economic data. Both primary and secondary information sources were used. Primary data were collected from the study area through participatory resource mapping, questionnaire survey, informal meeting along with local healers, village persons, experienced knowledgeable persons, key informant survey and observation, household survey as well as personal contact with local ethnic groups, Vaidhyas, Herbalist, and medicinal plant collectors and traders. Secondary data were collected from published materials regarding medicinal plants. Altogether 46 species were identified which belonging to different life forms such as herbs, shrubs, trees, and climbers. Generally, the local people are using these species to cure and treat common human disorders like diabetes, fever, headache, cold and cough, dysentery, stomach pain, urinary disorders, injuries and wounds. It was found that Brahmins and Chhetry's were more than Tamang's and Rai's in the study area. The most preferred species by the local people in their CF in descending order are namely Alaichi (*Amomum subulatum*), Pakhanbed (*Bergenia ciliata*), Jatamasi nakkali (*Valeriana hardwickii*), Chutro (*Berberis aristata*), Dhasingre (*Gaultheria fragrantissima*), Timur (*Zanthoxylum armatum*), Thulo Okhati (*Astilbe rivularis*), Utis (*Alnus nepalensis*), Aiselu (*Rubus ellipticus*), Siltimur (*Litsea cubeba*).

Keywords: Ethnobotany, Vaidya, Brahmin, Chhetry, Tamang, Rai

Traditional herbal remedies used for the treatment of diabetes in South eastern region of Nepal

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Abstract

Diabetes mellitus is now rapidly rising as a worldwide epidemic. It has been projected to be the seventh most important cause of death worldwide by 2030 according to WHO report 2014. Traditional knowledge has become recognized worldwide to control many diseases and diabetes is also one of them. In Nepal, remote areas are the root of the indigenous knowledge of the useful value of medicinal plants. The aim of the present study was to record the traditional medicinal uses of indigenous plants to control diabetes mellitus. The present study reviews the traditional knowledge and use of plant resources for the treatment of diabetes. Several times interactions were done with the traditional healers, local knowledgeable old person and other informants like few local people and household visits. A total of 37 plant species belonging to 33 genera and 24 angiosperms families were found to be used in diabetes. The most dominant anti-diabetic plant bearing family was Fabaceae (5 sp.) followed by Poaceae (4 sp.) and Liliaceae (3 sp.). The inhabitants of the study area used different parts of plants and methods of their uses. About 32 types of phytotherapy were investigated from the rural inhabitants of the area. These traditional recipes include extracts, leaves, powders, flour, seeds, vegetables, fruits and herbal mixtures. Indigenous knowledge systems are culturally valued and scientifically important. Strengthening and disseminating the use-value of these plants can save the money and life of poor people.

Keywords: Medicinal plants, Diabetes, Herbs, Traditional remedies, Tribals

Phytochemical fingerprinting and cytotoxicity assays of the ethno-medicinal fern *Tectaria coadunata* (J. Smith) C. Christensen from central Nepal

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Abstract

Tectaria coadunata, an ethno-medicinal fern used in Nepal to treat a large number of diseases, has been poorly studied with regard to its phytochemical composition. This study was performed with the aim of supporting traditional medicine as a new source of bioactive constituents. Phytochemical compositions of methanol extracts were determined by nuclear magnetic resonance (NMR), liquid chromatography–diode array detector–mass spectrophotometry (LC-DAD-MS), and liquid chromatography–fluorescence–mass spectrometry. Quali-quantitative data revealed a large number of procyanidins, mainly of the A-type, as well as eriodictyol-7-*O*-glucuronide and luteolin-7-*O*-glucuronide as main constituents. Furthermore, a moderate cytotoxic effect was observed in the 2008 and BxPC3 cell lines. Overall results showed the potential usefulness of this fern as a source of phytochemicals for pharmaceutical uses.

Keywords: Phytochemical composition, Bioactive constituents, Cytotoxic effect, Pharmaceutical uses

Oral Session: Wildlife Conservation

Habitat use and conservation status of *Ailurus fulgens* (Red panda) in Choyatar community forest, Sandakpur-Ilam

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Abstract

Ailurus fulgens (Red Panda) is an endangered species distributed throughout the Himalayan Range of Southeast Asia. The present study was carried out to assess the habitat use and conservation status of *Ailurus fulgens* in Choyatar Community forest of Ilam district. Direct observation in the field, collecting the scats, recording the pug marks and interaction with the forest user groups were carried out. During the field visit, the sign of Red Panda (Scat) was encountered in 16 different locations in the community forest. The scats were found between 2035-2517m throughout the community forest. Moreover, the main diets of Red Panda were found to be consists of Bamboo species such as Malingo and Nigalo. The main conservation threats of red panda in Choyatar CFUG were found to be of natural factors including predation from eagles and Yellow-throated martins; and flowering of bamboo as well as anthropogenic factors such as loss of habitat, open grazing and illegal hunting. Choyatar CFUG has adopted plantation of Nigalo and Malingo in barren areas near the habitat as well as tree plantation in open areas. Moreover, CFUG members visit the forest regularly for constant monitoring of red panda habitat. Therefore, it is necessary to change the people's attitude by new initiatives for awareness building and conservation-friendly alternatives for the enhancement of their livelihood with high valued incentives via eco-tourism and sustainable living practices.

Keywords: *Ailurus fulgens* (Red Panda), Conservation, Habitat, Choyatar Community Forest

Piloting fox lights to promote the coexistence of snow leopard and local herders: A case study from Nepal Himalayas

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Abstract

The higher Himalayas in Annapurna Conservation Area (ACA) i.e. Manang and Mustang are the potential habitats of snow leopard (*Panthera uncia*). Snow leopard often comes in conflict with local herders over livestock depredation. Pastoralism is one of the dominant economic activities in the region, thus snow leopard-caused depredation brings significant financial burdens to the herders. Such frequent incidence of conflict contributes to the negative attitude of herders towards snow leopard which sometimes ends with retaliatory killings. Thus, human-snow leopard conflict mitigation is crucial in promoting coexistence and long-term survival of the snow leopard in the Himalayas. Since 2015, we have been piloting fox lights (n=50) to reduce the livestock depredation from snow leopard in Manang and Mustang. Herders' (n=50) response to fox light is very positive. Nighttime livestock loss has been reduced significantly after the use of fox light. The combination of guarding dog and fox light has been more effective in deterring snow leopard and other predators away from the corral. This result is based on the initial one year of piloting and thus it is premature to claim full effectiveness of this intervention. However, it has been useful in raising positive hopes among the herders.

Keywords: Foxlight, Snow leopard, Livestock depredation, Retaliatory killings, Non-lethal mitigation measures, predator-proof corals

Effect of habitats, topography and human disturbances on the occurrence of large mammals in Panchase Protected forest, Nepal

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Abstract

This study focused on the distribution of large mammals in Panchase Protected Forest located in the junctions of three districts, Kaski, Parbat and Syanja that connects the mid-hill ecosystem with the Annapurna Conservation Area. The distribution of the large mammals in Panchase area was studied by using 34 line transects that covered a total of 34.053.km (average= 1.001±0.044 km) and also by using the vantage point count method. Both direct observation and signs of the large mammals were recorded including habitat

and human disturbance parameters such as habitat types, topography and signs of disturbance. The encounter rates of ungulates (muntjac= 1.52/km, Himalayan goral=1.82/km) and primates (rhesus monkeys=4.19/km, common langur=2.76/km) and sign encounter rate of leopard (0.76/km) and Himalayan black bear (0.29/km) were found. Habitat types ($F = 1.793$, $P=0.04$), human disturbances ($F= 4.674$, $P=0.002$), topography ($F= 1.361$, $P=0.01$) played the significant role in the distribution of large mammals. The distribution of mammals was low nearer to the human settlements and nearer to the roads, but nearer to the water resources ($F= 11.795$, $P =0.002$). However, natural succession, biological invasions of alien plant species, landslides, unplanned construction of roads added even more threats to the survival of large mammals. Hence, such conditions can be improved by the scientific management of forest, pasture and rangeland.

Keywords: Large mammals, Leopard, Midhill ecosystem, Protected forest, Himalayan Black bear

Impacts of Linear Infrastructure on endangered Bengal tiger in Nepal's Chitwan National Park- a UNESCO site

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Abstract

Infrastructure development is much-needed efforts for the country's economic and social prosperity. However, linear infrastructure projects like roads, canals, firebreaks, transmission lines, especially in and around the protected areas of Nepal, could be disturbing to the wildlife in various ways including, leading to habitat loss and fragmentation, animal injury and mortality, behavioral change. We investigated impacts caused by the existing road networks and predicted the future effects of various ground transportation projects, on tiger numbers, population viability through time and space, using empirically informed, spatially-explicit computer models in Chitwan National Park (CNP) of Terai, Central Nepal. We deployed a total of 63 cameras at three existing road sites of heavy, moderate and in the fire-line of the park core area with minimal vehicle movement, and collected data over a total of 2888 trap nights. Camera traps were installed 2 km along the edge of the road, each of 500 m apart, and 3.5 km into the forest from the road. We observed that tigers are avoiding the larger road with heavy vehicle movement compared to the smaller road with minimal vehicle movement. The computer simulation model predicted that upgrading and expansion of roads in and around the park significantly decrease tiger populations (7.5 – 24%) in ten years period of time. Environmental measures should be considered while upgrading and expanding the road networks in and around CNP.

Keywords: Linear infrastructure, Chitwan National Park, Camera trap

Role of central zoo in conservation education

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Abstract

The present study was conducted at Central Zoo (CZ), Lalitpur with an aim to explore the role of central zoo in conservation education. Key informant interviews, questionnaire survey are the methods used to meet the objective. Altogether 388 questionnaire surveys were analyzed. The result revealed that the overall status of the zoo was not sufficient for the management and conservation of animals. There was a significant difference between Friends of Zoo (FOZ) members and non-FOZ visitor's responses in what influences them to visit the zoo ($\chi^2= 80.608$, $df=4$, $p= 0.0001$). CZ allocated budget NPR 8995400 (USD 78,125.05) in conservation education but still, among the respondents, 59.79% were unaware of the conservation programs and 40.20% were aware that zoo conducts conservation programs. They mainly focused on FOZ members for conservation education while other visitors are unknown about the conservation programs. Our results showed a significantly high difference ($\chi^2=35.64$, $df=1$, $p< 0.002$) between respondents from FOZ and non-FOZ. Visitors seem to be satisfied with the conservation programs conducted by CZ. Besides programs, the signboards that are kept to give information was not properly used by the visitors. Only 12% in total surveyed visitors always read signboards and 28% never read it. CZ conducts various programs for FOZ members providing knowledge of different species, their status, their importance and aware of them to protect animals. It conducts various awareness programs and celebrates all important days related to wildlife. This study suggests not only FOZ members they should also focus on other visitors and encourage them in conservation through their programs.

Keywords: Zoo, Captive animal, Conservation awareness, Zoo problems, Friends of the zoo

People's attitude towards wild water buffalo *Bubalus arnee* (Kerr, 1792) conservation in Koshi Tappu Wildlife Reserve, Province 1, Nepal

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Abstract

This study was carried out aiming to explore people's attitudes towards wild water buffalo *Bubalus arnee* (Kerr, 1792) in Koshi Tappu Wildlife Reserve, Province 1, Nepal, from 15 August to 15 November 2019. A structured questionnaire was used to collect information on major threats, human casualties, and people's perception of wild water

buffalo. People's perceptions toward wild water buffalo and its conservation were mostly positive. During the study, 500 people were interviewed. It was recorded that 73% had a positive attitude towards wild water buffalo. On the other hand, 27% of the people had a negative attitude regarding the species' activities and its conservation. The local people had understood various aspects of wild water buffalo. 51% of the people responded that the wild water buffalo entered human residential areas because of the absence of food in the natural forests and habitat degradation. 24% of respondents said that immediate action was needed for conservation. Most of them expressed the view of understanding about it but could not do anything for the conservation.

Keywords: Wild water buffalo, Koshi Tappu Wildlife Reserve, threat

Distribution and conservation issues of turtles in the lowland of Province No. 1, east Nepal

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Abstract

Turtles have immense ecological importance as well as religious significance in Nepal. However, it is not only amongst the most endangered vertebrates but also one of the most ignored species in terms of conservation in Nepal. Turtles are not included in protected species list of National Parks and Wildlife Conservation Act 1973 and successive amendments. In Nepal, 10 species of all 18 species (including subspecies) of turtles recorded so far are regarded as globally threatened by IUCN and also included in either CITES appendix I or II. The research was aimed at studying the distribution of turtles in the lowland of Province 1 of eastern Nepal as well as their conservation issues with major threats in the area were studied. This research is based upon the literature survey of turtles, which was accompanied by a field survey in prominent wetlands and Sal forests of eastern Nepal. In addition, key informant interviews with forest officials, experts and fishermen were carried out. Eleven species of turtle viz. *Indotestudo elongata*, *Cyclemys oldhamii* cf. *gemeli*, *Melanochelys tricarinata*, *M. trijuga*, *Pangshura flaviventer*, *P. smithii smithii*, *P. tentoria circumdata*, *Chitra indica*, *Nilssonina hurum*, *N. gangetica* and *Lissemys punctata* are recorded from 5 districts (Ilam, Jhapa, Morang, Sunsari and Udayapur) of Province 1. The populations of turtles are found to be decreasing due to habitat loss and anthropogenic causes, mainly catching for food and trade. In 2012 AD a community-based Turtle Rescue and Conservation Centre-TRCC has been established in Jhapa for the first time with aim of conserving turtles.

Keywords: Turtles, distribution, threatened, conservation, lowland, Province 1

Prevalence of gastrointestinal parasites in abandoned cattle of Kathmandu District, Nepal

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Abstract

Animals suffer from several infectious and non-infectious diseases especially that originate from parasites. This study was conducted to determine the prevalence of gastrointestinal (GI) parasites in cattle. 100 dung samples were collected from 15th March 2019 to 20th April 2019 from the different parts of the Kathmandu district and preserved in airtight sterile vials containing 10% formalin solution and transported to the parasitology laboratory of Central Department of Zoology, Kirtipur. The dung samples were processed using a direct and concentration method. Results revealed 72% were found positive for one or more species of GI parasite. The sex-wise prevalence of parasitic infection was higher in male (73.68%) as compared to that of female (69.76%) but difference was nonsignificant ($\chi^2=0.0003$, $df=1$, $p\text{-value}=0.986>0.05$). The dung samples were collected from 14 calves, 17 heifers and 69 adults, among them GI parasitic infection, were 8.33% in calves, 27.78% in heifers and 63.89% in adult and the association of parasitic infection with age of abandoned cattle was statically significant ($\chi^2=12.562$, $df=5$, $p\text{-value}=0.02499<0.05$). Out of 76 cross breeds, 76.19% were positive and out of 24 local breeds, 64.86% were positive for parasitic infection but difference was nonsignificant ($\chi^2=0.1112$, $df=1$, $P\text{-value}=0.738>0.05$). The heavy intensity was found in the case of *Fasciola* sp. followed by *Emeria* sp. GI parasites are the problem in abandoned cattle of Kathmandu district. The prevalence rate of gastrointestinal parasites varied with age.

Keywords: Prevalence, Abandoned cattle, Gastrointestinal parasites, Calves, Heifers, Kathmandu

Gastrointestinal parasites prevalence in Rhesus Macaque (*Macaca mulatta* Zimmermann, 1780) of Devghatdham Religious Site, Nepal

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Abstract

Prevalence of GI parasites in Rhesus Macaque was studied in Devghatdham Religious sites, Chitwan. There were 90 fresh fecal samples collected and examined microscopically

by wet mount and concentration technique. We found a high prevalence of GI parasites (80%). Among the GI parasites, helminths (72.2%) were more prevalent than protozoans (27.78%). Altogether nine helminths and seven protozoan parasites were identified. The infection rate was more in the summer season (protozoan 60%, helminths 75.5%) than in winter (protozoan 46.6%, helminths 68.8%). *Cryptosporidium* was found higher in summer (44.44%) than in winter (37.77%) season. In the case of helminths, there was the highest prevalence of *Enterobius* sp. (34.44%) and the least prevalence of *Hymenolepis nana* (1.11%). Such findings are useful for primatologists, veterinarians, ecologists, and also applicable to public health issues where such monkeys and humans coexist.

Keywords: Intestinal parasites, Protozoan, Helminths, Rhesus Monkeys

Seasonal variation in the infestation of helminth parasites in the Common carp, *Cyprinus carpio*.

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Abstract

This study reports the seasonal variations in the intensity of helminth parasites in 150 specimens of *Cyprinus carpio* (average size 30-36 cm) collected from ponds of Darbhanga, Bihar. The study was conducted from September 2018 to August 2019. Altogether 38 fishes were found positive to harbour four parasites in skin, gill and intestine of the fish. Two (*Dactylogyrus* sp. and *Gyrodactylus* sp.) were monogeneans; one digenean (*Fellodistomum* sp.) and one (*Caryophyllaeus* sp.) cestode. The highest prevalence of the three parasites (*Dactylogyrus*- 10.66%; *Gyrodactylus*- 5.33% and *Fellodistomum*- 8.66%) was in winter (Dec.- Feb.) and that of *Caryophyllaeus* (8%) in Summer (Mar-May). Maximum mean intensity (68.42; 5.33; 21.05 for *Dactylogyrus*, *Gyrodactylus* and *Caryophyllaeus* respectively) was also during the winter season except for *Fellodistomum* which showed the maximum intensity (15.78) in summer. Similar trends were recorded in an abundance percentage of these parasites with reference to the season. The monsoon months (June - August) revealed minimum prevalence, mean intensity and abundance of the parasites. Further, the unit - wise intensity of parasites was recorded more in males than females. Our study concludes winter and summer months as most susceptible to parasites and may help in the management and conservation of *C. carpio*.

Keywords: *Cyprinus carpio*, Helminth parasites, Seasonal variation, Darbhanga

Identification of gastro-intestinal parasites from faecal matters of Rhesus monkey *Macaca mulatta* (Zimmerman, 1870) of Dharan, Nepal

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Abstract

The study was conducted to identify the gastrointestinal parasites in Rhesus monkey of Dharan. Altogether 130 samples of faecal matters were collected in the sterile vials. Of which 124 samples were examined, 6 samples were discarded due to contamination. Sampling was done in the morning time (0600 -1000 hrs) twice a week for five months. Macroscopic and microscopic observations were done for the identification of parasites. Among 124 examined samples, 54.03% (n=67) samples were found to be positive with at least one parasite, 31.19% (n=39) samples were negative for the parasites and 14.51% (n=18) of them were unidentified. Out of 67 positive samples, 40% (n=27) samples were found to be positive with protozoans whereas 60% (n=40) samples were found to be positive with helminths. Out of the total collected samples, 68% (n=45) of the samples showed single parasitic infestation, 24% (n=16) of the samples showed double and 8% (n=6) of the samples showed the multiple parasitic infestations. Similarly, 60% (n=40) of total positive samples were infested with helminths and 40% (n=27) with protozoan parasites. The parasites identified were four species of protozoa and six species of helminths. The protozoans include *Entamoeba coli*, *E. histolytica*, *Balantidium coli* and *Eimera* sp. The helminths include *Ascaris lumbricoides*, *Strongyloides stecolaris*, *Taenia* sp., *Enterobius vermicularis*, *Trichuris trichuria* and *Ancylostoma duodenale*. The study shows that the *Ascaris lumbricoides* has the highest prevalence (34.32%, n =23) in the Rhesus monkeys of Dharan.

Keywords: Gastro-intestinal parasites, Rhesus monkey, Faecal matters, Dharan, *Entamoeba coli*, *Ascaris lumbricoides*

Ectoparasitic infection on domestic mammals of Budol, Banepa

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Abstract

The present study was carried out in order to find out the prevalence of ectoparasite in the cattle. A total of 144 cattle was observed from Budol-06, Banepa, Kavrepalanchowk from August 2018 to February 2019. Out of 144 cattle examined, 113 (78.87%) were found to be positive with ectoparasites. In the study, 100% of sheep and buffaloes were

recorded to be infected by ectoparasites, 83.33% of cows and 65% of goats were found infested by different ectoparasites. Ectoparasites belonging to two different classes and six different genera were recorded. They were *Rhipicephalus microplus*, *Bovicola bovis*, *Linognathus stenopsis*, *Ctenocephalides felis*, *Phlebotomus* spp., and *Haematobia irritans*. The prevalence of *Rhipicephalus* was found highest (44.24%) and the least was *Ctenocephalides* (26.54%). Seasonal prevalence of ectoparasite was found higher in summer with 80% and only 71.87% of cattle were found infested by ectoparasite during winter which was found to be statistically significant ($P>0.05$, d.f.=1). Cows and buffaloes were found infested by *Rhipicephalus microplus* and *Bovicola bovis* but goats and sheep were found infested by *Rhipicephalus microplus*, *Linognathus stenopsis*, *Bovicola bovis* and *Ctenocephalides*. This study showed that the growing threat of ectoparasites to cattle needs well-coordinated and urgent control intervention.

Keywords: Bovicola, Cattle, Ctenocephalides, Ectoparasites, Prevalence, *Rhipicephalus*

Prevalence of gastrointestinal helminth parasites of domestic mammals in Gairigaun-1, Nagarkot Mandan Deupur Municipality

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Abstract

The study was carried out in Gairigaun-1, Nagarkot Mandan Deupur Municipality from December 2018 to May 2019. A total of 131 fecal samples of domestic mammals were collected and examined under a microscope by using direct smear and sedimentation techniques. Overall 86 (65.65%) samples were found positive with various types of gastrointestinal helminth parasites. Among 17 fecal samples of cow, 13 (76.47%), 35 of buffaloes, 20 (57.14%) and 79 of goat, 53 (67.08%) were found positive with gastrointestinal helminth parasites. The study revealed the prevalence of nematodes (74.47%), cestodes (7.70%) and trematodes (3.10). The prevalence of *Strongylus* sp. was found highest (35.88) and prevalence of *Cooperia* sp., *Hymenolepsis* sp., *Enterobius* sp. and *Fasciola* sp. were found similar (0.8%). In sex-wise study, higher prevalence was found in male (67.86%) than female (65.05%) which was statistically insignificant ($\chi^2 = 0.008$, $P>0.005$, d.f.=1). In age-wise prevalence, an adult was more infected (68.27%) with gastrointestinal helminth parasites than the younger ones (55.55%). Seasonal prevalence showed higher prevalence in summer (66.18%) than winter (65.08%) but statistically not significant ($\chi^2 = 0.017$, $P>0.005$, d.f. = 1). In the present study single infection was found highest (47.29%) and multiple infections were found least (2.29). Out of 31 samples from medicated mammals, 48.39% and out of 100 samples from non-medicated mammals, 71.0% were found positive which was statistically significant ($\chi^2 = 5.37$, $P>0.005$, d.f.=1).

Keywords: Cestodes, Host, Livestock, Nematodes, Trematodes

Phytochemical screening, metal concentration determination, antioxidant activity and antibacterial evaluation of *Drymaria diandra* plant

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Abstract

Several phytochemicals constitute possess natural antioxidant activity and are in fact advantageous in reducing many oxidative stress-related diseases. *Drymaria diandra* of the Caryophyllaceae family is one such plant that exhibits various medicinal properties. The aim of the current study is to provide a detailed exploration of phytochemical constitutes, metal concentration determination, antioxidant, and antibacterial activity of *Drymaria diandra*. Qualitative phytochemical analysis showed the presence of the maximum number of metabolites in methanol-water (1:1) extract. The heavy and toxic metals such as As, Cd, Cr, and Pb were almost near to the detection limit. The concentration of Fe (19.64 mg/l) was highest followed by Mn (2.35 mg/l). The (IC₅₀) value for methanol extract was found in 195.61 which is greater than the standard Ascorbic acid. Antibacterial activity of methanol extract was found higher for *Staphylococcus aureus* and *Escherichia coli* with 22-mm and 14-mm sized diameter of zone of inhibition respectively and methanol-water extract for *Proteus vulgaris* with 17mm diameter of zone of inhibition. The findings of the present study showed the presence of various valuable phytochemical constitutes responsible to give antibacterial and antioxidant potency. The presence of bio-metals and the absence of toxic metals further highlight the importance of plants as the source of food that bears medicinal properties.

Keywords: Antibacterial activity, Anti-oxidant activity, Heavy metal concentration, *Drymaria diandra*, Phytochemical screening

Investigation on phytochemicals for chemical constituent analysis and antioxidant scavenging activity of *Clerodendrum viscosum* from Morang, Nepal

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Abstract

Because of the rapid increase in population, industrialization, urbanization, climate change has become one of the challenging problems. Pollution, smoking, UV- radiation, dust & gases, dietary are the factors for free radical which causes an alarming increase in the incidence of new and re-emerging destructive diseases such as cancers, tumors, diabetes, coronary heart diseases and aging. So there is continuous and urgent need to be concerned and discover new antioxidant compounds that neutralize and balance the free radicals. The present investigation was carried out to assess the qualitative phytochemical analysis of different parts (root, stem, leaves, flower) and antioxidant activities of flower in methanol and ethanol solvent of *Clerodendrum viscosum*. Phytochemical analysis showed the presence of different chemical constituents in maximum amounts such as alkaloids, flavonoids, tannins, saponins, phenols, carbohydrates, coumarins, steroids, cardiac glycosides in both solvents almost in all parts. Similarly, antioxidant scavenging activity was carried out by making free hydroxyl radicals by various chemical treatments (EDTA, TCA, Glacial acetic acid, Ammonium acetate, Acetone, Ferrous ammonium sulphate and distilled water). Different concentrations 250, 500, 750, 1000 μ g of flower extract was treated with prepared reagents and absorbance was read at 412nm in UV-Vis spectrophotometer. It was found that IC₅₀ value of flower extract in methanol was 640 μ g which means 640 μ g sample is required to inhibit 50% free radical and in ethanol 940 μ g, also it was found that as concentration increases, inhibition% increases in both solvents.

Keywords: *Clerodendrum viscosum*, Phytochemicals, Antioxidant

An efficient acclimatization techniques of tissue culture raised commercially valuable native orchids of Nepal *Phaieus tankervilleae* (Banks) Blume and *Cymbidium aloifolium* D. don

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Abstract

Micropropagation has been extensively used for the rapid multiplication of many orchid species. However, its wider use is restricted often by the high percentage of plants lost or damaged when transferred to the natural condition. To acclimatize the micro propagated plants different workers have employed different approaches towards the successful establishment of *in vitro* raised plants under natural conditions. In this present study a successful attempt has been made to acclimatize the tissue culture raised orchid's viz. *Phaius tankervilleae* and *Cymbidium aloifolium*. The well-developed *in vitro* plantlet after 16 weeks of shoot and root proliferation were transferred for the acclimatization process for 4-6 weeks in natural condition. The acclimatized plantlet was then transferred in various substrate combinations of cocopeat, moss, charcoal and Pine bark. A substrate prepared by cocopeat and pine bark (3:1) was found effective for *in vivo* acclimatization and hardening. These conditions were able to regenerate secondary root and shoot in *P. tankervilleae* and *C. aloifolium*. This protocol might be useful for mass propagation and ex-situ conservation of these rare and valuable orchid species.

Keywords: Orchids, Acclimatization, Mass propagation, Substrates, Ex-Situ conservation

Proximate analysis of coal and antimicrobial activity of silver nanoparticle impregnated activated charcoal

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Abstract

Coal is a combustible black sedimentary rock. Activated charcoal possesses small, low volume pores that increase the surface area available for adsorption or chemical reaction. So, the objective of this research was to assess the proximate analysis of coal and antibacterial activity of silver nano-particles impregnated activated charcoal made from coal locally available at Kalimati of Dharan, Nepal but not been explored. Proximate analysis of coal, Antibiotic Susceptibility test performed by Kirby-Bauer Method and antibacterial activity of silver nano-particles activated charcoal against the test isolates

were performed. 2.2% moisture content, 15% volatile matter and 53.8% fixed carbon and p^H was 5.83. *E. coli* was 25% sensitive, 62.5% Intermediate and 12.5% resistant; *S. enterica var Typhi* was 62.5% % sensitive, 12.5% Intermediate and 25% resistant; *P. aeruginosa* was 12.5% Intermediate and 87.5% resistant and *S. aureus* 62.5% % sensitive, 25% Intermediate and 12.5% resistant to the antibiotics. The silver nanoparticles activated carbon has effective antimicrobial activity against *E. coli* (10mm and 11mm) only whereas *P. aeruginosa*, *S. enterica var Typhi* and *S. aureus* were not inhibited with 1.5 mol/L AgNP. The good quality of coal and antibacterial activity of silver nano-particles activated charcoal was satisfactory.

Keywords: Activated charcoal, AST, Coal, Silver Nanoparticles, Proximate analysis

Poster Session: Ecology and Environment

Study and enumeration of wall flora of Pokhara valley, Nepal

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Abstract

Certain plants design their life on the wall in addition to their natural habitats. It is simply a matter of occupying space with limited nutrition and water. The aim of this study was to enumerate the diversity of species found naturally on four different types of the wall (stone mud wall, Brick mud wall, stone cement wall and Brick cement wall). The wall flora of Pokhara had a total of 124 species of plants (40 families, 90 genera), where 3 species of bryophytes were the first colonizers and second were the pteridophytes containing 9 species. A total of 96 species (77.41%) were herbs, 14 species (11.29%) were shrubs and 14 species (11.29%) were trees. Most of the herbs and shrubs species were found on the wall base and surrounding areas. Species diversity decrease and the percentage of typical rock xerophytes rise from the base to the top of the walls. This study might contribute to future urban ecology and restoration programs of National Heritage buildings for the Pokhara sub-metropolis.

Keywords: Diversity, Pteridophytes, Bryophytes

Estimation of fine root biomass of Charkoshe Jhadi of eastern Nepal

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Abstract

The fine root biomass at different sites of Charkoshe Jhadi was studied. 10 samples of each site were collected during rainy and winter seasons at the depth of 0-10cm, 10-20 cm and 20-30 cm and examined by wet sieve method. The total fine root biomass at different forest sites ranged from 4170 kg ha^{-1} to 6180 kg ha^{-1} . The maximum value of total fine root biomass was found in the rainy season than that of winter. The total biomass during the rainy season in Site I(Protected forest), II(Disturbed forest) and III(Degraded forest) were 5100 kg ha^{-1} , 4540 kg ha^{-1} and 6180 kg ha^{-1} respectively. Similarly, the values during winter seasons were recorded 4170 kg ha^{-1} , 4280 kg ha^{-1} and 4530 kg ha^{-1} in Site I, II and III respectively. Fine root biomass was found to be maximum in rainy seasons in all sites observed. This is due to rapid nutrients released during the rainy season. The

seasonal change in fine root biomass is due to change in environments such as soil moisture, soil temperature, and fine root turnover.

Keywords: Fine root biomass, Nutrient cycling, Litterfall, Rainy season, Winter season

Soil quality under different land-use type in Bakaiya River of Chure Region, Makwanpur District

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Abstract

Soil quality is the dynamic interaction between various physical, chemical and biological properties of soil. This research is carried out to assess the soil pH, electric conductivity, bulk density, texture, soil nitrogen, phosphorus, potassium, soil organic carbon soil organic matter, microbial biomass carbon and nitrogen and soil quality index. The dominant land use type of Bakaiya River in Chure region of Makwanpur district was selected for the study sites. Altogether 80 samples were collected by using a systematic random sampling method from 1-15 cm and 15-30 cm. The soil samples were carried in the lab for analysis. The highest pH 7.17 was recorded at 1-15 cm in the kitchen yard whereas the least pH 5.87 observed in an abandoned land. Total organic carbon and organic matter found highest in Kitchen yard and least was found in Upland land use type. Highest Electric conductivity 120.4 micro Simon was observed at 1-15 cm of Kitchen Yard. Bulk density was found highest in 15-30 cm then 1-15 cm. Bulk density was found highest in Abandoned land use i.e. 1.65 gm./cm³ at 1-15 cm and 1.75 gm./cm³ at 15-30 cm. Least Soil Nitrogen was observed in Abandoned land and the highest N was found in the kitchen yard. Available Potassium and Available Phosphorus were found higher in 15-30 cm than 1-15 cm. Hence the result will be an important tool for planners and the scientific community to formulate appropriate land use management strategies.

Keywords: Soil quality index, Chure, Soil properties, land use, Organic Carbon

Aquatic macrophytes and physico-chemical characteristics of Ghodaghodi Lake, Kailali, Nepal

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Abstract

Ghodaghodi Lake is an ox-bow perennial lake. It is situated in Kailali district. The present study had been conducted to investigate the quantitative analysis of aquatic macrophytes

and physico-chemical characteristics of Ghodaghodi Lake during pre-monsoon and post-monsoon season. Four different sites were studied. Triplicate of water samples were collected from each site of Lake and physico-chemical characteristics, i.e. pH, temperature, depth, dissolved oxygen, total alkalinity, total hardness, conductivity, total dissolved matter, free CO₂, nitrate and inorganic phosphorous were analyzed. A random sampling method was used. Aquatic macrophytes were collected during field sampling with the help of 1m×1m quadrats and herbariums were prepared by following standard technique. Altogether, 8 quadrats (four paired quadrats) were plotted in each site of the study area per season. Altogether 32 quadrats were laid down per season. Water samples were collected from the depth of 0.5 m within the 1m×1m quadrats. Data obtained from macrophytes and water analysis were analyzed by descriptive and multivariate analysis. Hardness, temperature, depth, CO₂, nitrate and phosphate were found to be high during pre-monsoon than the post-monsoon season. All together 37 plant species belonging to 22 families were recorded with the dominance of emergents species. In all sites, during pre-monsoon, *Trapa quadrispinosa* and *Nelumbo nucifera* (threatened species of Ghodaghodi Lake) were found to be dominant in terms of IVI, whereas during post-monsoon *Chara* sp. and *Cyperus* sp. were dominant. Species diversity index was found higher in pre-monsoon than post-monsoon. Lakes showed a hyper-eutrophy category on the basis of phosphorus concentration. Most of the species had shown a positive affinity towards pH, Nitrate and Total hardness.

Keywords: Emergents, Hyper-eutrophic, IVI, Post-monsoon, Pre-monsoon, Species diversity

Ecotourism management in Jagadishpur Reservoir, Kapilvastu District, Province No.5, Nepal

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Abstract

Ecotourism relates to ecological tourism. It is the tour of natural heritage and associated communities and their practices. At present, the world ecotourism has become the synonym of conservation. The study was carried out entitled “Management of Eco-tourism in Jagadishpur Reservoir Ramsar Site” which was conducted for seven months starting from 2018 May to 2018 November. The main objectives were to study ecotourism and management. The ecotourism management in Jagadishpur reservoir is low in comparison to other tourist destinations, Even in Lumbini Zone. Around 150 to 200 international and about 10,000 to 12,000 domestic visitors make the trip to JRRS area each year. Most of the domestic visitors are from Rupandehi and other neighboring districts such as Arghakhanchi, Dang, and Palpa. Some Indian visitors also travel to Jagadishpur area particularly for religious purposes, especially to visit the Buddhist archeological site and

the Bhagirathi River. And other visitors are for bird watching, nature beauty, Education and research tours, Monasteries and temple visits, for boating, picnic etc. Presently the JRRS has one view tower, six paddle boating, few picnic spots, 14 homestays, and few lodges, restaurants, hotels etc. the finding based on direct observation, field studies and questionnaire. The presented study here helps in the future planning programs to the management policy, to the local people towards conservation. This study also provides information about the potential, infrastructure and park people interaction to the reservoir. For sound management and betterment of the reserve to enhance eco-tourism, it needs active support, a positive attitude and people's participation in the conservation of natural resources. The reserve has a very high potential for eco-tourism, just needs more careful plans and effective management with some strict rules regarding conservation, marketing, exploring etc. The JRRS has many tourisms attraction like birds watching, boating, ecological tour, Archaeological site tour, monasteries and temple visits, view tower, etc. which can definitely attract the tourists. JRRS is close or shares the same zone with Lumbini which is also beneficial for it if it's able to attract that tourist.

Keywords: Ecotourism, Wetland conservation, Sustainable development

Plant diversity and iron bioaccumulation among angiosperms at hematite deposit of Dhaubadi, Nawalparsi (Ba. Su Purba), Nepal

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Abstract

Plant diversity relation with the iron deposit area has a highly significant relation and highly concerned for Nepal Geobotanical survey. The purpose of this study was to understand and measure the plant diversity, plant biomass and iron accumulation in plants and iron concentration in soil. Plant diversity was screening by IVI and diversity indexes. Biomass of herbs and shrubs was obtained by dry weight method and trees were obtained by measuring diameter, breadth and height. Iron accumulation in plants and iron concentration in soil was obtained by using the wet digestion method and measured in Atomic Absorption Spectroscopy (AAS). Common herbs (*Spermacoce alta*, *Isodon coesta*, *Anaphalis busua* and *Salvia sclarea*) and common shrubs (*Osbekia stellata*, *Ageratina adenophora*, *Elsholtzia blanda* and *Maesa chisia*) show a significant trend in plant biomass and iron accumulation. Translocation factor and Bioaccumulation factor values explain as these common plants like *Spermacoce alta*, *Isodon coesta*, *Salvia sclarea*, *Osbekia stellata*, *Ageratina adenophora* and *Maesa chisia* are the iron accumulator or excluder species. *Begonia picta* has the highest iron accumulation so this plant should be considered as high iron accumulator species. Plant-like *Elsholtzia balnda* and *Anaphilis busua* are as good indicators of iron deposits. This study definitively answers the question regarding the relationship between iron concentration in soil with plant

diversity and plant biomass. The coloration and bronzing morphological character were observed in high iron deposits may conclude as the plants are iron indicator plants.

Keywords: Plant diversity; Plant biomass; Iron accumulation; Translocation factor; Bioaccumulation factor

Possible impacts of Arun- III hydropower project on biodiversity of Sankhawasabha District

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Abstract

Despite being one of the protected areas, the construction of Nepal's biggest hydropower, Arun- III had created a major impact on the biodiversity of Makalu Barun National Park. Every construction has both positive and negative impacts and thus, with the aim of identifying the possible impact of Arun- III hydropower project on biodiversity of Sankhuwashabha district, this study was carried out from 3rd Dec to 7th Dec 2019. Direct observation, local people interaction and semi-structured interviews with officials of the hydropower project were the methodologies applied. The visit was limited to Tumlingtar, Khandbari, Num Bazaar, dam construction site and buffer zone area of Makalu Barun National Park. Transportation access is most needed for carrying out construction work. Road and hydropower projects have not only created habitat fragmentation but also have led to increase in air, noise, water pollutions and risk of landslides which has a high chance of negative impact on the floras and faunas in different ways. Habitat fragmentation can limit the foraging area of the fauna to certain areas. Airborne disease, the problem in transpiration and photosynthesis can be listed as one of the impacts. Migration of the species to the less disturbed area, leading to an increase in population on the existing areas can be observed. Even though the EIA report says, the present impact can be compensated in the future; the Government of Nepal should show extra interest to minimize the present impact to some extent. Developmental work is necessities for the betterment of the country but the impact assessment and mitigation of adverse should also be taken into consideration.

Keywords: Makalu Barun National Park, Biodiversity, Arun- III Hydropower project, Habitat fragmentation, Transportation, EIA

Plant resource of Barju Lake, Sunsari, Nepal

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Abstract

In Barju lake, Sunsari, plant resources for various uses with their availability, seasonal occurrence were studied from December 2018 to November 2019. A total of 48 aquatic plant species belonging to 43 genera and 27 families were recorded. Major families were Poaceae, Cyperaceae, Asteraceae, Areceae. Abundant plant species of the lake were: *Nelumbo nucifera*, *Nymphoides indica*, *Elaeocaris* and scarce macrophytes were *Lindernia indica*, *Typha domingensis*. Invasive alien species were: *Mikania micrantha*, *Eichhornia crassipes*, *Leersia hexandra*.

Keywords: Plant diversity, Macrophytes, Alien species

Production of solid waste and its management in Rangeli Municipality

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Abstract

The present study reports on assessment for the details of solid waste management of Rangeli municipality. It includes aspects like moisture content, soil temperature, amount of biodegradable and non-bio degradable wastes along with the net collection of waste material. The study was conducted for eight months that is from the month of December 2018 to July 2019. The mean report shows that the amount of biodegradable waste was much higher in the month of March which was 79.14% and of non-bio degradable on the same month was found to be 20.86%. Materials like organic matter, paper, foam, wooden piece, cartoons, jute material etc. are biodegradable wastes whereas materials like plastic, metal, glass, rubber, wire, leather, hair, bone, etc. include non-bio degradable wastes. Moisture content was maximum in the month of January which was 73% and minimum in June that is 51.5%. It was noticed that the temperature was found to be maximum in the month of June that is 37°C whereas minimum in the month of January which was 9.5°C. A complete study on the production of the actual amount of waste has been done with proper recommendations of disposing it and thinking for the alternative sources of energy production with the help of the staff of Rangeli Municipality.

Keywords: Solid waste, biodegradable, non-biodegradable, moisture content, soil temperature, management of solid waste, alternative energy sources.

Ecological status, diversity and conservation of orchids in Nepal

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Abstract

Orchidaceae, one of the largest groups of flowering plants in Nepal is with 502 species under 108 genera and is commonly known as Sunakhari. Orchids are generally terrestrial or epiphytic herb and are important non-timber forest products (NTFPs) of Nepal having great ornamental, medicinal as well as food value. Abundance, distribution, ecological status of orchid populations depend upon the ecological factors and host characteristics. Diversity, distribution, and abundance of orchids are significantly high in the host tree having tall, old age, rough bark texture, and adequate bark pH with thick trunk size and having a large diameter at breast height. It shows a significant positive linear relationship between tree size (dbh) and the number of orchid individuals, indicating that large-sized trees offer more space for the growth of the orchid. Host occupancy is highest in the highest strata on trees with rough bark that are mostly evergreen in nature which shows the higher number of orchid species. Having a moderate water holding capacity of bark is suitable for the growth of orchids. The population of orchid was influenced by different ecological factors. The main factors that threaten epiphytic orchids under anthropogenic disturbances in the subtropical are an increase of bark pH due to air pollution and a loss of adequate host trees (appropriate species and size). Orchids are especially threatened by habitat fragmentation because they grow in small populations, and fragmentation may block gene flow and result in lower genetic diversity. In addition, due to their ornamental and medicinal value, many orchids are over-collected. Orchids face a serious continued threat to their wild populations in Nepal due to heavy collection of ornamental and medicinal orchids. Some of the medicinal purposes, especially *Dactylorhiza hatagirea*, species of *Coelogyne*, *Dendrobium*, *Flickingeria*, *Otochilus*, *Pholidota* are now highly threatened. Habitat destruction has added more to the reduction of wild populations, especially to those of the endemic species. Orchid species richness is significantly higher in the Community forest than in the National Forest and the largest number of orchids are recorded in the subtropical zone. Orchid's subtropical zone is getting scarce every year. Thus, it is an urgent need for the conservation of orchids.

Keywords: Orchid, Medicinal value, Endemic species, Community forest, Ecological factor, Conservation

Present status of alien invasive species in Biratnagar, Nepal

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Abstract

The present study attempts to explain the status of alien invasive species of Biratnagar metro municipality based on their habitat. The main objective of the study was to find out the present status of alien invasive species in Biratnagar. The field observation was done and secondary data were collected from various sources. Altogether 20 species of invasive alien plant species were been found in Biratnagar. A total of 8 species from Asteraceae family was found. Most of the plant species were shrubs. There was found to be fifteen terrestrial and five aquatic plants. The increasing rate of alien invasive species can adversely affect native biodiversity. It was concluded that proper management of alien invasive species is required to save our native species and cropland.

Keywords: Habitat, Biodiversity, Field observation, Allelopathy, Management

Effects of abiotic and disturbance factors on forest plant community structure and composition

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Abstract

Forest community structure and composition are not only affected by biotic factors but also changes in abiotic factors and disturbances. Therefore, to understand the impact of these factors on species diversity, richness, and composition at a definite space and time, their vulnerability and management, a systematic review and synthesis of relevant literature are essential. Disturbances (physical and biological) in forests not only destroy mature trees but also give chances for new plants and create a micro-habitat, thereby increasing the species diversity compared to undisturbed forests. On the other hand, species diversity and richness are high in non-degraded forests than degraded forests. Similarly, species richness decreases with the increase of altitudes, slopes, aspects, elevation, and soil nutrients also play an important role in the community structure and composition of the forest. The role of light in forest regeneration studied as the survival rates of seedlings and sprouting were found higher at the forest periphery than under the dense canopy. Deadwood, the number of micro-habitats, tree size diversity was found reduced by forest stand management, while no effect was found for stand basal area and the number of living trees.

Keywords: Species diversity, Richness, Composition, Forest Community structure, Vulnerability

Characterization of Polycots niger (*Guizotia abyssinica* Cass.)

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Abstract

Niger (*Guizotia abyssinica* Cass) is a neglected and underutilized summer oilseed crop adapted to grow in different soil and climatic conditions. Earlier, more than two cotyledons (tricot, monocot, and others) were reported in niger populations. Tricot niger plants had a high potential growth rate, seed output and oil yield. The present work aims to know the different characteristics of tricot and tetracot niger including pollen viability and germination, seed attributes, morphology, phenology and oil yield. Pollen viability was 81%, 79% and 66% and seed germination percentage was 82%, 83% and 80% for dicot, tricot and tetracot niger plant, respectively in field condition.

Keywords: Leaf area, Net assimilation rate, Phenology, Pollen germination, Pollen viability

Effect of composts from invasive plant species on soybean in Nepal

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Abstract

There are more than two dozen IAPS that has been creating serious problems in Nepal. Their control and management have become a serious issue. In this regard, one of the options of their management could be the utilization of IAPS to make compost fertilizers but the effect of the compost to crop plants should be essential to evaluate. We have tested the compost fertilizers prepared from 3 highly problematic IAPS (*Lantana camara*, *Ageratina adenophora*, and *Ageratum haustonianum*) on the most important leguminous plant Soybean (*Glycine max*) at Central Department of Botany, Tribhuvan University, Kirtipur. The compost was prepared as the traditional method by mixing invasive plants with cow dung (20%) and allowed to decompose for 3 months. The seedlings of Soybean were grown in polythene pots under the treatment of the compost prepared from the selected IAPS. To compare the effect of the compost seedlings were also grown with the treatment of only cow dung and control (no compost and cow dung). It was found that both IAPS compost and cow dung equally enhanced the growth parameters of Soybean than in control. The cow dung increased the length of Soybean shoot length by 15.23% whereas the composts from *A. haustonianum*, *A. adenophora* and *Lantana camara*

increased the shoot length by 12.22%, 12.57% and 12.61%, respectively. Soybean leaf number was increased by cow dung, *A. haustonianum* and *L. camara* by 15.38% while *A. adenophora* increased by 30.77%. Similarly, all the treatments enhanced the Soybean leaf length (14.87% by cow dung, 10.18% by *A. haustonianum*, 4.38% by *L. camara* and 8.19% by *A. adenophora*). Hence, it can be concluded that the compost prepared from IAPS has no inhibitory effect on Soybean. Therefore, it can be recommended that these IAPS should be utilized for making compost for Soybean which would be helpful also for the management of IAPS.

Keywords: Invasive plants, Traditional compost, Crops, Treatments

Effects of embargo (2015 blockade) on Godawari-Kunda community forest

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Abstract

The undeclared embargo had affected people from every walk of their lives. With a shortage of liquefied petroleum gas (LPG), kerosene and fluctuating load shedding problems have heightened a lot of pressure on the country's forest resources in the first place. The sudden rise in demand for fuelwood from domestic households to eateries had soared rapidly. In order to minimize the energy crisis, the Government of Nepal even started distributing fuelwood to its people. So, in this study undeclared the effects of the embargo on Godawari Kunda Community Forest have been addressed. Around 900 pole size trees were cut down for temporary settlements after the earthquake. To make matters worse the energy demand hiked after the embargo. Out of 135 households, 30 households were taken by purposive sampling method and 5 key informants were interviewed where the use of fuelwood, LPG only, and both was found to be 13%, 70%, and 17% respectively before the embargo and 23%, nil and 77% respectively after embargo respectively. People from other community forests were also dependent upon this community forest. *Castanopsis indica*, *Castanopsis tribuloides*, *Schima wallichii*, *Pinus roxburghii* etc were used as fuelwood. Even though the fuelwood provided were from the thinning and pruning of trees but if the situation gets prolonged it may hamper the community forest. Lack of use of alternative energy and a maximum reliance on fuelwood by the entire community was a common scene that has affected Godawari Kunda Community forest.

Keywords: Energy crisis, Fuelwood, Energy demand, Reliance

Hazardous waste and its impact on human health

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Abstract

Hazardous waste is the label assigned to a specific class of refuse. The key characteristic that identifies this refuse is that, in some way, it is potentially dangerous to living beings and the environment, particularly when handled, transported or disposed of in an unsafe manner. Hazardous waste can take different forms – solid, liquid or gaseous – and it can be released to land, water or air. The substance with the labels warning, caution, poisonous, toxic, flammable, corrosive, reactive is related to hazardous substances. The main objective of this study is to list and quantify the hazardous wastes, know the level of knowledge about it and to see the health impacts among the residents at the HHS present at the households of ward no 5,7 of previous Rajghat VDC, now is Urlabari Municipality-9. The fieldwork was based on the questionnaire survey, interview with respondents in Rajghat VDC ward no-7: Households-375, ward no-5: Households-359 and the sample size was taken as 60 in each ward. The primary data was collected through different interviews and questionnaire survey and the secondary data was collected from various reports, maps, journals, articles etc. The average HHS per household and per person in ward no-5 was 17.94 kg and 0.0497 respectively. Likewise, in ward no -7 it was 15kg and 0.0425kg respectively. Among the respondents, 33% and 25% were found to be aware of hazardous wastes in ward 5 and 7 respectively. Similarly, health issues regarding skin allergy, headache, weakness vomiting, etc. were also recorded. Awareness programs regarding hazardous waste, in particular, HHSW and its impact on human health can improve the living quality of people in Eastern Nepal.

Keywords: Hazardous Waste, HHSW, Waste categorization, Health impact

Tree diversity and carbon stock in Panchase protected forest, central Nepal

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Abstract

Forests serve as the natural sink of atmospheric CO₂ to mitigate climate change and provide several ecosystem services. The relationship between tree carbon stock and diversity is a matter of concern of today from the viewpoint of climate change mitigation and biodiversity conservation. To address the issues, the tree diversity and carbon stock were assessed along the elevation gradient from 1500 m to 2500 m amsl maintaining 100 m of vertical difference and their relationship was studied in the north and the south

aspects of Panchase Protected Forest of central Nepal. Altogether 66 quadrats were sampled in the 11 elevation belts. A stratified systematic sampling method was followed with three circular plots (each of size 314.29 m²) in each elevation belt. Tree diversity and species richness were calculated using diversity index and counting the species per plot respectively. Tree biomass was calculated using an allometric equation developed for moist forest and later converted into carbon stock using the default factor. Altogether 24 and 33 tree species were found in the north and south aspects, respectively. Linear regression analysis showed the statistically significant increment of Species richness ($p = 0.00$), Shannon Wiener's index ($p = 0.002$) and Simpson's diversity index ($p = 0.009$) with the increase in elevation in the north whereas the variation of species richness ($p = 0.92$), Shannon Wiener's index ($p = 0.63$) and Simpson's diversity index ($p = 0.54$) with elevation was not significant in the south. The tree carbon stock also increased significantly ($p = 0.00$) with increasing elevation in the north but the variation was not significant ($p = 0.77$) in the south. Similarly, there was no significant change in tree carbon stock with the increase in species richness and diversity. The difference in tree carbon stock between two aspects was not significant ($p = 0.61$). The result will have direct implications for the management and policies related to forest management for climate change mitigation and biodiversity conservation.

Keywords: Density-diameter curve, Management, Regeneration, Species diversity

Poster Session: Faunal Diversity

Review checklist of Dharan Birds, Sunsari district, Province 1

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Abstract

Nepal is rich in avian diversity but lack of proper data outside the protected areas. The study was carried out in Dharan Sub-metropolitan city (26°49'0"N 87°17'0"E) having area of 192.32km². Intensive field studies carried out at 12 different sites of Dharan sub-metropolitan by purposive sampling. Line transects were done with multiple replications during Feb 2017-Dec 2019. "R" Version 3.3.1 software package was used in analyzing data. A total of 167 bird species belonging to 14 orders and 50 families were identified. Among them 19 species are listed in CITES Appendix II, 3 species in national vulnerable status, 1 globally threatened, 2 national endangered category and 1 bird species have been recognized as critically endangered species at a national level. Studies revealed that out of total birds' species residential (74.854%), winter season migratory (21.5%), summer migratory (2.39%) and passage migrant (1.19%). Among 886 species of birds found in Nepal, the study area accounts for 18.84% of total bird species of the country.

Keywords: Dharan birds, Checklist, CITES, critically endangered

Seasonal diversity of avifauna and anthropogenic impacts in and around of Jamunxhadi area, Kankai Municipality, Jhapa, Province-1, Nepal

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Abstract

Monitoring of avifauna and estimation of their diversity helps to provide baseline data to take solid steps towards their conservation. The present study was carried out to assess the seasonal diversity of birds and anthropogenic impact in the Jamunxhadi area of Jhapa. The study was done for the time period of six months, June/July 2017 (early monsoon), August/September 2017 (late monsoon) October/November 2017 (early winter) in six-point count stations within the study area. Anthropogenic impacts were assessed through field observation and discussion with local villagers. 84 species of birds having 1781 individuals belonging to 13 orders and 40 families were recorded. Order Passeriformes was found dominating with high species richness i.e. 40 species from 20 families whereas

order Strigiformes, Gruiformes, and Pelecaniformes were the least dominating with single species. Among the 40 families, family Ardeidae has the highest number of species (six) whereas family Sturnidae contributes to the highest number of individuals (403). A total of 70 species were found to be residential, five were summer visitors and nine species were found to be winter visitors. The highest number of species was observed during the early winter (66). One-way ANOVA shows that there was no significant difference ($F=2.29 < F=3.68$, $v_1=2$, $v_2=15$) in the seasonal diversity of birds. Shannon Wiener diversity index shows that the early winter season ($H=3.61$) was more diverse than the early monsoon ($H=3.48$), and late monsoon ($H=3.35$) seasons. Evenness index also shows that birds were evenly distributed in the early winter season ($E=0.86$), then in early monsoon ($E=0.85$) and late monsoon ($E=0.83$). Similarly, point station four was found to be more diverse ($H=3.25$) and birds were evenly distributed in the same stations ($E=0.86$) than in other point stations. Sorenson similarity index showed that the birds' community of early monsoon and late monsoon were more similar ($SSI=82\%$). A total of 36 species of birds were found to be uncommon, 30 species as frequent, 16 species as common and only two species were found to be abundant in their local abundance status. Habitat degradation and fragmentation activities like cutting trees, clearance of the dense undergrowth for fodder, overgrazing, modification of wetlands into farmland and settlement areas were major threats to birds. Use of chemical fertilizers and insecticides in agriculture, electrofishing, mining of sand and gravel from rivers, construction of cemented home pipes and hunting were other responsible human activities for threatening the avian community.

Keywords: Jamunkhadi area, Avifauna, Seasonal diversity, Anthropogenic impacts, Overgrazing, Chemical fertilizers

Avian species distribution along elevation at Lwang Ghalel Village (Machhapuchhre Rural Municipality) of Annapurna Conservation Area, Kaski, Nepal

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Abstract

The altitudinal gradient is one of the important factors which affect on bird distribution and composition. The main objective of the study was to determine the altitudinal variation of bird distribution at Lwang Ghalel village of Annapurna Conservation Area (ACA). The study was done within 1,000 to 3,500 m altitudinal gradients in two different seasons summer (May, June) and autumn (September, October) in 2017. The birds were surveyed by using line-transect and call count methods. A total of 77 species of birds belonging to 1,598 individuals, nine orders and 35 families were recorded. The higher number of bird species were recorded at 1,500-2,000m (38 species) followed by 2,000-2,500m (34

species), 1,000-1,500m (28 species), 2,500-3,000m (21 species) and 3,000-3,500m (18 species) respectively. It showed a hump-shaped pattern of avian species distribution with mid-elevation peak. The Shannon wiener diversity index showed that, the more diverse bird assemblage at 2,000-2,500m ($H' = 3.21$). Similarly, the evenness index showed that the bird species were not more evenly distributed ($E = 0.91$) at 2,000-2,500m altitudinal ranges. Among 77 species four of them nationally threatened species and six species were included inside the CITES categories. Overgrazing, Poaching, use of insecticide, Human disturbance and lack of awareness were observed the major threats to the avian community in the study area.

Keywords: Bird distribution, Altitudinal variation, Shannon wiener diversity index, Evenness index

Study on macrofauna biodiversity of Devidaha, Sirha, Nepal

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Abstract

The present work was conducted on Devidaha wetland of Sirha District. It was focused on diversity and population of fishes, wetland birds, and mollusca in the year 2019. The fishes were caught using cast-net with the help of local fishermen. Altogether six species of fishes were recorded viz., *Puntius phutunio* (pothi), *Mystus tengara*, *Cyprinus carpio*, *Cirrhinus mrigala*, *Oreochromis niloticus* and *Channa* species. Wetland birds include Lesser whistling duck, Cattle egret and Common myna. Three species of mollusk i.e., *Achatina fulica*, *Bellamya bengalensis*, and *Pila globosa* were recorded. From the contact of old fishermen, it was learned that the population of local fish species in Devidaha is declining because of an invasive fish *Oreochromis niloticus*.

Keywords: Devidaha, resident bird, Fishermen, Invasive fish species

Study of general behavior and singing pattern of Oriental Magpie Robin *Copsychus saularis* (Linnaeus, 1758)

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Abstract

Oriental Magpie Robin belonging to Muscicapidae is a common resident garden bird. The male is glossy blue-black while females are dull dark grey instead of black. This is

the first singer bird on a spring morning, beginning at 4 am or earlier. Males use to select their singing posts from where the bird can broadcast about his territory. Oriental Magpie Robin is one of the songbirds which sing more than two hundred varieties of songs. The present work was attempted to study general behavior and singing patterns of Oriental Magpie Robin in Biratnagar and Kathmandu. Direct observations were performed in the territories of this bird in Biratnagar, Song of each bird was recorded for one hour without break by a digital voice recorder (Olympus VN-8700PC) at six selected sites in Biratnagar and one from Kathmandu. Recorded songs were converted in the form of a spectrogram by using avisoft. Six Oriental Magpie Robins, belonging to six different study sites of Biratnagar and one of Kathmandu were taken as subjects and have been abbreviated as Bird A, B, C, D, E, F and Z respectively. This study revealed that there was no almost sharing of element types among individuals' motifs. Oriental Magpie Robin is an excellent songbird that has individually different singing patterns though their songs appear to be similar to the listeners.

Keywords: Robin, Song, Avisoft, Elements, Motifs

Hatching Success of Gharial (*Gavialis gangeticus*) in Rapti River, Chitwan National Park, Nepal

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Abstract

This study was carried out between March-June 2017 in the Rapti river of Chitwan National Park. The gharial is 'Critically Endangered'. Its population has been crashed drastically in the last half-century in all of its global distribution range including Nepal. Understanding the breeding behavior and hatching process of Gharial is crucial for preparing effective conservation strategies to ensure the survival of freshwater rivers in Nepal. Considering these facts, the field data were collected in the breeding season between March-June 2017 in Rapti river. During the months of March/April 2017, a total of 5 nests were located. The Gharials started laying eggs from 23 March to 6 April 2017. The incubation period varied from 71 days to 85 days. The clutch size ranged from 19 eggs to 37eggs. Among 130 eggs laid only 108 eggs were hatched which accounts for only 83.08% hatching success in the Rapti river. A mean soil temperature of the nest was recorded at 31.9°C. Three dead hatchlings and 19 infertile eggs were recorded during the study period. There was a strong correlation ($r=0.978561$) between soil temperature of nesting site and hatching success. The regular monitoring of captive-reared and released Gharials, control of river contamination from industrial sewage disposal, minimization of anthropogenic pressures on the river sandbanks and community outreach programs are recommended for the conservation of Gharials.

Keywords: Gharial, Anthropogenic Pressures, Conservation, River Pollution, Fishing Communities

Diversity of herpetofauna and analysis of people's perception at Sukhani Martyrs Memorial Foundation Park in Arjundhara Municipality- 9, Jhapa

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Abstract

This paper is a result of dissertation work carried out in February and May of 2018 at Sukhani Martyrs Memorial Foundation Park. It covers an area of 22.4 hectares with Sal dominated forest and wetlands. The purposive sampling method was used to select stations at ten different locations of the park. A frequent random search in the potential area and the opportunistic survey was carried out throughout the research period. The questionnaire survey was also conducted among the local residents to assure the presence of species in the area. Altogether, 20 species of herpetofauna belonging to 3 orders and 11 families comprising 7 Amphibians and 13 reptiles were recorded from the study area. *Lissemys punctata* and *Varanus flavescens* were among the most exploited species for consumption purposes. The study also analyzed the perception of people towards herpetofauna and suggested necessary efforts to sensitize the conservation in the area.

Keywords: Herpetofauna, Diversity, Conservation, Opportunistic, Jhapa district

Study of feeding analysis of Ostrich *Struthio camelus* Linnaeus, 1758 in Rupandehi District, Province No. 5, Nepal

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Abstract

Ostrich (*Struthio camelus* Linnaeus, 1758) farming is a new upcoming venture in Nepal. Only one breeding farm was started in Nepal during 2010 with the sole objective of studying its adaptability and commercially viability. Experience revealed that rearing, feeding and nutrition of Ostrich were quite different from other poultry species. The present study was conducted to examine the effect of dietary feeds on the growth performance (initial and final body weight), feeds preparation and inspecting management practices on the farm. A total of eight unsexed Ostrich chicks were used in the present study by feeding two types of diet. Farm feed (normal diet) and supplementary diet are given to the Ostrich chicks for about four months to measure the weight gain. Both feeds showed little weight gain in the first few weeks of life, compared to the following weeks which showed less fluctuation and more stability through the study. The growth rate of the Ostrich feeding supplementary diet was better and faster than that of the farmed diet

at the same age period. Formulation and preparation of feeds were done by direct observation. The management system of the farm was inspected through a questionnaire survey and observational study. The result reveals a commercial production of Ostrich by 100% with the farm engaged in the production of other livestock species (Emus). The parasitic infection may lead to somewhat poor performance so effective deworming program and management strategy should be conducted in order to upgrade the health status of Ostrich and hence to maximize the benefit.

Keywords: Feed Conversion Rate, World Ostrich Acid, Crude Protein, European Union

Prevalence of intestinal helminths parasites in Rajbanshi community of Birtamode, Jhapa District

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Abstract

Parasitic infection is an indication of the poor hygiene and sanitation of the community people. The present study has been conducted on Rajbanshi community of ward no. 7 and ward no. 9 of Birtamode Municipality, Jhapa District, Nepal from June 2014-September 2014. A total of 233 samples from two wards were examined by direct smear method. Out of 233 people, 77(33.04%) were found positive for different helminths infection. *A. lumbricoides* (21.46%) showed the highest prevalence rate followed by Hookworm (4.29%), *T. trichiura* (2.58%), *E. vermicularis* (1.72%), *H. nana* (1.72%) and *S. stercoralis* (1.29%). *A. lumbricoides* was a common parasite in both sexes. Between two wards, the higher prevalence was found in ward no.7 without any significant differences ($P>0.05$). People ≥ 46 yrs. age group was infected more compared to 20-45 yrs. and ≤ 19 yrs. aged. The infection of helminths was found significantly higher in females ($P<0.05$). The present finding showed that the prevalence was significantly high (31.16%) among people having no toilet and use riverside for defecation($P<0.05$). The prevalence of intestinal helminths parasites was found high among Rajbanshi and among them, *A. lumbricoides* was the commonest helminths parasite.

Keywords: Rajbanshi, Helminths, Parasites, Infection

Poster Session: Fungi and Plant Pathology

Mycoflora associated in some commercially cultivated mushrooms in Kathmandu City, Nepal

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Abstract

Fungal contaminants are the major cause of severe damage to the commercial production of *mushrooms*, by reducing production yield, causing deterioration of commercial value and shortening shelf-life. This study attempts to investigate the mycofloral contaminants associated with three commercially cultivated mushrooms viz *Pleurotus oystreatus*, *Pleurotus florida* (Oyster mushroom) and *Agaricus bisporus* (White button mushroom). A total of 21 fungal species belonging to 10 genera (*Aspergillus* spp *Rhizopus* sp *Mucor* sp, *Penicillium* sp, *Alternaria* sp, *Chaetomium* spp, *Geotrichum* sp, *Trichoderma* spp, *Gliocladium* sp and *Fusarium* sp) were isolated from the samples which were collected from three major vegetable markets in Kathmandu city. The occurrence of these fungi varied with different mushroom types with the maximum number (19) of fungi associated with *A. bisporus*, minimum (14) with *P. oystreatus* and 15 species of fungi were isolated from *P. florida*. The most frequent fungal contaminants were *Aspergillus niger* (57.77%), *Rhizopus* sp (42.22%), *Trichoderma viride* (34.44%) and *Aspergillus flavus* (27.77%). As the mushrooms appeared prevailed with many fungal contaminants, more caution should be taken such as the selection of strain from resistant varieties, proper sanitation during in-field and postharvest conditions.

Keywords: Oyster Mushrooms, White button Mushroom, Fungal contaminants, Postharvest loss

Effect of *Alternaria alternata* on leaf spot of brinjal and its management

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Abstract

Brinjal (*Solanum melongela*) is one of the important species cum vegetable crops of Nepal and India. It is also called Bhanta and is grown for its fruits. Brinjal (Eggplant) is a delicate, tropical perennial often cultivated as a tender annual in a temperate climate. Eggplant grows 40 to 150cm tall, with large coarsely lobed leaves. In India, it is one of

the most common, popular and principal vegetable crops grown throughout the country except higher altitudes. It is a perennial but grown commercially as an annual crop. Brinjal is one of the important vegetable crops of Nepal and India. About 25 pathogens have been reported to occur on brinjal. *Alternaria alternata* is one of the important fungal pathogens that cause leaf spots on brinjal growing areas of the world resulting in substantial yield losses. It is a severe and common disease in the entire brinjal growing area in the country. The maximum disease was recorded during mid-July (rainy season). The disease was always noticed in the plains but rarely in the hills. Generally, the fungus attacks the only leaf of nursery-grown brinjal seedlings. The disease persisted in the same areas for years, causing gradual deterioration in the health of the brinjal seedlings in the nursery and loss of crop yield. The present study deals with the factors influencing mycelial growth and screening of resistance varieties of brinjal with *Alternaria alternata*. Factors influencing mycelial growth of *Alternaria alternata* were studied with special reference to their growth in different media, variable pH and variable sources of carbon as well as organic and inorganic nitrogen sources. The maximum growth of pathogen occurred after 10 days of inoculation at pH 6.5. Dextrose was the most effective carbon source and of the nitrogen sources, yeast extract (organic source) was found most optimum for the growth of *Alternaria alternata*. Organic nitrogen sources were found to be better than inorganic nitrogen sources. It revealed that among the three varieties of brinjal local lalgulab was the most susceptible while varieties of hybrid- sumo green long was the most resistant. F₁ hybrid long purple of brinjals was less resistant than the hybrid- sumo green long.

Keywords: *Solanum melongela*, Susceptible, Resistant, Seedlings, Mycelial growth

Toxicity test of some selected wild mushrooms of Nepal

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Abstract

People have been using wild mushrooms in their diet as well as a source of income, but they do not have the proper knowledge to know the edible and poisonous mushrooms. The main objective of this research is the identification of some selected wild mushrooms of Nepal. Samples were collected from the representative, most commonly consumed by the local people on ethnomycological practices having rich mycodiversity in the different ecological belts of the country. Tests were performed on mice and clinical observations of mice were performed four times per day. The sample solution was prepared 2000 mg/kg in aqueous solution for testing on mice which had regarded as high dose. Prepared sample solution, was injected on the mice according to their body weight, for this on Acute Oral Toxicity Test, Acute Toxic Class Method 423 of the Organization for Economic Co-operation and Development (OECD) protocol was used. The level of toxicity was

determined on the basis of the behaviours of mice. The dose was decreased as decreasing the concentration of samples. If the injected mice died even at low concentration then the sample was regarded as highly toxic. During all fourteen tested samples, mice did not die, when the sample solution was injected at 2000 mg/kg for testing on mice which had regarded as high dose. In Nepal, mushroom toxicity was studied on the basis of morphology and ecologically only. But till now, the mushroom toxicity was not tested directly upon animals. Therefore, this research was providing scientific validation regarding mushroom toxicity.

Keywords: Fatality, Indigenous knowledge, Mortality, Mushroom poisoning

Assessment of diseases on *Swertia chirayita* of Dolakha district, central Nepal

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Abstract

Swertia chirayita is a medicinally and economically important herb of family Gentianaceae. The whole part of the plant possesses the medicinal value. It is one of the highly traded species and has been widely used in traditional medicine and the homeopathic system as well as regional folk medicine. In such a context, farmers are suffering from different diseases and consequent loss in quality and quantity of *S. chirayita* production. This study has tried to access the diseases associated with *S. chirayita* cultivated lands of Dolakha district, Central Nepal. Severity assessment was conducted and found to have 19.39% severity and incidence of 47.50%. For the disease pathogen identification, diseased portions were cultured on Potato Dextrose Agar for fungal pathogens and Nutrient Agar media for bacterial pathogens. Among the 14 disease samples collected, 6 fungal diseases, 1 bacterial disease and 1 insect disease were recorded. *Alternaria alternate*, *Fusarium* sp., *Rhizoctonia* sp., *Bipolaris* sp., *Curvularia* sp. and *Colletotrichum* sp. were the fungal pathogens while an unidentified insect larva was found to be feeding on the plant. *Alternaria* leaf spot was recorded as the most occurring disease. It will be tested for in vitro control by poison food technique using the methanol and ethanol extracts of some invasive plant species in different concentrations.

Keywords: *Swertia chirayita*, Severity assessment, *Alternaria* leaf spot, Poison food technique

Poster Session: Ichthyology

On the production technology of Watercress *Roripa naustericum aquatilicum* and Small Indigenous Fish Species (SIS) in the integrated system

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Abstract

A case study was performed on the farm of Ganesh Bahadur Chemjong, located on the bank of Chisang River basin, Lamitar, Letang Municipality-6 of Morang District of Nepal during July 2019 with the objective to understand the production technology of Watercress and SIS in the integrated system. Information was collected through interviews with farm owners using a semi-structured questionnaire followed by field observation. Data were analyzed by using tabular and descriptive statistical methods. This case study clearly revealed that integrated Water-cress and Small Indigenous Fish Species (SIS) farming is a highly profitable enterprise. Multiple harvesting of water-cress was found to have been taken from each crop and marketed in local markets of Morang, Sunsari and Jhapa district. The productivity of Water-cress was calculated to be 8.75 tons per ha and gross income generated was NPR 3,50,000/ha/year. Net profit from the sale of Water-cress was NPR 2, 19,000/ha and the benefit-cost ratio was 1.87 (FY 2075/076), which indicated that Water-cress farming is a profitable business. At the same time, more than seventeen SIS were found in the study site. According to the farmer, harvested SIS is not sold in the market instead are consumed by themselves and sometimes exchanged with neighbors and relatives occasionally done. The present practice was one of the most income-generating schemes and which also provide safe feeding and breeding for SIS. there.

Keywords: Watercress, Integrated farming, Income-generating scheme, SIS, Employment opportunity

Fecundity on Hillstream Catfish *Pseudecheneis sulcatus* (McClelland, 1842) from Tamor River, Nepal

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Abstract

The present study reports on the assessment for the fecundity of *Pseudecheneis sulcatus* from Tamor River, Nepal. A total of 70 specimens were studied for fecundity assessment,

with 10 specimens for each month. Parameters such as total weight, gonad weight, total length and egg diameter were considered for the assessment of fecundity. Gonado-somatic index (GSI) was also calculated. The study was conducted for seven months from the month of February 2019 to August 2019. The mean absolute fecundity of fish (4390.19) shows the fish was moderately fecund compared to the reports of some highly fecund fishes with tens of thousands of eggs and some low fecund fish like *Xenontedon cancila* (142-1197). The present report shows the fecundity of fish was highly correlated with its gonad weight (0.981) then total weight, total length and GSI of fish. Gonado-somatic index (GSI) of fish was found to be the peak in March (9.79%) which abruptly fell to 2.06% in August, showing the spawning season of fish coinciding with these months. The largest mean size of an egg was observed in March (1.25mm) and the mean of smallest egg size was found to be 0.11mm in June. The single ovary contains eggs of varied diameter, which suggests that fish is a fractional spawner. The illegal fishing practices like electrofishing, poisoning of the river, mass fishing etc. had become a threat to the population of *Pseudecheneis sulcatus* in recent times.

Keywords: Gonadosomatic index, Tamor, Reproductive biology, *Pseudecheneis sulcatus*, Ovaries

Demand of fishes and their diversity in markets of Saptari District

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Abstract

Nepal has a large freshwater body like rivers, lakes, wetland reservoirs and others that promote the potentiality of fisheries and other aquacultures that convert natural aquatic waste foods into animal protein good for health. A regular survey of the fish market of different parts of Saptari district had been made for observation and collection of fishes from June 2017 to May 2018. A photo of fishes was taken immediately as soon as possible. Several interviews were taken with fish sellers and persons related to this field especially by questionnaires to know the demand of fishes in the markets. Most of the peoples living in Saptari district had a concept as fishes are very beneficial to human health. So, the demand for fish in local markets had been increasing in the past few years (1578 tons annually). But the local production was unable to fulfill the demands of fishes in the markets. 60% of fish sold in major markets of Saptari used to be imported from India (Andra Pradesh, Siliguri, Naur and Kunauli border). Rajbiraj has the highest demand for fish and lowest in Fattepur, Lahan, Bhardaha, Kanchanpur and other different parts of the district had a medium demand for fishes. 99% of total fish were sold in wet form and 1% was sold in dry form. Markets had a high demand for carps like *Labeo rohita*, *Cirrhinus mrigala*, *Cyprinus carpio*, *Aristichthys nobilis*, *Ctenopharyngodon idella*; and then catfishes like *Pangasius pangasius*, *Wallago attu* and *Clarias gariepinus*. The non-

cultivated indigenous fishes supplied in different markets of the district include 32 different species. Some indigenous fishes captured directly from rivers and other water resources are *Chagunius chagunio*, *Puntius sophore*, *Puntius ticto*, *Aspidoparia* spp., *Barilius* spp., *Danio devario*, *Esomus danricus*, *Salmostoma bacaila*, *Garra annandalei*, *Garra gotyla gotyla*, *Acanthocobitis botia*, *Botia lohachata*, *Lepidocephalus guntae*, *Somileptes gongota*, *Mystus bleekeri*, *Mystus cavasius*, *Ompok bimaculatus*, *Wallago attu*, *Xenentodon cancila*, *Channa orientalis*, *Channa punctatus*, *Chanda nama*, *Parambassis ranga*, *Colisa fasciatus*, *Glossogobius giuris*, *Monopterus cuchia*, *Macrognathus* spp., *Mastacembelus armatus* etc. Non-hygienic fish stalls, lack of marketing infrastructure & facilities, lack of cold storage facilities, poor transportations and financial crisis were some problems faced by fishermen in fish markets.

Keywords: Fishmarket, Saptari, Diversity

Fecundity of *Glyptothorax telchitta* (Hamilton, 1822) from Tamor River, Nepal

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Abstract

The present study elaborates on the fecundity of *Glyptothorax telchitta*, a hill stream fish from Tamor River. A total of 60 specimens was collected with the help of local fishermen in the duration of six months from March 2019 to August 2019 for the study. The range of absolute fecundity was found to be 3385.2 to 14298.4 eggs. The relationship of fecundity with various body parameters was studied and found that fecundity was highly correlated with ovary weight ($r=0.857$) and temperately correlated with fish weight ($r=0.841$) and less correlated with body length ($r=0.752$). This shows that fecundity mostly relies on ovary weight than other parameters. The mean smallest egg size was observed in April (0.42 mm) and the mean largest egg size was observed in May (1.37 mm). The matured ovaries occupied maximum space in the abdomen during the breeding season. GSI (Gonado-somatic Index) was calculated and was found to be maximum in May (16.64%) followed by March (14.66%) resembling the spawning period. The illicit fishing exercise such as poisoning and electrofishing has led this species to the IUCN list of threatened species.

Keywords: *Glyptothorax telchitta*, Hillstream, Fecundity, Gonado-somatic Index, Spawning period

Present status of finfish market in Biratnagar

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Abstract

A case study was performed to understand the availability of local and imported fishes in the local market of Biratnagar and their demand per season, and size and freshness. Fish production is closely related to fish consumers and hygienic conditions of the fish market. Consumer preference depends on the size and taste of fish species. Local fish markets of Biratnagar were visited two weeks per month in October and November in 2019. For information collection direct observations, interviews with fishermen, fish dealers and consumers were duly done while visiting local markets. The large-sized indigenous fish species observed in the markets were *Labeo rohita* (rohu), *Catla catla* (catla), *Cirrhinus mrigala* (mrigal), *Wallago attu* (Buhari) and *Channa* species whereas the exotic fishes locally cultured or imported from India were *Clarias gariepirus* (African catfish), *Cyprinus carpio* (common carp) and *Aristichthys nobilis* (bighead carp). etc. Among many table fish species, the most preferred fish was rohu because fish sellers have sold this fish more per day in comparison to other fishes. The consumers were found preferring fresh and healthy fish in spite of their high price. Fish packed in ice and chilled fish were also seen being commonly accepted by the consumers due to their comparatively low price. Live fish were found being sold at a high price rather than dead fresh fish. Local indigenous small fish species (SIS) were seen very less amount but of high demand and dearer than big fishes. As per fish dealers, the winter season is the best season for both dealers and consumers.

Keywords: Finfish, Fish market, SIS, Fresh fish, Fish dealers

A glimpse of shellfish market in Biratnagar Sub-Metropolitan City, Province 1, Nepal

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Abstract

The present paper attempts to describe the status of shellfish market in Biratnagar, Morang, Nepal. Shellfish is an exoskeleton-bearing aquatic invertebrate used as food, including various species of molluscs, crustaceans, and echinoderms. Shellfish is widely distributed and found in rivers, lakes, reservoirs, ponds, swamps, ditches, canals etc. of Nepal. In spite of its economic values, shellfish culture has not been brought into practice yet in

Nepal. However, considering consumer's demand, shellfish are imported from India and are sold in daily markets of Tarai of Nepal. With a view to understanding the quantity of shellfish and their present market price and consumer demand, a short investigation of local markets was carried out for two months (October and November). The people engaged in shellfish trade of Biratnagar were interviewed about how often they bring shellfish from India and how much they could sell shellfish per day in the market. The buyers were also asked how often they eat shellfish and why. It was found that shellfish is in high demand and 3.5-4 quintals of shellfish (mussels, snails, prawn) are bought and sold in a single day in a single fish market. The shellfish available in Biratnagar market are snails (*Pila globosa*, *Bellamyia bengalensis*, *Lamellidens marginalis*, *Corbicula alata*, *Parreysia flavidens*, *Brotia costula*), Prawn (*Macrobrachium* spp., *M. rosenbergii*), Crabs (*Paratelphusa spinigera*). The shellfish price in local markets ranges from NPR 60-70/kg for snail with shell and without shell NPR 90 -100/250 g., local prawn price NPR 800/kg. Similarly, the price of crab ranges from NPR 250 to 400/kg. It was found that a consumer's total demand was fulfilled by import.

Keywords: Shellfish, Mollusc, Crustacean

Ichthyofauna diversity and some physico-chemical parameters of Upper Churia range in Babai River, Dang District, Nepal

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Abstract

The present research work was carried out to study diversity, distribution, abundance, and status of fishes in the Babai River. The Babai River is a good habitat for many species of freshwater fishes such as carps, barbs, minnows, catfishes, eels etc. The study was focused on the fish diversity trend and data were collected through selected sampling sites and the field was visited monthly up to five months (May 2017 to September 2017). The physicochemical parameter of the river water was also analyzed by using different types of instruments following the methods prescribed by APHA, (1998). Total no of 42 fish species belong to 7 orders, 12 families and 29 genera were collected from the study area. The most commonly observed fish species during the study period were *Channa punctatus*, *Garra mullya*, *Tor tor*, *Mystus tengra*, *Mastacembelus armatus* *Cirrhinus reba* and *Glyptothorax pectinopterus*. Similarly, *Channa* species with two blotches on the dorsal side of the tail were collected. The physicochemical parameters were found to be related to the composition and distribution of the fish species in Babai River. Water temperature and fish diversity show a positive correlation in all of the months. Similarly, the correlation between dissolved oxygen (DO) and fish diversity show positive correlation in the three months May, July and August which were (0.4369), (0.7425) and (0.43267) respectively. In the same way, highly, a negative correlation was found between carbon

dioxide and fish diversity in May, June and August which were (-0.1801, -0.567 and -0.3096) respectively. The highest Shannon-Wiener diversity index was observed in station II (2.7), and the evenness index was found to be higher in station VI (0.84). No significant difference in the diversity status was obtained during the investigation period.

Keywords: Babai River, Ichthyofauna, Physico-chemical parameters

Observation on growth performance of major carps with small indigenous species

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Abstract

An experiment on the polyculture of major carps, Bighead carp (*Aristichthys nobilis*), Silver carp (*Hypophthalmichthys molitrix*) and Common carp (*Cyprinus carpio*) with small indigenous fish species (SIS): mara (*Amblypharyngodon mola*) and pothi (*Puntius sophore*) was carried out to evaluate the growth performance of major carps in aquaria of Laboratory of Zoology Department, Post Graduate Campus (Science Block), Biratnagar, Morang, Nepal. The experiment included four treatments in triplicates. Only major carps (bighead carp, silver carp and common carp) were stocked in treatment-1 (T-1), major carps with *Puntius sophore* were stocked in treatment-2 (T-2), major carps with *Amblypharyngodon mola* were stocked in treatment-3 (T-3) and major carps were stocked with both SIS in treatment-4 (T-4). Fish were fed on the dough of rice bran (60%) and mustard oil cake (40%) at the rate of 5% body weight. Weight gains by major carps over a period of 90 days were 6.99 gm, 6.84 gm, 6.55 gm and 6.37 gm, in four treatments, respectively. Water quality parameters were not much different in different treatments. There was no significant difference in weight gain between T-1 and T-2 while the weight gain in T-3 and T-4 was significantly lower. Hence, this study demonstrated that the growth performance of major carps is better with pothi than with mara or combination of both mara and pothi.

Keywords: Polyculture, mara, Pothi, Dough, Triplicates

Algae of Gupha Pokhari and Lam Pokhari, Sankhuwasabha District, Nepal

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Abstract

Gupha Pokhari (27.285098°N, 87.505739°; alt. 2890 m msl) and Lam Pokhari (27.10375N, 87.94852; alt. 3036 m msl), lies in Sankhuwasabha district along the popular Tinjure Milke Jaljale (TMJ) trail, a capital of *Rhododendron*. Algae of Gupha Pokhari and Lam Pokhari were collected by squeezing submerged macrophytes and leaf litters and with the help of a plankton net (mesh 10 μ m) during April 2019. Samples were brought to the Phycological Research Lab, Department of Botany and identification and microphotography of algae are undergoing. A total 18 algae have been identified till now and they are *Actinotaenium australe*, *Closterium* cf. *cynthia*, *C. diana*, *C. navicula*, *Cosmarium regnellii*, *C. subspeciosum* var. *validius*, *C. taticum* var. *taticum*, *Cylindrocystis brebissonii*, *Euastrum* cf. *denticulatum*, *Eunotia paratridentula*, *Frustulia rhomboids*, *Hyalotheca dissiliens*, *Pinnularia conica*, *Scenedesmus acutiformis*, *Staurastrum tohopekaligense* var. *tohopekaligense*, *Staurodesmus extensus*, *S. glaber*, and *Teilingia granulata*. Among these, *Actinotaenium australe*, *Cylindrocystis brebissonii*, and *Euastrum* cf. *denticulatum* were observed frequently in both ponds. Algae were found richly in Lam pokhari than the Gupha Pokhari. The present work is under progress.

Keywords: *Actinotaenium*, Chlorophyceae, *Euastrum*, *Rhododendron*, Tinjure Milke Jaljale

Diatoms of Manang district

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Abstract

Diatoms are photoautotrophic microorganisms found in various types of water sources and moist surfaces. They are considered a very important part of a freshwater ecosystem. Manang district having peculiar geography and climate is novel for exploration of diatom flora in Nepal. In July 2019 diatom samples were collected from freshwater bodies of Manang (2551 to 3510 masl) at different locations (Pisang, Humde, Manange village, and Gangapurna glacier region). The samples were brought to the Central Department of

Botany, Tribhuvan University, Kirtipur, Kathmandu, and diatoms were observed under the digital microscope by making temporary slides. Photographs were taken and a total of 17 diatoms were identified and described. Among them, *Navicula* and *Nitzschia* were the most common genera found in the majority of the samples studied. Further explorations in Manang are recommended to add the number of diatoms and other members of alga.

Keywords: Nepal Himalaya, Algal diversity, Bacillariophyceae, Algal exploration

Freshwater algae (excluding diatoms and red algae) from Hasina Wetland, Sundarharaicha, Morang: New to Nepal

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Abstract

Freshwater algae of Hasina wetland and its surroundings including Khayer Khola and Budhi Khola was studied in 2072. Algal samples were collected from five different localities using plankton net (mesh size 0.5 mm) and by squeezing submerged leaves and roots of aquatic macrophytes. There are 24 algae reported from Hasina Wetland as new for Nepal. They belong to 20 genera and 5 classes, viz., cyanophyceae (5), chlorophyceae (15), xanthophyceae (1), chrysophyceae (1) and dianophyceae (2). This area is also a favourable habitat for the growth of freshwater red algae.

Keywords: Chlorophyceae, Cyanobacteria, *Dinobryon tabellariae*, Xanthophyceae

Freshwater algae of Barju Tal (Chimdi Lake), Sunsari, Nepal

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Abstract

Freshwater algae of Barju Tal (Chimdi Lake), Sunsari was studied during the period of November to January 2017-18. A total of 20 algal samples (16 from New and 4 from old ponds) were collected from 10 different peripheral sites of the pond by squeezing submerged macrophytes. In this study, a total 105 freshwater algae belonging to 4 phyla (Cyanobacteria 11%, Chlorophyta 72%, Euglenozoa 2% and Bacillariophyta 15%), 7 classes (Cyanophyceae 11%, Trebouxiophyceae 5%, Chlorophyceae 13%, Conjugatophyceae 54%, Euglenophyceae 2%, Coscinodiscophyceae 1% and Bacillariophyceae 14%), 20 orders, 34 families and 51 genera were enumerated. The common algae found in this lake were *Dictyosphaerium pulchellum*, *Ankistrodesmus*

falcatus, *Closterium diana*, *Euastrum elegans*, *Actinotaenium subglobosum*, *Cosmarium quadrum*, *C. ralfsii*, *Staurodesmus unicornis*, *Staurastrum sonthalianum*, and *S. striolatum* which were present in almost all collections. The rarely occurred algae were *Tetraedron minimum*, *Kirchneriella contorta*, *Gonatozygon monotaenium*, *Penium margaritaceum*, *Euastrum divergens* var. *ornatum*, *Cosmarium abbreviatum* var. *minus*, *C. cf angular*, *C. meneghinii*, *C. regnesi*, *Monomorphina pyrum*, *Gyrosigma acuminatum* and *Stenopterobia intermedia*. The study showed that the algae were rich and diverse in the old pond than in the newly constructed one. The increasing human activities such as boating, swimming and picnic in and around the new lake may influence the algal habitat.

Keywords: Phytoplankton, Chlorophyceae, Bacillariophyceae, *Cosmarium*, *Penium*

Studies on freshwater algae of Arun River, Leguwa, Dhankuta

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Abstract

Freshwater algae of Arun River, at Leguwa, Dhankuta has been studied in the months of October, December and April 2018-2019. Algae were collected by plankton mesh net, handpicking from grassland and rice field by quadrat method (10×10 cm²) and brushing the slimy surface of the stones from three localities along the river edge. A total of 75 algae belonging to 39 genera, 18 orders and 4 classes were enumerated. The maximum occurred genera were *Cosmarium*, *Gomphonema*, *Navicula* and *Nitzschia* whereas the least occurred genera were *Luticola*, *Staurastrum*, *Reimeria* and so on. The maximum number of algae were collected during October whereas the minimum number of algae were collected during April. Algal flora of Arun river, Leguwa is rich and diverse. It needs further extensive exploration to document and conserve the algal world.

Keywords: Bacillariophyceae, *Luticola*, *Cosmarium*, Extensive, *Reimeria*

Aquatic macrophytes of Maipokhari wetland, Ilam, Province no.1, Nepal

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Abstract

Maipokhari is a wetland area situated in Ilam district of eastern Nepal. It was declared as the Ramsar site on 28th October 2008. Being a wetland habitat, the area is rich in herbaceous plants called aquatic macrophytes. The present study is based on field visits, collection

and identification. A total of 16 species of aquatic macrophytes belonging to 13 families and 15 genera. Among the collected wetland plants most of the species were angiosperms (56.25%) followed by bryophytes (31.25%). and the least species were pteridophytes (12.5%). *Hydrocotyle himalica* is the new species recorded in this area belonging to family Apiaceae. This area is facing the impact of climate change and anthropogenic disturbances.

Keywords: Biodiversity, Eastern region, *Hydrocotyle himalica*, Pteridophytes

Fern and fern allies of Raja-Rani Letang, Province 1, Nepal

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Abstract

Raja-Rani Letang (Lat. 26°45'21" N; Long. 87°29'10" E; Alt. 480m; Area 17 sq.km) is a wetland area, surrounded by forest lies in Chure range of Morang district, Province-1. The area is rich in floral diversity and a religious destination of Dhimal tribe. It is a moist and luxuriant habitat for pteridophytes. The present study aims to explore and document the fern and fern allies based on the regular field visits, collections and identification. A total of 43 species of Fern and fern allies belonging to 17 families and genera were recorded. Pteridaceae was the largest family and *Thelypteris* was the largest genus. On the basis of ecological habitat numbers of species were in the order: terrestrial (25) > lithophytes (8) > epiphytes (6) > climbers and aquatic (4). Sixteen species were new to the Morang district and 9 species were threatened species of Nepal. Conservation strategies for threatened pteridophytes in Raja-Rani Letang is inevitable.

Keywords: *Angiopteris helferiana*, Endangered, Epiphytes, Morang, *Oeosporangium belangeri*

Seasonal variation of algal diversity with reference to water quality in Jagadishpur Reservoir, Nepal

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Abstract

The importance of physicochemical parameters of water for algal growth and development was carried out in present research. The water samples were collected from Jagadishpur Reservoir Kapilvastu Nepal in two seasons (rainy and winter) to analyze physicochemical parameters such as Temperature, pH, Dissolved Oxygen, Alkalinity, Nitrate, Free CO₂,

Hardness, Phosphate, Conductivity, Total Dissolved Solids. Algal species and diversity were also analyzed. Free CO₂, Hardness, Phosphate, Temperature, pH and Dissolved Oxygen were recorded high in rainy season and Alkalinity, Nitrate, Conductivity and Total Dissolved Solid were recorded high in the winter season. Altogether 81 species belonging to 53 genera and 5 classes were recorded. Higher algal species were recorded in the winter season rather than in the rainy season.

Keywords: Physicochemical, Algal growth, Season

Algal flora of Ghodaghodi Lake, Kailali, Nepal

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Abstract

Algae of Ghodaghodi lake (Lat. 28°41'03" N and Long. 80°56'43" E, elevation 205 m msl), Kailali was studied during May and October 2015. A total of 56 algal samples were collected from 28 different peripheral localities by squeezing submerged parts of aquatic plants and by using plankton mesh net (size 0.5 mm) and preserved in 4% formaldehyde solution. The study enumerated a total 128 algae belonging to 60 genera and 5 classes i.e., Cyanophyceae (17 spp. or 13%), Chlorophyceae (96 spp. or 75%), Bacillariophyceae (8 spp.), Euglenophyceae (6 spp.) and Dinophyceae (1 spp., i.e., *Glenodinium borgei*). Within the class chlorophyceae, the desmids covered a total of 46.87%. Among the 60 genera, genus *Cosmarium* has maximum species (23 spp.) followed by *Euastrum* (9 spp.), *Scenedesmus* (8 spp.), *Closterium* (5 spp.), *Micrasterias* (5 spp.), *Pediastrum* (4 spp.) and so on. In this paper, genus *Staurodesmus* is excluded whereas *Staurastrum* is included incompletely. The dominant algae found in the lake were *Ankistrodesmus spiralis*, *Coelastrum cambricum*, *Cosmarium contractum* var. *pachydermum*, *Cosmarium impressulum*, *Desmidium swartzii*, *Gloeotaenium loitlesbergerianum*, *Gomphosphaeria aponina*, *Mougeotia scalaris*, and *Nephrocytium agardhianum*. More than 40 algae were reported from this lake as new for Nepal.

Keywords: Phytoplankton, Cyanophyceae, Diatoms, *Euastrum*, *Micrasterias*

Taxonomy and diversity of algal flora of Jagadishpur Reservoir, Kapilvastu, Nepal

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Abstract

Taxonomy and diversity of algal flora of Jagadishpur reservoir were studied at the interval of two months throughout the year 2072 (2015). This work comprises a total of 124 algal taxa belonging to 58 genera, 9 classes, 22 orders and 36 families. Out of these, 35 algae were reported as new to Nepal. The algal flora of Jagadishpur reservoir is rich and diverse. It needs further extensive exploration to document and conserve the algal.

Keywords: Phytoplankton, Diatoms, Blue-green algae, New report

Poster Session: Medicinal Plants and Ethnobiology

Folklore medicinal plants used against typhoid fever in Lwangghalel, Kaski District, central Nepal

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Abstract

Typhoid fever is an infectious contagious disease of concern throughout the developing nations around the world. Different types of plant species are used traditionally against typhoid fever by ethnic peoples of Lwangghalel, Kaski district, central Nepal. This study aimed to document traditional medicinal plants used traditionally by local indigenous people and traditional healers to treat typhoid and fever. Group discussions, forest walk, and individual interviews were part of the methodology using open-ended semi-structured questionnaires. Twenty plants were cited by elder people and traditional healers to treat typhoid fever. Most of them were used in the form of decoction taken orally. The most frequently utilized medicinal plant parts were root (33.33%) and bark (16.67%) followed by the whole plant (13.33%), shoot (13.33%), rhizome (10%), fruit (10%) and tuber (3.33%). Herbs (73%) were the primary source of medicine, followed by shrubs (10%) and trees (17%). Knowledge about medicinal plants and its practices existed only among elder people and traditional healers. Further detail documentation with the involvement of local stakeholders is important so that it can be accessible to a large number of populace.

Keywords: Antipyretic, Ethnobotany, Ethnomedicine, Herbal Healers, Traditional knowledge

Ethnomedicinal plants of Dhankuta District, Province 1, Nepal

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Abstract

The study of ethnomedicinal plants of Dhankuta district of province 1 was conducted in 2016. The ethnocultural uses of plants from ancient to this day are flowing till now in Dhankuta. Information was taken from 75 randomly selected individuals of 3 municipalities and 4 rural municipalities of Dhankuta district using questionnaires. Fifty-one ethnomedicinal plant species belonging to 25 families under 37 genera were recorded during the survey. These plants have been used as a cure of 20 different ailments -diabetes, blood pressure, tonsillitis, dry cough, fever, dysentery, common cold, fracture of bone, burns etc. But there is a lack of continuation and flow of indigenous knowledge to the

young generation. The proper conservation and management of local ethnomedicinal plants with the involvement of ethnic people of Dhankuta must be encouraged by a joint venture of local government and government of the province.

Keywords: Conservation, Dhankuta, Indigenous knowledge, *Oroxylum indicum*

Ethnobotanical study of ferns of Panchase protected forest, central Nepal

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Abstract

Pteridophytes are of immense economic importance, so there is high value in further researching the species. Their medicinal value has been known to people for more than 2000 years ago. The present study was carried out at Panchase Protected forest situated at an altitude range from 1405m to 2500m. The research was carried out in the year 2014-2015 which documents the traditional use of 51 fern plant species belonging to 28 genera representing 15 families, used by different village communities. The study deals with the utilization of Pteridophytes by the local, tribal people and the major groups included are Brahmin, Chhetri, Gurung, Bishwokarma, Nepali, Pariyar and Magar. It also reflects the ethnomedicinal uses of ferns that are prevalent in the study area, along with the botanical name, local name, family, habitat, plant parts use and mode of uses.

Keywords: Ethnomedicinal uses, Pteridophytes, Panchase Protected Forest, Central Nepal

Study the ethnobotanical plants of Tharus of Hasuliya, Kailali, Nepal

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Abstract

Ethno-botany is the study of a region's plants and their practical uses through the traditional knowledge of local culture and people. The aim of this study is to find the plants which play a significant role in household activities, have traditional importance as well as medicinal importance. The study of plants was done in community forest from where altogether 94 plant samples were collected. Among all samples 38(40.42%) plants are reported for household uses, 17(18.02%) plants are used as a traditional and religious ceremony and 39(41.56%) are reported as the medicinal plants. About 7(7.44%) species of plants have all these importance ie; household, traditional and medicinal value. This

study will help people to know the household, traditional and medicinal plants used by Tharu communities of the study site.

Keywords: Ethno-botany, Community forest, Ceremony

Ethnobotanical study on medicinal plants used by local Tamang ethnic people of Timal, Kavrepalanchok, Nepal

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Abstract

Ethnobotany reveals historical and present plant use to fulfill a wide variety of human needs. Documentation of indigenous knowledge is important for species conservation and sustainable resource use. The present study was conducted to document the use of medicinal plants, plant parts used, mode of preparation and delivery by the ethnic group of Timal. The study was conducted in Pokhari Narayansthan VDC ward no. 2, 3 and 8 of Kavrepalanchowk district. Original data were collected from 95 informants through semi-structured & unstructured interviews and participant observation. From this study, 33 medicinal plants were documented. There are 15 trees, 14 herbs and 4 shrubs of medicinal plants. Species are mainly used for treating prevalent health disorders, i.e. skin and digestive disorder, fever, respiratory affections and feminine issues. The major species are *Centella asiatica*, *Rhododendron arborem*, *Euphorbia hitra*, *Castanopsis indica*, *Eupatorium adenophorum*, *Schima wallichii*, *Myrica esculenta*, *Pinus roxburghii*, *Quercus lanata*, and *Nardostachys grandiflora*. Leaves were the most frequently used plant part in the preparation of medicines. The most frequent preparation method was decoction while the oral route was the most commonly mentioned mode of administration. The ethnic community of Timal holds valuable knowledge about the uses of medicinal plant resources. The study highlights the need for documenting and publicizing the traditional medicinal knowledge which will provide basic data for further research and conservation.

Keywords: Conservation, Ethnobotany, Medicinal Plants, Timal, Traditional Use

A traditional approach for the remedy of shingles using medicinal plants in rural village of Ilam, eastern Nepal

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Abstract

Collection and documentation of indigenous knowledge of local people have an important role in scientific research, conservation, and the drug development process. A study was carried out with the aim to document the medicinal plants that have been used by the local folk healer to treat Shingles in the rural village of Ilam district, Eastern Nepal. A renowned folk healer was selected who was involved in curing Shingles for 15 years and had cured over 250 patients to date. Altogether six plants viz: *Oroxylum indicum*, *Cynodon dactylon*, *Centella asiatica*, *Drymaria cordata*, *Sesamum indicum*, and *Lygodium japonicum* were found to be used against the disease. The method was found to be highly effective than any conventional allopathic medicine. The finding proves the efficacy and legitimacy of the traditional medicines and provides a clue for further extensive lab-based research to isolate the specific compound that was effective against the disease.

Keywords: Shingles, Folk-healer, Indigenous, Allopathic, Traditional

Ethnomedicinal plants used by Dhimal of Rajghat VDC of Morang district

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Abstract

The present work was carried out during 2015-2016. During the study, the Participatory Rural Appraisal technique (PRA) and interview technique were employed to get ethnomedicinal information from local people. Altogether 113 plant species were reported with their local name, short description, field notes and ethnobotanical notes used by Dhimals in medicinal purpose. These 113 plant species are distributed under 102 genera and 55 families. Among them 44 families belonged to dicotyledons, 9 families belong to monocotyledons and 2 families from pteridophytes. The largest family was Fabaceae with 12 species of medicinal purpose. Different 15 plant species were used to cure fever and another 15 species for cold and cough. More than 1 plant species were used by Dhimals to cure one illness. Similarly, more than one illness was cured by a single plant species. Dhimals used different parts of plants for medicinal purposes. They used leaves of 51 species, roots of 33 species and fruits of 21 species. Others are seeds, flowers, trunks, barks, rhizome, latex, resin etc of plants for the treatments of different ailments.

Keywords: Ethnobotanical notes, Cure, Illness, Plant parts, Latex, Resin

Ethnobotanical study of Limbu tribe of Sudap VDC, Tehrathum, Nepal

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Abstract

The present study provides the knowledge of different aspects of Limbu tribe of Tehrathum district, Nepal including indigenous knowledge of many plants being used by them for medicines, foods, fodders, fuel, timber, cultural rites and others. Ethnobotanical information was collected by PRA and Interview methods from elder aged people, Dhamies, Fedangmas and other experienced housewives during 2017. A total of 153 plant species belonging to 56 families, 29 genera were reported from the study area. Among them, pteridophytes are comprised of 3 species, monocotyledons 19 and dicotyledons 131 species. Among the total plant species, 112 plants were wild and 41 were cultivated. Out of the 120 plants were edible, 31 for fodder and remaining were under other uses.

Keywords: Pteridophytes, Monocotyledons, Dicotyledons, Fodders

Plants in the rituals of Newa community of Chapagaun, Nepal

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Abstract

Newa community performs different rituals throughout their lifespan, from birth to death. Particular plants and plant products are considered indispensable for such rituals. Present research enlists the plants used during the rituals of the indigenous community of Chapagaun and also discusses the availability of these plants in the area. Altogether 41 species of plants belonging to 36 different families are being used in seven different rituals. The rituals such as *Macha Buigu* or Birth of a child, *Ja Nakegu* or Rice feeding to a newly born, *Ihin* or marriage ceremony with Wood Apple fruit, *Kyenta Puja* or worshipping a young boy before entering the adolescence, *Ihipa* or marriage ceremony are the rituals in which many plants species are believed to be indispensable. *Bura Janku* or the worshipping of the elderly is unique to Newa community and this ritual makes use of 21 different plant species. During *Shee Jya* or the death ritual alone, 19 species of plants are believed to be essential. Almost all rituals essentially employ *Cynodon dactylon*, *Ficus religiosa*, *Ficus benghalensis*, *Jasminum multiflorum* and *Musa paradisiaca* as the most essential plant species. The most unique feature of *Ihipa* among Newa is popping in the flowers of *Narcissus tazetta* and *Artemisia pallens* on the head of a bride by the groom. Among the plants used, 49% are found cultivated, 30% are available in the packaged form and the remaining are found in the wild.

Keywords: Chapagaun, *Ihipa*, Newa, Rituals, Wood Apple

Medicinal plants of Dhankuta District, Nepal

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Abstract

Medicinal plants of Dhankuta district has been studied in 2015. The medicinal plants data were collected by Participatory Rural Appraisal (PRA) method which involves the direct participation of local people to get information about the knowledge on the different uses of plant species, location, and place of availability and interview method in which the questionnaires were asked about the medicinal uses of the locally available plants with local Dhami or Jhakri, elder people, local medicine men etc. Plant specimens were identified with the help of monographs and literature. A total of 91 plant species belonging to 50 families were enumerated which were utilized for the treatment of various diseases. As per the plant, parts are concerned, mostly, fruit (19.6%) and leaf (18.8%) followed by the whole plant (15.7%), bark (9.4%), etc. were used to prepare the medicine from locally available plants. Most of the medicinal plants have been found to be prepared in the form of paste (34.5%), juice (29.2%) and decoction (10.6%). Due to the lack of conservational activities and carelessness of people, some of the rare medicinal plant species are decreasing day by day. If proper actions to conserve these plants are not taken then they may disappear. Therefore, emphasis should also be given to identification, conservation and cultivation techniques of different species of medicinal & aromatic plants so that they can be saved for future use.

Keywords: Enumeration, Aromatic plants, Decoction

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National Conference on Integrating Biological Resources for Prosperity
6-7 February 2020 / 23-24 Magh 2076
Biratnagar, Nepal

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