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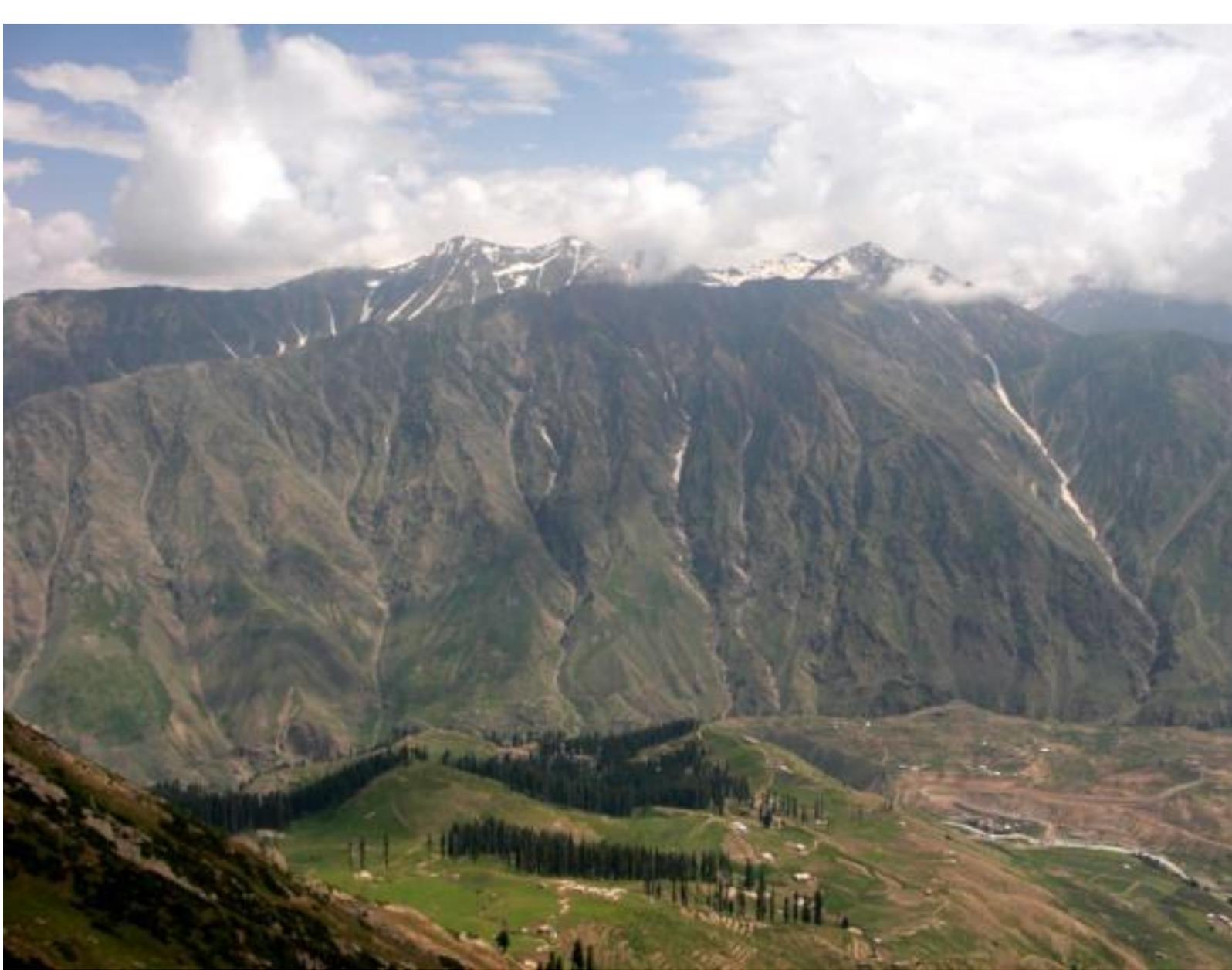
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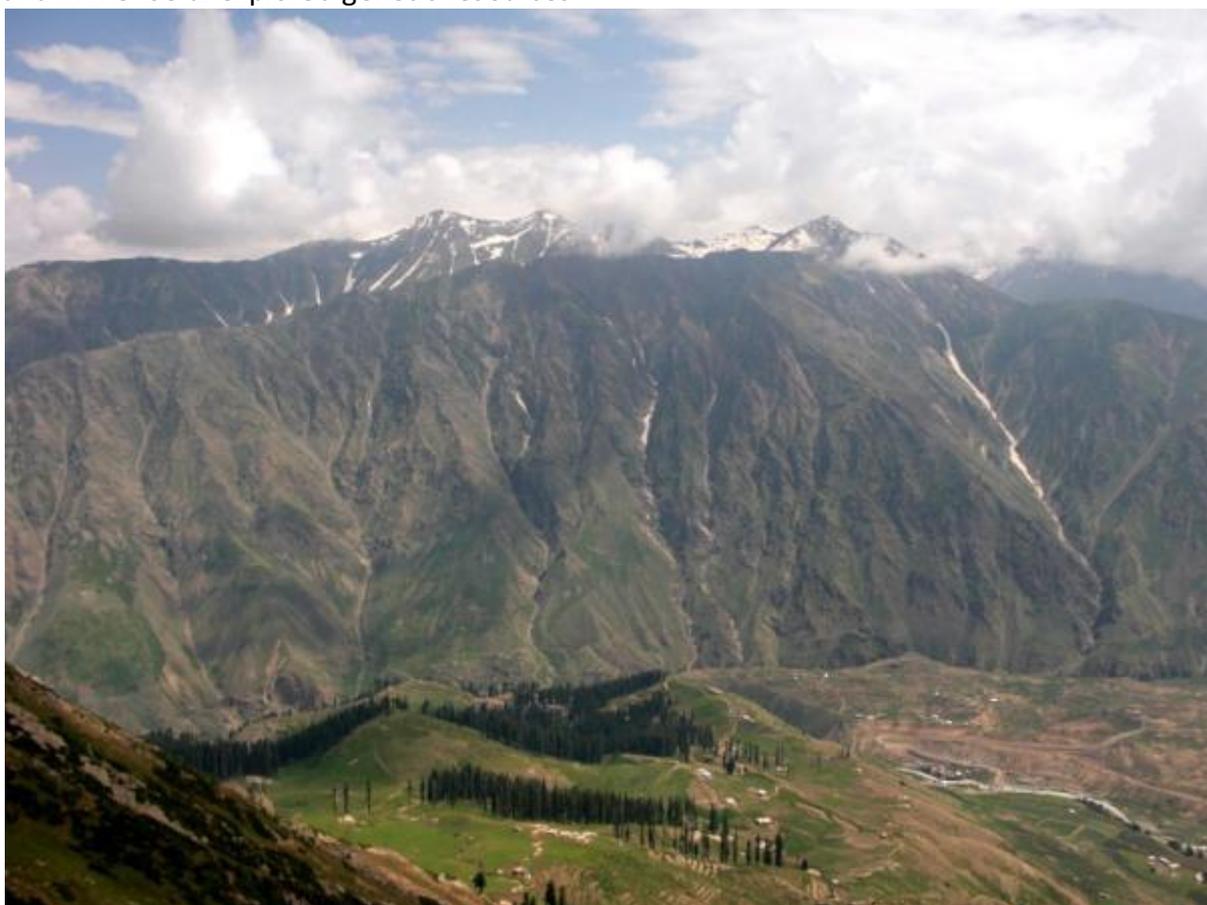
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PREAMBLE

Himalayas are the world's largest mountain ranges situated in South Asia separating the plains of the Indian subcontinent from the Tibetan Plateau. Himalayas include more than hundred mountains exceeding 7,200 metres. The Himalayan region of Pakistan is recognized as the well-known Western Himalayan Province famous for its unique endemic and threatened biodiversity, which gives it as a distinction viz Western Himalayan Moist Temperate Ecoregion in the Global-200 priority ecoregion for conservation. It hosts enormous tangible and intangible resources broadly recognized as sociocultural, physical and biological resources. The Himalayas of Pakistan not only preserve the precious biodiversity but also provide precious ecosystem services including supporting, providing and cultural services. The Himalayan highlands of Pakistan provide uncountable environmental benefits and socioeconomics standing to the dwellers of the region. The area is blessed with the world's highest peaks, plateaus, glaciers, snow fields, forests, wildlife and immense unexplored genetic resources.



A view of Pakistani Himalayas (Photo provided by Dr. Shujaul Mulk Khan).

Hazara University lying on the western edge of Himalayas is the real custodian of the research and development potential of Western Himalayas has a special privilege of exploring the ecological problems of the area and trying to address the issues through the involvement of associated communities for sustainable management through bridging scientific findings with the traditional wisdom. The event is proposed from November 27 to 30th, at Hazara University, Mansehra, with



the aim to introduce the potential and problems of biodiversity and ecosystems of Western Himalayan Region and to plan for mitigating the issues through proper involvements of the relevant stakeholders. Holding the 1st ISHP in 2014 is an activity of series of experience sharing and raising awareness regarding development and conservation issues of the Himalayas of Pakistan. This symposium will not only gather the experts to discuss the potential and issues from different points of view but will also provide an opportunity to introduce the area internationally in terms of research and development, one of the promising areas could be the ecotourism industry.

This multidisciplinary symposium has drawn together multiple researchers in different fields who generally address the same problems in isolation from each other. A recent review in Annals of Botany argued that we should be combining Importance Value Indices (IVIs) based on classifications of species assemblages and environmental biodiversity gradients and Use Values (UVs) that use anthropological methods to examine how local communities use different plants. This could be unexpectedly wide, as the difference in altitude over a small distance means one community could access many different ecological niches. Traditional wisdom adds an important dimension to the accepted biodiversity conservation criteria – rarity, threat and endemism. Species can also have historical, traditional and educational values. These are values that are as much under threat as the plants themselves as urbanism encroaches on local communities, and could be a significant loss. For example ethno-medicinal knowledge can help recognize and preserve important species. If we do not pay attention to the loss this cultural practice, then its loss might also lead to losing the plant itself and any uses it might have.

The 1st ISHP 2014 is expected to be participated from all the people from all the relevant walks of life including faculty, graduate students, professionals, civil society representatives, conservation activists and leading conservation agencies. The Symposium is an important milestone in the history of higher education in northern Pakistan. It will link the professional and amateurs of the region and those who are thinking for the betterment of life as a whole in this part of the world. The event would play a role as does by the famous KKH (Karakorum Highway), which explores the silk route through the world's highest passes, highest mountains, tiresome gorges, the cold and hot deserts of Himalayas, Karakorum and Hindu Kush series. The activity aims to establish a strong and sustainable link among the stakeholders for joining hands to mitigate the emerging conservation issues of the region. I appreciate the prompt action and generous financial support of the Higher Education Commission (HEC), Islamabad Pakistan. The students and faculty of Hazara University are admired for their contributions towards the success of the activity. The technical support of Dr. Shujaul Mulk Khan, Dr. Haider Ali and Mr. Abdul Majid for preparing and reviewing of this abstract book is acknowledged. Looking forward to come and join hands with us in 1st ISHP and moving further for research and sustainable development through the wise use of the Himalayan resources.

PROF DR HABIB AHMAD

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Introduction to Mountain Ecosystems with Reference to Pakistan

The Irano-Turanian region of the Tethyan subkingdom has a rich and significant floristic diversity due to the presence of various mountain systems. As a country, Pakistan supports some of the world's most diverse vegetation, owing to varying geo-climatic zones and the presence of five significant mountain systems. North-Western Pakistan is situated in this region where the Kirthar, Suleiman, Hindu Kush, Karakorum and the Himalayas (western part) congregate together and contribute to a high plant biodiversity. The Kirthar range starts from the Arabian Sea and extends about 300 km northwards to the Mula River in east-central Balochistan. The Sulaiman Mountains are a major geological feature of the northern Balochistan province of Pakistan that extends westward to the Zabul province in Afghanistan and northward to the Hindu Kush. Being situated at lower latitudes and with infrequent summer precipitation, the Kirthar and the Suleiman ranges support subtropical thorny vegetation.

The Hindu Kush mountain range stretches 800 km between the Sulaiman range (from the south west) the Himalayas (from the east) and the Karakoram (from the north east) forming the geopolitical boundary of Pakistan and Afghanistan. The forest areas of the Hindu Kush are represented by *Cedrus deodara*, *Picea smithiana*, *Pinus wallichiana*, *Pinus roxburgii* and *Abies pindrow* especially in wetter areas that come under the influence of the monsoon. The eastern part of the Hindu Kush becomes more similar to the Himalayas in terms of climate and flora thus most bio-geographers term it the Hindu Kush-Himalaya (HKH).

The Karakorum Mountain range, which is about 500 km long, connects the plateaux of Tibet and the Pamir and forms a part of the political border between Pakistan, India and China. The vegetation composition is mainly xeric in nature due to the cold climate. Vegetation zones can be categorized on the basis of humidity and elevation gradient from semi-desert, through montane shrub to alpine meadows. A few studies indicate the shrubby nature of the vegetation at lower altitudes (around 2700 m), with alpine pastures at higher altitudes (above 3500 m).

The Himalayan range of mountains is about 2500 km long and 400 km wide and has a comparatively small part in Pakistani territory due to political boundaries. Plant diversity decreases with a decrease in the monsoon effect as one moves from south east to North West in the Himalayas. Other factors responsible for this decline are the increase in altitudinal and latitudinal gradients. Important indicator species of the Himalayan range are *Pinus wallichiana*, *Abies pindrow*, *Rhododendron* species, *Fragaria nubicola*, *Viola* species, and *Clematis* species. Floristically, the vegetation of the western and northern Himalayas becomes similar to respectively the Hindu Kush and the monsoon belt of the Karakorum in terms of species composition and richness, perhaps owing to geologic, physiographic and climatic correspondence. Characteristic species of this transitional belt of the western Himalaya, the southern Karakorum and the eastern Hindu Kush are *Cedrus deodara*, *Picea smithiana*, *Ephedra Gerardiana*, *Thymus linearis* and *Cotoneaster microphyllus*. Alpine and sub alpine habitats, where altitude becomes the most powerful limiting factor, further strengthen the floristic affinities with higher elevation vegetation of Hindu Kush and Himalaya; characteristic species of *Juniperus*, *Poa*, *Sibbaldia*, *Geranium*, *Rhodiola*, *Rheum*, *Androsace*, *Iris*, *Primula*, *Potentilla* and *Polygonum* in these adjoining parts of these three mountain ranges. The dominance of an endemic flora in the western Himalaya, especially at high elevations, indicates the high conservation importance of these ecosystems. This author further advocates that the timberline zones should be protected as



priority regions. In the Himalayas these conservation values are threatened due to human exploitation through a number of activities such as farming, herding, fuel, timber, and medicinal plant collection etc. Accordingly, mountain vegetation has become a significant focus in recent ecological, conservation and ethnobotanical studies.

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Endemic Plant Diversity of High Altitudes and Strategies for their Conservation - A Case Study from Aydin Mountains in Turkey

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Abstract

Aydin Mountains are situated in the Mediterranean phytogeographical division of Turkey and are included in the West Anatolia. Major soil groups distributed in the area are; alluvial, colluvial, non-calcareous brown forest, rendzina, brown forest, reddish brown mediterranean, regosol, naked stone and pebbles, calcareous brown and brown soils. The dominant climate is the mediterranean type. Although the flora dominated by the Mediterranean elements, However Irano-Turanian and Euro-Siberian have also impacts. In all 836 taxa are distributed on these mountains which belong to 395 genera and 95 families. From these, 262 taxa are mediterranean (21.84%), 33 taxa belong to the Irano-Turanian (3.96 %), 51 taxa to the Euro-Siberian (6.12 %) ,2 taxa to the Euxin (0.24 %) elements. The number of cosmopolitans is 5 (0.60 %). Total endemic taxa distributed naturally on Aydin Mountains are 82 (9.80 %), which are included in 25 families. The number of Critically Endangered taxa are 1, endangered 4, vulnerable 11, lower risk 66. A major part of the macchias has been cut down on some parts of the mountain and replaced by Castanea, Apple, Fig and Grapes. Vegetation of Akdağ in Çivril (Denizli) is represented by: *Pinus nigra ssp.pallasiana*, *Pinus brutia*, *Juniperus excelsa* - *J. foetidissima*. The vegetation of Babadağ (Denizli) is represented by *Erodio leuconthi-Quercetum cocciferae*, *Quercu cerridis- Quercetum infectoriae* and *Scutelleria-pinetum brutiae*. On Bozdağ (Denizli) main vegetation types are; *Salvio-Quercetum cocciferae*, *Euphorbia- Pinetum brutiae*, *Muscaro-Pinetum nigrae*, *Satorejo-Juniperetum excelsae*, and *Verbasco-Cedretum libanii*. On Aydin mountain we come across *Lathyro-Pinetum nigrae* Çelik ass. nov, *Teucrio-Juniperetum excelsae* Çelik ass. nov, *Euphorbio-Cistetum laurifolii* Çelik ass. nov, *Asparago-Pinetum brutiae* Çelik ass. nov, *Cyclamo-Quercetum cocciferae* Çelik ass. nov, *Ferulago-Quercetum ithaburensis* Çelik ass. nov. Demographic outburst, overexploitation of natural resources and environmental degradation have resulted in an ever accelerating decline of biodiversity. Nearly 80 percent of the original forest cover has been cleared, damaged or fragmented. Different biotic and abiotic pressures threatens the biodiversity of Aydin mountains. Hence conservation efforts need to be lunched.

Keywords: Aydin Mountrains, Plant Diversity, Endemics, Conservation



An overview of the Biodiversity Resources of Turkey

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Abstract

Having the richest biodiversity in Europe and Middle East countries, Turkey is ranked ninth in Europe in terms of biodiversity. Each one of the seven geographical regions of the country shows different features of climate, flora and fauna and has the world's three most important ecological regions. Turkey is very rich in species diversity with biodiversity up to 120 mammals, over 400 species of birds, 130 reptiles, and 400 species of fish. Due to its location on the migration route of birds, Turkey is a key country for many bird species. In our country, about 454 species of birds are known to exist, some of which are globally threatened species. There are five distinct 'micro-gene' centers in Turkey. In the last thirty years, 256 varieties of cereals developed by local and imported breeds have been recorded and among them are 95 wheat, 91 corn, 22 barley, 19 rice, 16 sorghum, 11 oats, and two rye varieties. 33 % of all plant species are endemic in Turkey and Turkey contains about 3,000 endemic plant species among more than 9000 plant species in its rich flora, which includes more than 500 bulbs; snowdrops, winter ling, cyclamen, tulips, crocus species and highly recognized in the international flower bulb trade. The flora of Turkey with high endemism is very rich in terms of medicinal and aromatic plants as well. This considerable wealth of biodiversity both offers economic opportunities and burden the responsibility to establish a balance for their conservation and use. Development and implementation of multilateral environmental agreements that promote research, education, training and public awareness to preserve biological diversity worldwide is urgent and obligatory.



Vegetation cover change in Manglot Wildlife Park, Pakistan: example of Landsat data application in detecting land cover, land use change in HKH region

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Abstract

Manglot Wildlife Park was established in early 90's for re-introduction of chinkara, hog deer and urial, to the range from where they were extinct. The park's vegetation changed over time with fencing and protection. Vegetation at center improved, while on periphery of the park degraded. This helped some individuals of chinkara gazelle to escape and establish population in the nearby area with comparatively open vegetation. In this paper we have analyzed the vegetation change in Manglot Wildlife Park over time with Landsat time series. The changes suggest a change in forest area of 1992 from 553 ha to 669 ha in 2013. This is however concentrated in center of the park, which is probably more protected than its peripheries. The open areas in the park reduced from 317 ha to 231 ha in 2013, however the degradation is more towards the edges, where local communities living around the park are probably cutting the forests. However, this degradation at edges, creating open areas which are preferred habitat of chinkara, has probably played a key role in escape of the chinkara from the park and establishing its population outside of the park, in the nearby open area.

Keywords: Manglot, Nizampur, Chinkara, Pakistan, Wildlife, Khyber Paktunkhwa, land use change.



An Overview of Ustilaginales in Himalayan Moist Temperate Forests of Pakistan

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Abstract

This preliminary effort to summarize the diversity and spatial distribution of smut fungi in Himalayan Moist Temperate Forest (HMT) on the basis of the study of herbarium specimens and references taken from published work. Fifty nine (59) species belonging to fourteen (14) genera of three (03) families of smut fungi parasitizing forty seven (47) host plants belonging to nine (09) plant families have been described or recorded so far from selected sites. Among these Poaceae hosts have been found most susceptible hosts for these pathogens. This number may include seven (07) indigenous species of smuts. Several specimens have been found rare, being known from a limited number of collections. An overview of taxonomy, diversity and distribution of these important pathogens will help to use bioclimatic modeling methods to predict habitat distribution, future risk assessment and strategic management planning in this highly valuable reservoir of biodiversity.



Wild Edible Fruits of District Tor Ghar, Western Himalayas of Pakistan

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Abstract

The present study deals with the identification, documentation and exploration of wild edible fruits consumed by indigenous tribes of district Torghar. The study area is located in Lesser Himalayas and dominated by Sino-Japanese type of elements. This is the first ethnobotanical investigation of wild edible plant biodiversity of Torghar. Local wisdom was interrogated by group discussions and semi- structured interviews. It was found that the wild fruits have a great socioeconomic significance because of their food and medicinal values. People utilize wild fruits not only for main uses as food and medicine, but also for a variety of purposes such as fodder, fuel wood, timber, etc. The study revealed 38 wild edible fruits of 29 genera and 22 families for 19 different uses. Maximum numbers of wild edible fruit plants belong to family Rosaceae (8 plant species). Popularity of wild edible plants among different tribes of Torghar was assessed on the basis of Fidelity level %age. Fidelity level index shows values for each species in descending order from *Juglans regia* 74.4% to *Buxus wallichiana* 17.4%, thus establishing *Juglans regia* as the most popular wild edible plant species. This study will serve a base line for nutritional profiles of wild edible fruits and help to explore genetic resource for allied cultivated fruits.



First record of *Leucocoprinus cretaceous* from man-made forest Changa Manga, Punjab, Pakistan

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Abstract

During the monsoon season from August to September, 2014 extensive surveys were made to explore the fungal diversity of man-made forest Changa Manga, Punjab, Pakistan. During the investigation, a species of the genus *Leucocoprinus* was collected and characterized macro-microscopically and phylogenetically. It was also characterized molecularly by amplifying internal transcribed spacer (ITS) region of rDNA and identified as *Leucocoprinus cretaceous*. After the literature survey of fungal flora of Pakistan, this species was found as a new record in fungal flora of Pakistan.



Conservation of Biodiversity through Information Technology

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Abstract

Conventional System of communication is quite expensive, time consuming, laborious practice that involves diverse resources of labor, computers, printers, ink, time and paper. It has been estimated that one tone paper is prepared from 24 trees. Further, this is time consuming, space restricted, polluting environment and money demanding business. If replaced by e-communication system, it will drastically cut down monetary input up to 90%, save time, labor, speedy, safe, easily retrievable and extremely efficient. Further it will change behavior of the community and will set an ideal working environment. An effort has been initiated at Centre of Plant Biodiversity and Botanical Garden, University of Peshawar for switching over from conventional system to e-communication. The result has been presented.

Rhizospheric Microflora of Pakhal (Mansehra) and its Potential Use as Biofertilizer for Vegetables

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Abstract

Vegetable Rhizospheric soil samples with root were collected from Pakhal area Mansehra. Rhizospheric microflora were isolated from collected samples by using dilution plate technique, on selective media for PSBs and N- fixers. Population density of phosphate solubilizer in vegetable rhizosphere range from 8.63×10^7 (CCM1) to 1.16×10^8 (SPI). Out of forty two isolates 38 were found positive for phosphorus solubilization. The purified cultures of PSB isolates were characterized on the basis of general colony morphology and biochemical tests. The PSB isolate, PPM (M) showed the highest solubilization index (4.2) on PIK medium, while on NBPRI medium Isolate KBM3 showed the highest solubilization index (4.2). Quantitative study of twenty six isolates showed significant P solubilization range from $12.5 \mu\text{g/ml}$ (MZM) to $99.04 \mu\text{g/ml}$ (CCM1) on PIK medium, while on NBRIP medium range from $5.45 \mu\text{g/ml}$ (KPM) to $81.77 \mu\text{g/ml}$ (WTM3). The pH decrease in liquid medium of PIK range from 4.72 (GAM1) to 6.05 (KPM), whereas in NBRIP medium range from 3.83 (KPM) to 5.61 (TNM). PSB isolates showed great variation in their osmotic Potential range from -22.21 to -4.58 bars. Isolate TBM2 has highest osmotic potential and PPM (ich) has lowest osmotic potential value. Bioassay study was carried out for ten selected PSB isolates for their effect on tomato seed germination over a period of fifteen days. Inoculation with isolates increased dry weight and shoot, root length of tomato as compared to control plant. Isolate CBM1 (F=2.3, P=0.04) showed most significant effect of PSB in inoculated plants.

Keywords: Rhizosphere, Phosphate Solubilizing bacteria, Biofertilizer



Evaluations of Locally Collected Germplasm of Common Bean (*P. Vulgaris*. L) for Variability in Morphological and Yield Characters in the Swat Valley

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Abstract

An experiment was designed to quantify variability of morphological characters with yield among the locally collected germplasm of common bean (*Phaseolus vulgaris*. L). Comprising of nine accessions, collected from local farmers of the remote areas of the valley during 2013. The experiment was conducted in Randomized Complete Block Design with three replications. Data was recorded on days to 50% flowering, days to pod formation, days to maturity, pods plant⁻¹, pod length, seed pod⁻¹, 100 seed weight, and yield ha⁻¹. The results revealed that genotypes differed significantly for the studied traits. Among the tested accessions the "A5LS" was early maturing while "A2TH" was late maturing. The accessions "A8TS" and "A2TH" were high yielding with 2042.3 and 1968.3 kg ha⁻¹ dry seed production respectively. Based on the results it may be concluded that these genotypes may be further studied and included in bean improvement program.

Study on Soybean (*Glycine Max* L. Merrill) Germplasm for the Evaluation of Quantitative Traits in the Swat Valley

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Abstract

This research study was conducted at Agriculture Research Institute (North) Mingora Swat in summer 2013. The objective of this study was to estimate variations and correlation among the important traits using 19 accessions of soybean (*Glycine max* L.) including two cultivated varieties (Malakand-96 and Swat-84) as checks. The experiment was laid out in RCB design with three replications. Data was recorded on days to 50% flowering (DFF), days to pod formation (DPF), days to maturity (DM), plant height (PH), number of pods plant⁻¹(NPP⁻¹), number of seeds pod⁻¹ (NSP⁻¹), pod length (PL), number of branches plant⁻¹ (NBP⁻¹), 100 seeds weight (HSW), seeds yield ha⁻¹ (SYHa⁻¹), and oil contents (OC %). The accession exhibited significant variations for all the traits which confirm the presence of genetic variation in these accessions. Positive and significant correlation was observed between seed yield and days to 50% flowering, days to maturity, pods plant⁻¹, 100 seed weight. Positive correlation was observed for seed yield with days to pod formation and pod length, however it exhibited negative correlation with plant height. The genotype “Elgin” was early maturing while “Woodwarth” out yielded (4.24 tons ha⁻¹) all the tested accessions including the checks. It may be concluded from the present study that these accessions may further be evaluated for yield and maturity in Soybean improvement program.

Keywords: variation, correlation, accessions, *Glycine max*, genetic variations, selection criteria, yield and maturity.

Varietal Response to *Myzus Persicae* (Sulzer) and its Associated Natural Enemies in Potato Crop.

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Abstract

Studies regarding the field evaluation of potato varietal response to *Myzus persicae* (Sulzer) and its associated natural enemies were carried out at Hazara Agricultural Research Station, Abbottabad for 5 varieties i.e. *Desiree*, *Cardinal*, *FDI-4*, *diamond*, and *Dura*. The experiment was laid out in RCB Design with five replications. Insect population was observed with weekly intervals. The data revealed that noticeable aphid infestation was invariably present on all five genotypes by the last week of March 2005 (1st observation). The peak population of 29.38 aphids per leaf was recorded during 3rd week of May (11th observation). Two species of Coccinellids i.e. *Coccinellids septempunctata* and *Harmonia dimidiata* were positively identified. The predominant species i.e. *C. septempunctata* first appeared around 24th April with a mean number of 0.05 beetles/leaf. The population of *C. septempunctata* was recorded to be 0.75 beetles/leaf when the aphid population touched its peak on the 22nd of May. The mean population of *Harmonia spp.* was very low and negligible. The predominant syrphid fly (*Syrphid balteatus*) population was 1st recorded on 8th of May (6th observation) with mean number of 0.15 syrphid flies/leaf and their peak population of 1.35 syrphid flies/leaf was observed on the 22nd May. *Chrysoparla carnea* appeared in the 2nd week of May (18th May) and their Peak population was recorded during last week of May (29th May) with mean population of 1.02 syrphid flies/leaf. *Aphidius matricarei* and *Aphidius colemani* were among the major parasitoids observed. There was no activity of parasitoids till 17th April, the parasitoids appeared with 0.65% parasitism on aphids in the 1st week of May and the highest percentage of parasitism was recorded (46.15%) on the 22nd of May.

Among all the varieties used, *Cardinal* showed comparatively high resistance than that of *Diamant*, *FD1* and *Dura*. *Desiree* showed least resistance against *M. persicae*, which was found to be the most susceptible variety.

Keywords: *Myzus persicae*, Natural Enemies, Potato varieties, Resistance

Child Labour in Pakistan and its Realization for Education for All (EFA)

Akhtar Iqbal

Abstract

This research study was carried out to examine the effects of child labour on the goals of Education for All. Child labour is a burning issue in the developing countries including Pakistan. The researcher took district Mansehra as population while selected three Tehsils, namely Mansehra, Oghi and Balakot as samples. Thirty government primary schools were randomly selected wherein two Teachers were handed over questionnaires. Thirty working children and their parents were selected for structured interviews. The collected data was put in tabular form and was analyzed by using statistical methods of percentage and mean frequency.

After analyzing the available data, it was evident that majority of the respondents were of the view that children joined labour market not willingly but they were forced to earn livelihood for their families. Majority of the children responded that they were eager to go to school if favorable conditions existed. Majority of the parents were agreed to send their children to school if education be made free of cost. It is a fact that parents and children are unaware of the importance of education. Sufficient Enough legislation has been done for the elimination of child labour but due to lack of proper implementation, the issue is escalating day by day. Pakistan is experiencing high level of out-of-school dilemma. Majority of the respondents were agreed that child labour had an adverse impact on child education. Overwhelming majority Maximum of the respondents were of the view that poverty was the main cause of child labour and the children would join schools if free of cost education is provided to them.

Changes in the Distribution Pattern of Species in the Astore Valley, Gilgit-Baltistan

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Abstract

The main factors that involved in plant biodiversity loss of Astore valley are mostly human induced. The natural threats faced by the plants include earthquakes, snow slides, landslides avalanche, declining precipitation, humidity and other climatic fluctuations. The anthropogenic threats mainly include habitat degradation, expansion of agriculture, harvesting of plants for fuel, timber, grazing pressure of livestock, selective removal of plant species, over exploitation of plants particularly medicinal important species for indigenous cure system and for commercial purpose and unsustainable uses of natural resources are major cases. The usage of natural resources in high proportion may be cause the rapid depletion of many plant species. With increasing human population in few decades many demands increased in all aspects including construction, agriculture, livestock, etc. Cutting and removing of plant species for expansion of agriculture is the common phenomena of indigenous people. Unplanned grazing pressure in forest area is also a threat for loss of species. It is estimated that about 200,000 livestock are grazed annually in forests and pastures and nearly 70 – 80 percent land of the study area is under grazing. Besides, 99 % people of Astore valley use firewood as fuel for their domestic purposes, about 10,000 trees per year were cut down in study area for construction, firewood and for commercial purposes. On the basis of observation and information from inhabitants of Astore valley *Eremurus himalaicus*, *Dactylorhiza hataqirea*, *Peganum harmala*, *Allium jacquemontii*, *Pinus gerardiana*, *Jurinea himalaica*, *Saussurea costus*, *Arnebia benthamii*, *Nepeta adenophyta*, *Aquilegia fragrans*, *Rosa foetida*, *Sinopodophyllum hexandrum*, *Aconitum heterophyllum*, *Rheum tibeticum*, *Pulsatilla wallichiana* and *Salix karelinii* were under threat due to overexploitation, selective elimination and habitat destruction. It is imminent that after few (10-20) years valley bottom plain areas will come under cultivation through irrigation process, as a result flora of these zones will decline or will become extinct from original habitat, mainly *Haplophyllum gilesii* which is an endemic spices was found in Bunji Dass of the study area will become extinct, because this endemic species is typically distributed in this region. *Artemisia amygdalina* is endemic to Pakistan and Kashmir. Its distribution is very narrow small patch in study area. In this area grazing pressure of domestic cattle and nomadic cattle is high during flowering season. Therefore these species are under threat. Due to cutting of forest trees many shade dependent plant species are also rapidly declining like *Fragaria nubicola* and *Aquilegia moorcroftiana*. *Betula utilis* is a beautiful tree species; it is facing multiple threats e.g. cutting for fuel, for making domestic tools, grazing pressure and snow sliding etc.

Pteridophytes of Pakistan and Azad Kashmir: Diversity and Future Conservation Challenges

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Abstract

The present study was aimed to review previous efforts to investigate the Pteridophytes of Pakistan and Azad Kashmir. Critical examination of the reported taxa suggests that there are 174 species distributed in eighteen families and fifty-one genera. Pteridaceae is the largest family with 113 species (64.95%). Aspleniaceae and Polypodiaceae come next with 13(11.50%) and 11(9.74%) species respectively. In the remaining 15 families, less than 5 species per family were found to occur. Like-wise for genera, *Dryopteris* was the largest genus with 17 species, followed by *Polypodium* and *Athrium* with 16 and 14 species respectively. In the rest of genera, three had 11 to 13 species, eighteen were 2-10 and 17 genera were one species each. An average number of species per genus was noted to be 3.42. Majority species (%) have been reported from the Himalayan region of the study area. However, there are still many potential localities are unexplored and many species may be added in the flora of the area. In the view of conservation efforts, even a single species could not be evaluated yet. Therefore, it is a dire need of further inventorying and monitoring of Pteridophytes of the study area.

Keywords: Pteridophytes, Pakistan and Azad Kashmir

Mistletoes of Himalayan foothills in Rawalpindi district and their host range

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Abstract

Mistletoes are hemiparasites that draw nutrients and water from host stem by means of haustorium. Mistletoes are represented in Pakistan by nine species in four genera in the families' Loranthaceae and Viscaceae. *Loranthus longiflorus* and *L. pulverulentus* were recorded in Lehtrar and Panjar areas. Both mistletoes parasitise a variety of dicotyledonous trees. Although both of these mistletoes are generalist species, *L. pulverulentus* was recorded on 12 different hosts compared to only five hosts recorded for *L. longiflorus*. Specimens of both mistletoes were also taken for addition to Herbarium.

The spread of Dengue virus from Southern to Northern Pakistan

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Abstract

Dengue, the most common arboviral (arthropod transmitted) disease, considers as the most important arthropod-borne viral disease in the world. Around 2.5 billion people in tropical and sub-tropical regions of the world are at risk of this infection, which makes up to two-fifths of the world's population. An estimated global rate of dengue infection is 50-100 million every year with 24,000 mortalities and 500,000 cases requiring hospitalizations. Furthermore, the fact that the number of infection has doubled in people living in the tropical and sub-tropical regions makes dengue an unqualified global threat to public health. Earliest dengue infection in Pakistan dates back to 1985 in Karachi and the worst recent outbreaks were witnessed in Lahore, Punjab (2011) and in Swat, KP (2013). Over 422 people died in these two outbreaks and thousands were hospitalized. As yet 2014 (the writing of this review), dengue infection is affecting the people of Pakistan in various territories in terms of mortalities and morbidities.

Keywords: Dengue infection in Pakistan, dengue review, deaths due to dengue in Pakistan, dengue infection

Application of Remote Sensing and GIS in Forest Cover Change in Tehsil Barawal, District Dir (Upper), Pakistan

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Abstract

The forests of Pakistan reflect plentiful climatic, physiographic and edaphic differences in the country. However these forests facing a serious problem of deforestation. Geographic information system (GIS) techniques and remote sensing (RS) from satellite platforms offer best ways and assess deforestation. A GIS and RS based study was conducted in tehsil Barawal, district Dir (U) to analyze forest cover change. The main objectives of the study were to 1) identify different classes of land use, land cover and its spatial distribution in the study area, 2) determine the trend, nature, location and magnitude of forest cover change and 3) prepare maps of forest-cover change in different time periods in the study area. To assess the objectives remote sensing and GIS techniques were utilized. A supervised image classification technique was applied on Landsat 5 satellite images of 2000 and 2012. Five main classes such as agriculture, forest, barren land, snow and water were identified. The results showed that the area of forest, barren land, agriculture, water and snow in year 2000 was 49.54%, 43.38%, and 5.19%, 1.40% and 0.49% and the area in 2012 was 37.17%, 41.36%, and 12.69%, 5.05% and 3.72% respectively. Furthermore 2.02% decrease in barren land, 12.37% decrease in forest and 7.5% increase in agriculture land and was identified. Due to high deforestation rate and increased agricultural activities it is recommended that awareness campaign should be launched in the study area to protect and conserve this forest from further deforestation.

Keywords: Deforestation, Change Analysis, Forest Cover Change

Prospects of Tourism along the Silk Route: Living Treasure of Himalayas

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Abstract

Cultural and natural resources are the major attractions for developing Tourism industry in any country. Pakistan being a cradle of famous cultures and civilization has a rich potential for the promotion of tourism. The archaeological sites and monuments embodied landmarks in the progress of human civilization and constitute an invaluable heritage of mankind.

The network of trading routes known as the Silk Route stretched from China to Japan in the East and to Turkey and Italy in the West, encompassing Afghanistan, India, Pakistan, and the other lands of Central Asia, and linking the ancient Mediterranean world to the empires of China. For thousands of years, highly valued silk, cotton, wool, glass, jade, lapis lazuli, metals, salt, spices, tea, herbal medicines, fruits, flowers, horses, and musical instruments moved back and forth along various portions of the Silk Road.

The term Silk route was first used by a German geologist, Baron Ferdinand Von Richthofen in a paper published in 1877. Some of the scholars trace back the silk route to 206 B.C. and J. Mark Kenoyer traced it back to 2500 B.C. to 3000 B.C.

Silk route passing through Himalayas presents a great diversity of natural and cultural resources. The course of this route incorporated the cities of Taxila, Haripur, Abbottabad, Mansehra, Muzaffarabad, Kaghan, Naran, Babusar Pass, Chilas and Jaglot. All these places are full of natural and cultural treasures which attracts tourists from all around the world.

This paper focuses on exploring the major resources for the development of sustainable tourism in the Himalayas along the Silk route. It will help to highlight the conservation, preservation problems of the cultural and natural resources.

The paper will bring the natural assets, especially the botanical resources into limelight thus it will pave the way for further research. It will also focus on the preservation of the endangered species and ecologies.

Phylogenetic Study of selected Mentha Species

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Abstract

Mentha commonly known as peppermint has a large number of species distributed in the Himalayas which are used important herbal medicines. This paper reports the findings regarding nucleotide sequencing, DNA markers and Phylogenetic analysis of Mentha accessions of Pakistan. To conduct the current study, three commercially cultivated Mentha plant accessions were collected from Qarshi Industries (Pvt.) Ltd and genomic DNA extraction protocol was optimized to perform RpoB PCR based DNA marker techniques. Partial sequence of rpoB gene was used for the alignment with 500 bp in the genomes and the development of DNA barcodes. These sequences of the nucleotide were analysed by doing BLAST at NCBI. All results of the analysis at the nucleotide level showed a better understanding of the taxonomic position of species. This study could be useful to provide a baseline to authenticate, identify and phylogenetically analyse important medicinal plants of Pakistani industry. Further elaboration is possible through more DNA barcodes at species level.

Keywords: Phylogeny, DNA Barcoding, PCR, Mentha, RpoB, NCBI.

Floristic Diversity of Family Poaceae in District Torghar, Khyber Pakhtunkhwa, Pakistan

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Abstract

District Tor Ghar lies on the western most edge of the Himalayan Range of Mountains. Grasses have greater importance in the area of Tor Ghar, where most of the people are dependent on agriculture and livestock. The floristic survey of the District was carried out during 2012-13. Plants belonging to family Poaceae were collected from various localities, voucher numbers were given to specimens and other relevant data pertaining to locality, i.e., habitat, habit, subfamilies, scientific and local names were recorded for each species. A mounted copy of each voucher specimen was deposited in the Herbarium of Hazara University Mansehra. The results of this study were arranged according to latest format and classification system proposed by GPWG (2001). During this study total of 73 plant species belonging to 54 genera and 6 subfamilies were identified. Among the subfamilies, Panicoideae is best represented in the District Tor Ghar (44%). It includes 32 plant species in 23 genera. The pooidae was the second largest subfamilies which contributed 27 grasses (37%) belong to 19 genera. Other subfamilies include Chloridoideae representing 12% of the total plant species belong to family Poaceae. It has 9 species of grasses belong to 08 genera. The Subfamilies Arundinoideae and Aristidoideae each have 02 species, and subfamily Bambusoideae includes only one species. Genera which have the highest number of plant species in the study area were, Poa (04), Digitaria (04), Chrysopogon (03), Lolium (03) and Agrostis (03) species. Overall 27 annuals grass species (37 %) and 46 perennials grass species (63%) were reported. It is thought that the present study will provide baseline to the researchers to observe the Poaceae diversity and to protect the biodiversity and gene sources of the area. This investigation is a part of an ongoing project in which we will explore plant communities and ecological as well as anthropogenic gradients of the regional flora in the near future.

Presence of TbLCV in Tobacco Crop Grown in Mansehra

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Abstract

Tobacco is one of the important cash crop of many countries in the world including Pakistan. It is widely grown in Mansehra and is one of top cash crop of the region. It belongs to family Solanaceae also called night shade family. Among biotic component viral infection causes severe yield loss to tobacco crop. The most important and most widespread of these is Tobacco leaf curl disease (TbLCD) caused by Tobacco Leaf Curl Virus (TbLCV). TbLCV belongs to genus Begomovirus and family Geminiviridae. Begomoviruses cause infection in a number of cultivated and non-cultivated dicotyledonous plants such as tomato, egg plant, cotton, peach, squash and tobacco -and they are linked with great economical losses. Here in this study, symptomatic tobacco samples that showed leaf curl like symptoms having twisted and yellow leaves were collected from the farmers' tobacco fields at Mansehra. For the detection of virus, molecular technique (DAC-ELISA) was performed and the presence of the virus was detected. Furthermore, A set of primers was designed for the amplification of the coat protein gene of TbLCV. Polymerase chain reaction for the amplification of coat protein gene was done using gene specific primers i-e TbLCV-F and TbLCV-R. A fragment of app. 795 bp was amplified using the extracted DNA as template. This study was an effort to identify tobacco leaf curl virus accountable for causing the tobacco leaf curl disease in this area. The result of this research conformed the presence of TbLCV in tobacco growing areas of District Mansehra.

Impact Assessment of edaphic and topographic variables on plant species composition of the Peochar Valley District Swat Pakistan; A step towards Ecological Modeling of the Hindu Kush Forests

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Abstract

The valleys in the Hindu Kush range of mountains are among the regions where vegetation diversity and composition of certain regions have not been evaluated in relation to environmental variables. This research project formulated to measure the effect of environment on species composition. A mixture of quadrat and transect methods were adapted. Sizes of quadrat were determined for trees, shrubs and herbs 10×10m², 2×5m², 1×1 m² and respectively. Twenty Seven stations were established along 6 elevation transects on various aspect slopes of the valleys. Floristic composition such as density, cover and frequency for all the species were recorded in each quadrat. Aspect, elevation, rock types, soil nature and grazing pressure were also considered as edaphic and topographic variables. Preliminary results showed that the Peochar Valley host 120 species. Specie abundance and environmental data matrices were treated in CANOCO software version 4.5 to evaluate and model the environmental gradient of vegetation through Canonical Correspondence Analyses (CCA). Results showed that among all the environmental variables elevation, aspect, grazing pressure, deep soil and rocky soil show significant effect on species composition and diversity (P-value 0.0120). Our results also identify the dominant and rare plant species in each sort of habitats. Conservation measures for the whole flora of this valley in general and rare species in particular is recommended.

Isolation and Spectroscopic Characterization of Natural Products from *Artemisia* and their biological activity

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Abstract

In Pakistan the genus *Artemisia* is represented by 25 species, which are used for different purposes including food, ornamental, fumigants as well as in folk medicine. We have isolated, characterized and carried out the biological activity of two species of *Artemisia* i.e. *Artemisia persica* and *A. roxburghiana*. Both species are distributed in the temperate regions of Pakistan, China, India, Nepal and Afghanistan. In Pakistan the species are found Hazara, Azad Kashmir and Kurram agency. These species used in the current analysis were collected from Mansehra.

A. persica is used for the treatment of leprosy, hysteria, asthma, scabies and ulcer in the body. It is also used as a tonic febrifuge, vermifuge, antipyretic antimalarial, antihepatic, antiulcerogenic and antispasmodic in the ancient times. *A. roxburghiana* is employed in the treatment of malaria, diabetes, and helminthes. Plant extract is also used as antihelmintic, termittent, antipyretic and skin allergies. Dried plant material is used for intestinal worms, skin and eye diseases. Plant extract is used for treatment of cuts and wounds. Roots of the plant are used for the treatment of piles and secretion of insulin to cure diabetes.

Eleven (11) compounds were isolated from *A. persica* in which 1-9 and 11 were previously reported from various other sources. While, compounds 1 and 2 were isolated for second time and compound 10 is newly isolated. Screening of the crude extract against antibacterial, antifungal, phytotoxicity of samples shows significant activity at higher concentration. These compounds were identified by sophisticated spectrophotometers (¹H, ¹³C and GC-MS), which included three coumarines, two sterol, four flavonoids and two guaianolides.

Twelve (12) compounds were isolated from *A. Roxburghiana* that included four triterpenes, two flavones, two coumarines, one-sterol glycosides, two fatty acids and one alcohol. These compounds were characterized by the same spectroscopic methods and were named as Lupeol (1), Taraxeryl acetate (2), Betulin (3), Betulinic acid (4), Apeginn-7,4-dimethyl ether (5), 7-hydroxy-4-methoxy flavone (6), Scopoletin (7), 6-7-dimethoxy coumarin (8), β -Sistosterol glucoside (9), Stearic acid (10), Docosanoic acid (11) and n-Nonacosanol (12)

Floristic Composition and Biological Spectrum of Village Palangzai, Miran Shah, North Waziristan

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Abstract

A study was conducted to assess the floristic composition and biological spectrum of village Palangzai, Miran Shah, North Waziristan during 2013-2014. The floristic diversity consists of 130 species belonging to 51 families. Based on the number of species, Poaceae and Asteraceae with (12 spp. each) and Solanaceae with (10 spp) were the dominating families. Followed by Lamiaceae and Papilionaceae with (6 spp. each), Brassicaceae, Euphorbiaceae, Fabaceae and Rosaceae with (5 spp. each). The remaining families had less than 5 species, each. Life forms indicate that Therophytes with 66 species (50.76%) and Microphanerophytes with 23 species (17.69%) were the dominating life forms. The rest of the life forms were Chamaephytes 16 species (12.30%), Hemicryptophytes 11 species (8.46%), Nannophanerophytes 8 species (6.15%) and Geophytes 6 species (4.61%). Leaf size spectra revealed that Nanophylls with 43 species (33.07%); Microphylls, 38 species (29.23%) and Mesophylls, 23 species (16.92%) were the major leaf size classes. Leptophylls with 21 species (16.15%); Megaphyll, 3 species (2.30%); Aphyllous, 2 species (1.53%) and Macrophyll with only one specie (0.76%) were the remaining leaf size classes. Nanophylls, Microphylls and Mesophylls were the most prevalent leaf sizes, which indicate the xeric nature of the area.

Taxonomic survey of Odonata (Damselflies and Dragonflies) Fauna of Upper Swat

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Abstract

A taxonomic work was conducted during two consecutive summer seasons (2012 and 2013). Adults of Odonata (damselflies and dragonflies) from ten different sites of the Upper Swat were collected with the objectives to contribute to the knowledge of the Swatian fauna of odonata, to provide an updated checklist of species occurring in the locality and to describe the patterns of species distribution within this area. The selected area (Upper Swat) was surveyed during both years. The whole collection yielded a total of 500 specimens carrying 32 species identified under 2 sub-orders, 10 families and 22 genera, including one new record for Pakistan. Among them 10 species were of damselflies and 22 were dragonflies. The damselflies were belonging to 5 families and 8 genera while the dragonflies were belonging to 5 families and 15 genera. *Allogaster parvistigma* (*Neallogaster ornate*) was first time recorded from Pakistan. So one species have been added to the existing odonata fauna of Pakistan.

Allelopathic Effects of Different Weed Extracts on the Germination and Growth of *Oryza Sativa* L.

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Abstract

The germination and growth of twenty varieties of rice were analyzed after treating with the distilled water (control) and aqueous weed extract of different native weeds of upland areas of Pakistan; *Cyperus rotundus*, *Trianthema apertulacastrum*, *Convolvulus arvensis* and *Parthenium hysterophorus*. The whole weed plants from different rice fields were collected, shade dried and crushed. The crushed powder was soaked in the distilled water for 24 hrs, filtered and diluted in distilled water by making the final volume up to 100 ml (10% w/v). T₁ was prepared by mixing equal amounts of *Cyperus rotundus* and *Parthenium hysterophorus* while T₂ was prepared by mixing equal amounts of *Convolvulus arvensis* and *Trianthema apertulacastrum*. For germination test, germination plate method of seed germination was used and blotter paper was moistened with different combinations of weed extract and for control distilled water was used. Observations were recorded after 24 hrs interval for up to 8 days. After germination, seedlings were allowed to grow for a week and then their radical and plumule length as well as fresh and dry weight was recorded. Results showed the more drastic effects of T₂ on rice germination and seedling growth as compared to T₁. Germination rate of rice was most severely affected by the T₂ with the exception of IRRI-6 which was affected by T₁ more adversely. These studies can be applied to encourage the weed removal practices to increase the rice production.

Keywords: allelopathy, *Cyperus rotundus*, *Trianthema apertulacastrum*, *Convolvulus arvensis*, *Parthenium hysterophorus*, seedling growth.

Molecular screening of Pakistani wheat germplasm for leaf rust resistance

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Abstract

Molecular screening of fifty two Pakistani wheat germplasm was carried out for leaf rust resistance genes Lr37, Lr46, Lr47, Lr50 and Lr51. Polymerase chain reaction (PCR) with specific primers for five leaf rust resistance genes were used. This polymorphic assessment revealed that out 52 genotypes Lr37 was found in 15 genotypes viz. 010818, 010821, 010819, 010879, 010814, 011876, 010759, 010725, 010755, 010780, 010740, 010743, Lasani08, Gomal, Kaghan93. Lr46 was detected in 09 genotypes namely; 010819, 010814, 010875, 010730, 010816, 010718, 010732, Uqab2000, Pak-81. Lr47 was also found in 09 genotypes as; 011882, 010879, 010771, 010755, Faisalabad08, Gomal, Suliman96, KT-2000, Kaghan 93. Lr50 was found in ten genotypes namely; 010879, 010878, 010730, 010815, 010877, 010771, 010743, Faisalabad08, Atta habib, PS-85. Lr51 was found in 15 wheat genotypes as; 011882, 010821, 010814, 010875, 010813, 010877, 010803, 010772, 010732, 010809, 010717, 010810, 010759, 010725, Faisalabad08, Atta Habib. The genotypes 010879, 010814 and Faisalabad 08 having maximum number resistant genes are recommended for incorporation in rust resistance breeding. Identification of leaf rust resistance genes in Pakistani wheat germplasm will help in accelerating the breeding of resistant varieties and pyramiding disease resistance genes.

Keywords: Wheat, leaf rust, germplasm, Lr genes, screening.

Guli Bagh: The Last Capital of Turk Rulers at Pakhli and Its Monuments (their problem of conservation) Mansehra, Pakistan

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Abstract

Guli Bagh is located about 23 km north-west of Mansehra town and is known to have been the capital of a state known in medieval period as Pakhli. This is defined by Abu al-Fazl, the famous historian of the Mughal emperor Akbar, the Great, as comprising the whole of the hill territory between Kashmir in the east and the Indus on the west. To Pakhli also belonged the lower valley of the Kishanganga and the valley of the streams which flow into the latter from the Kajnag range and the mountains to the northwest of Kashmir proper. Whether Urusa also formed a part of it, is not known for certain but its proximity to Pakhli suggests that it must have been Guli Bagh is naturally protected by high mountains of Tanglai, located on its east and north, while from south and west it is protected by River Siran. The total land of Guli Bagh is 10,000 acre in which the hilly occupied about 4,000 acre and the remaining 6,000 acre is used for cultivation and residential purposes.

The monuments and architectural remains in the Guli Bagh area are consists of Fort Feroza ruins, Ditch around the fort, tomb of Sultan Kurd, part of Turkish Court, tomb of Dewan Raja Baba, Shrine of Bahadur Baba, Shrine of Masoom Baba, Shrine of Sat Warwaon Wali Ziyarat, old graveyard, Spring (natural), Well and reservoirs. All these monuments and architectural remains are in a very bad state of preservation and mostly going to decade with the twirl of time, need proper concentration for conservation and preservation. An attempt has been made in the present paper to bring in limelight these ignored of the very significant part of the history of this area

The traditional uses of the plants in wound-healing were rationalized on the basis of their antioxidant capacity

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Abstract

Mountainous regions of Himalayas are rich not only in medicinally important plant species but also in traditional knowledge. An ethno botanical survey was carried out to collect information regarding the various indigenous uses, especially the medicinal plants in Tanawal valley. A total of 83 taxa are reported as being used locally for various purposes. Our results suggest that root and leaves are the major plant parts used in most of the recipes. Majority of the recipes are prepared in the form of decoction from freshly collected plant parts. Mostly a single species is used and are mainly taken orally. All of these plants are collected from the wild, based upon informants' knowledge eight frequently available plants were selected to observe antioxidant potential in them. The extracts of these plants were then evaluated for antioxidant activity with DPPH. This study revealed that highest activity shown by plant *Nasturtium officinale* *Achyranthus aspera* *Tegetes erecta* and *Pistacia integririma* while *Daphne oleoides* shows its maximum activity with 100µgm/ml. All the plants show a significant extent of antioxidant activity at 25µgm/ml. It is clearly revealed that all the selected plant species have a great potency to show the antioxidant activities in them.

Ethnobotanical Studies of Wild Edible Plants of the Lesser Himalayas, Pakistan

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Abstract

Wild edible plants (WEPs) are an important source of vegetables, fruits, tubers and nuts which are relevant for many people in ensuring food security and balancing the nutritional value of diets. The present investigation was carried out to assess the ethnobotanical studies of some selected wild edible fruits and vegetables used by the inhabitants Lesser Himalayas, Pakistan. The Lesser Himalayas, lies between 33°-30' to 33°-50' north latitude and 72°-33' and 74°-05' east longitude (Hussain & Ilahi, 1991). Informed consent semi-structured interviews from 95 inhabitants of fifteen mountainous vicinities were conducted to collect data. A total of 50 wild edible fruits and vegetables belonging to 30 families and 25 genera were documented. Among wild edible fruits *Berberis lycium*, *Carissa opaca*, *Ficus carica*, *Ficus palmata*, *Ficus gloumerata*, *Pyrus pashia*. *Pyrus communis* and *Ziziphus nummularia* express extreme citation; while *Malva neglecta*, *Nastutium officinale*, *Bauhinia variegata*, *Amaranthus viridis* and *Solanum nigrum* were among the most popular wild edible vegetables. Gathering, processing and consuming wild edible plants are still experienced in all explored areas. The tradition of using wild palatable plants is still practiced in the rural populations of Lesser Himalayas, but is declining. Consequently, documentation of this traditional knowledge is pressing and vital for next generation.

Ethnobotanical Study of some Flowering Plants in Laspure Vally, District Chitral – Pakistan

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Abstract

This paper deals with the indigenous uses of 47 flowering plants of Laspur Valley, Chital District. These species distributed in 26 families and 44 genera. Asteraceae was the largest family with 7 species (14.89%), followed by Rosaceae with 4(8.51%) species. In the rest of families, less than 3 species (6.38%) per family were recorded. Leaves of 45 plants were used for medicinal purposes. Similarly roots of 24 taxa and fruit / flowers of 22 taxa were used, while 22 taxa were used as whole plant for different purposes. About 30 species were as fodder, 26 medicinal purposes, 7 for hatching, 7 as fire wood, 5 as timber, 5 as vegetable, 3 fencing, 3 furniture 5 agricultural purposes while 4 used for making handy craft instrument. Further study is required to quantify the availability of plants which are important traditionally for various purposes.

Keywords: Traditional uses, Laspur, Chitral

Medicinal flora and conservation issues of plant resources of Kumrat Valley, Dir Kohistan, Khyber Pakhtunkhwa province Pakistan

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Abstract

Pakistan is blessed with rich natural resources, diverse environmental conditions and over six thousand plant species of flowering plants species. The conventional utilization of natural resources in the Valley reflects a way of maintaining biological diversity in the mountains by the local inhabitant. Medicinal plants always played a key role in the lives of the local people for many reasons like traditional values and due to the limited access to healthcare. The aim of this study was to judge the use of the forests by the local inhabitant in Kumrate Valley in the modern world. In this paper lists the ethnobotanically important plant species of the area. A study was conducted to elaborate the ethnobotanical profile of medicinal plants of Kumrate valley and analyze the potential and problems of the area. Ethnobotanical studies were conducted from May 2012 to August 2013. Intensive exploration showed that 83 plant species belongs to 43 families were used to treat different ailments. The major ailments treated with medicinal plants were digestive system (55.42%), blood circulatory system (19.20%), urinary system, (16.00%) and respiratory system (14.00%). The ailments linked with the skeletal systems and skin were 12.04% and 13.25% respectively. The used value showed that *Aconitum violaceum* (UV = 0.68), *Achillea millefolium* (UV = 0.67), *Berberis lycium* (UV = 0.64), *Viola betonicifolia* (UV = 0.64), *Paeonia emodi* (UV=0.63) and *Valeriana jatamansi* (UV = 0.62) are highly medicinal plants used in the area. The results also showed that in the local recipes the leaves were used in 23 %, fruits (22%), whole plant (14 %) and seeds (13%). These plants require conservation for future germplasm from the area before their extinction. It has been revealed that due to several factors the plants do not exist in their natural habitats due to over grazing, ruthless cutting of forest resources has been endangered by unawareness of natural and forest resources. Major causes of the loss of forests degradation is poverty. Care of natural resources will help to alleviate poverty. The threatened plant species require conservation for future germplasm from the area before their extinction.

Keywords: Ethnobotanical uses, Medicinal plants, Conservation issues

Identification of Fragrance Gene in some elite advance Lines of Rice Cultivated in Foothills of the Himalayas

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Abstract

A molecular survey was conducted for the identification of fragrance (*fgr*) gene in advance lines of rice. STS marker RG 28L was used in this study that amplified 140 and 120 bp fragment in aromatic and non-aromatic genotypes, respectively. Among the cultivated varieties Basmati-385 and Swat-1 showed the presence of *fgr* gene (140 bp amplicon) while IRBB59, JP-5, Fakhre Malakand, and IR24 were lacking this gene. Among the advance lines 12 genotypes showed the presence of *fgr* gene (140), two genotypes (NPT-86 and Line 36) were segregating while the remaining 16 genotypes were lacking this gene. Thus more than one third of advance lines used in this study showed *fgr* gene and were categorized as aromatic.

Disturbed Regeneration Patterns and Underlying Factors in Subtropical and Moist Temperate Forests of Kashmir Himalayas

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Abstract

Forest regeneration pattern was investigated in western Himalayan moist temperate and subtropical forest sites in Bagh district, Kashmir. The anthropogenic pressure in terms of live stock grazing and tree felling intensity was investigated. Anthropogenic stimuli were significantly correlated with retarded forest regeneration patterns. A very low regeneration values of 121 seedlings/ha was recorded for the whole area. Subtropical forests showed a relatively higher regeneration value of 211/ha as compared to 119/ha in moist temperate forest sites. A very low tree/stump ratio of 1.62 was recorded for the forest stands showing immense lumbering activity. Available grazing area per grazing unit was extremely low, calculated as 0.16 ha only. A gradual decline in tree felling and grazing intensity was observed with increasing altitude and distance from settlements; followed with an increase in seedling count.

Keywords: Forest regeneration, Seedling count, stem/stump ratio, grazing area

The Ethnobotany of Sarban Hills Abbottabad, Pakistan with certain Folk Recipes

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Abstract

An ethno botanical survey was carried out to collect information regarding the various indigenous uses, especially the medicinal plants of Sarban hills. A total of 30 taxa are reported as being used locally for various purposes. Our results suggest that root is the major plant part used in most of the recipes. Majority of the recipes are prepared in the form of decoction, infusion and poultices from freshly collected plant parts. Some species are used directly. All of these collected plants are wild. Unsustainable collection methods, overgrazing, and deforestation are the main causes of the reduction of local flora. As the inhabitants of the area still depend on medicinal plants for majority of their complaints, therefore loss of these plant resources will, badly affect the existing healthcare system in the area. Proper awareness among the local peoples of the Sarban area is very necessary.

Keyword: Sarban recipe, Overgrazing, Detoxification, Medicinal Plant.

Iron Weed (*Vernonia anthelmintica*) As a Renewable Oil Seed Crop in Pakistan

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Abstract

Iron Weed (*Vernonia anthelmintica*) is an important medicinal and industrial oil seed plant of the family *Asteraceae*. It has immense potential for cultivation as commercial medicinal and oilseed crop on marginal lands, particularly in the semi-arid agro-climatic conditions of Pakistan. Apart from its local use as medicinal plant, its seed contain sufficient amount of epoxy oils which is used in plastics and additive industries to form a clear, tough, rubbery coatings on metal. It can be used as a drying agent for resin paints that improve heat and light stability.

Medicinal plants biodiversity used for Diabetes in District Kotli of Himalayan Range, Azad Jammu and Kashmir

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Abstract

Diabetes has become a serious issue of every country and it threatens the health and economic prosperity of people. Pakistan has seventh highest number of diabetics in the world so it is a major health problem of Pakistan. Present research work therefore is based on an ethno botanical survey conducted first time for enlisting of medicinal plants used in phytotherapy of diabetes among the rural communities of District Kotli, Azad and Jammu Kashmir. A total of 36 plant species belonging to 31 genera and 18 families have been documented by 50 diabetic patients of area. The collected information was arranged in alphabetical order of Plant Botanical name, Family with local or common name and mode of use is listed. The most cited families in terms of number of species are Cucurbitaceae (5), Rutaceae (5), Brassicaceae (3) while Alliaceae, Meliaceae, Solanaceae, Leguminosae, Moraceae, Poaceae, Lamiaceae, Rosaceae, Myrtaceae were represented with two species and rest were represented with one species each. Fruit (45%) were most used plant parts followed by Seeds and Leaves (19%), Root (7%), Bulb (5%), Bark (3%) and whole plant (2%). Herbs were dominant (58%) followed by Trees (33%), Shrubs (6%) and climbers (3%). Mode of utilization were mostly Chewed (24%) followed by Infusion (16%), Powder (16%), Extract (13%), Cooked (13%), Paste (11%), Juice (5%) and Gel (2%). Besides the study also highlights socio-economic aspects of inhabitants of area. Phytotherapy in Kotli District is mostly followed by old aged people of area so continuous efforts are required for its establishment on large scale in area. A multidisciplinary approach on regional level is required for proper management of Diabetes in District Kotli.

Keywords: Medicinal plants, biodiversity, Diabetes, Himalayan Range, Azad Jammu and Kashmir

Reassessment of *Mentha* Species from Kunhar River Catchment using Morphological and Molecular Markers

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Abstract

Twenty five mint (*Mentha*) samples collected from catchment of river Kunhar. Quantitative trait analysis was done using Minitab software. The 22 morphological traits divided the twenty five menthe samples into 4 clusters as A, B, C and D. Cluster A showed 97% similarity (*Mentha Longifolia*), cluster B also showed similarity index of 97% (*Mentha. arvensis*), cluster C consist of (*Mentha. arvensis*) and cluster D revealed 90% similarity (*Mentha. royleana*).eleven randomly amplified polymorphic DNA markers were used for molecular study. RAPD markers showed greater level of genetic diversity from 0-100%. *Mentha royleana* need more primers for proper discrimination upto sub species and variety level.

Keywords: Dendrogram, DNA, *Mentha*, PCR, RAPD, Trait

Mosses of Kashmir Himalaya: Diversity, Conservation Status and Future Challenges

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Abstract

A thorough review of the previously published literature about mosses of Kashmir Himalaya reveals 254 species distributed in 108 genera and 36 families. Pottiaceae is the largest family with 49 species (19.29%), Bryaceae and Brachytheciaceae come to next with 23 (9.05%) and 17 (6.69%) species respectively. In the remaining families, 14 have 5 to 15 species and 16 have less than 5 species. Like-wise for genera, *Orthotrichum* is the largest genus with 15 species (13.88%). *Brachythecium* is the second largest genus with 11 species (10.18%) and *Bryum* is the third largest genus having 10 species (9.25%). About 5 species seems to be endemic for the study area. Conservation status of few species has been evaluated in occupied (Indian portion) Kashmir, while in Azad Kashmir, very little collection has been done in some selected localities of the region. Further inventory is extremely needed along investigation of their conservation status.

Keywords: Mosses, Kashmir Himalaya, Conservation Status

Biochemical Profiling of *Eucalyptus melanophloia* L.

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Abstract

Essential oil from fresh leaves of *Eucalyptus melanophloia* was extracted with 7 hours (hrs) steam distillation and characterized by physico-chemical analyses. The chemical components were detected through gas chromatography (GC). The presence of 31 components was confirmed along with pale yellow volatile oil from *E. melanophloia*. The 1.73 % yield was evaluated after 7 hrs of steam distillation. Antimicrobial properties of essential oil (20 μ L) were determined by disc diffusion technique on agar plates compared against standard antibiotics (20 μ g). The antibacterial activity of essential oil was determined against *S. aureus* (26mm), *B. subtilis* (22mm), *E. coli* (16mm), and antifungal activity against *Aspergillus niger* (27mm) and *R. solani* (12mm). Two methods were used for the calculation of antioxidant activity. The 90.7% DPPH radical scavenging and inhibition % age (91.4) of linoleic acid oxidation was estimated. Antifungal activity for *A. niger* was much greater than strain *R. solani* and the effectiveness of the essential oils against microbes depends upon the concentration. The percentage calculated from extracted components particularly α -Pinene (16.0) and β -Phellandrene (14.3) may contribute to enhance the antimicrobial and antioxidant properties.

Keywords: Antimicrobial activity, Antioxidant potential, Essential oil, *Eucalyptus melanophloia* L.

Traditional uses of some Phenerogames of Molkhow Valley- District Chitral

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Abstract

The present study deals with the documentation of traditional knowledge of some phenerogames in Mulkhow valley, District Chitral. About 50 taxa were collected and among these, 28 species were herbs, 13 shrub and trees were represented with 9 species. Maximum taxa were belonging to the family Asteraceae having 9 taxa (18%), Papilionaceae and Umbelliferae come to next with 5(10%) and 4(8%) species respectively. These taxa were used for different purposes i.e. medicinal purposes, traditional foods, fodder, firewood etc. Out of total, 27 species were used as medicinal purposes, 4 species used as traditional food, 5 species as fodder. The remaining species were used for fencing, timber, fire wood, harvesting material etc. Majority of plant parts were used in the form of decoction and use orally. Unsustainable utilization of the taxa, soil erosion, grazing, poor harvesting methods were identified as potential threats for the flora.

Keywords: Chitral, Mulkhow Valley, Traditional uses

New RAPD-PCR Markers to Identify Rust Resistant and Susceptible Genotypes of Sugarcane

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Abstract

In Pakistan, sugarcane is an important cash crop cultivated in the western Himalaya and its production is severely affected by various constrains but diseases are the most important one. The brown rust is the most vital disease which is severely affecting production of sugarcane. The present study set out to screen and identify rust resistance elite genotypes of sugarcane on the basis of agronomical impression and DNA based markers. The RAPD (Random Amplified Polymorphic DNA) technique was used to find fingerprints in commercially grown sugarcane genotypes of Pakistan. In this study, six sugarcane genotypes were characterized on the basis of rust resistance and susceptibility under natural inoculation in the field and divided into two discrete phenotypic classes, three rust resistant genotypes RR and three rust susceptible genotypes RS, for identification of RAPD markers. Initially, 260 decamers were subjected against the genomic DNA of six commercially grown sugarcane genotypes. After screening, 3 of 260 decamers were able to amplify specific loci in RR and RS discrete classes of sugarcane commercially grown genotypes in Pakistan. These markers generated 3 specific loci, 2 loci in RS group and 1 locus in RR group. Primer L-04 and L11 generated 800 bp and 900 loci in a rust susceptible group of genotypes (RS) respectively. But, only one primer L15 amplified 1400 bp locus in a rust resistant group of genotypes (RR). This study will be useful to provide powerful tool to explore the molecular basis of disease resistance in sugarcane. Moreover, these markers could be converted into more specific, stable, reliable and reproducible SCAR (Sequence Characterized Amplified Region).

Keywords: RAPD, sugarcane, rust resistance, SCAR

Effect of War on Terror on the Biodiversity and Vegetation Structure of South Waziristan Agency (A Case Study of Plant Conservation)

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Abstract

The full range of variety and variability within and among living organisms and the ecological complexes in which they occur is simply biodiversity. It encompasses ecosystem or community diversity, species diversity, genetic diversity. No doubt the negative aspect of the current insurgency praised countless miseries among the community; however it has forced two very noticeable and crystal clear encouraging features. The so called IDPs have got disclosure to educational institution and commerce. The vegetation has enlarged to its maximum in terms of species richness and species abundance after having been preserved for seven long years. The bonsai has turned into tree and there is least bear area. An increase of 95% was observed in species richness and community structure change as compare to the previous record.

Keywords: terrorism, biodiversity, species richness, conservation, South Waziristan, Pakistan.

***Russula sichuanensis* (Russulaceae; Agaricales) and its Ectomycorrhiza from Western Himalaya, Pakistan**

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Abstract

Russula sichuanensis and its ectomycorrhiza were collected from monoculture *Pinus wallichiana* forests. This fungus is a new record for Pakistan while its ectomycorrhiza is first time described based on morphology and nrDNA ITS region. *R. sichuanensis* is a morphologically variable species especially in respect of colour and shape of pileus. In addition, it can be characterized by small to medium sized stipitate basidiomata, reticulate globose to subglobose basidiospores and pluriseptate pileocystidia. Its ectomycorrhiza can be characterized by dichotomously branched, orangish brown to grayish brown tips, pseudoparenchymatous, acystidiate mantle with irregular shaped often interlocking cells and frequently septate, curved emanating hyphae. *Pinus wallichiana* is a new host for this species.

Keywords: Khyber Pakhtunkhwa, Phylogeny, Taxonomy

A Checklist of Epipetric Mosses of Kaghan Valley, Mansehra District

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Abstract

This checklist comprises of 44 Taxa belonging to 29 genera and 17 families. Among these 44 taxa 30 are acrocarpus and 14 Plurocarpus. This is the 1st checklist of epipetric mosses of Kaghan (Pakistan). The largest family is Fissidentaceae with 7 species and small families are Amblystegiaceae, Hypopterygiaceae, Enclalyptaceae, Timmiaceae and Ditrichaceae with 1 species each.

Keywords: Lithophytes, Kaghan Valley, Himalaya, Degradation

Analysis of Mineral Constituents of some Wild Mushrooms Collected from Different Areas of Pakistan

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Abstract

In the present study, 11 species of mushrooms preserved as herbarium specimen, collected from different areas of Pakistan were selected for analyses of following mineral constituent: Ba, Ca, Cd, Co, Cu, Cr, Fe, K, Li, Mn, Na, Ni, Pb and Zn. These minerals were analysed in 4 species of *Agaricus*, 1 species of each *Amanita*, *Boletus*, *Chlorophyllum*, and *Termitomyces*, 3 species of *Pleurotus*. Barium was found in all species in higher amounts. Lithium was found in 2 species of *Agaricus* and 1 species of each *Pleurotus*, *Boletus* and *Chlorophyllum*. Copper was absent in *Boletus*, *Chlorophyllum* and one species *Pleurotus*. Cadmium, Cobalt, Chromium, Nickel and Lead were absent in all species. Zinc, Iron, Manganese, Potassium, Calcium, Sodium were found in all species.

Isolation of Phytotoxic Metabolites from a Plant Pathogenic Fungus

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Abstract

To investigate phytotoxicity of metabolites of a plant pathogenic fungus Drechslera spp., the fungus was grown in M-1-D liquid broth for 28 days for the production of metabolites. These metabolites were extracted using different organic solvents. In bioactivity-guided bioassays, the metabolites caused necrosis as well as discoloration of leaf discs of Rumex dentatus, a noxious weed of wheat in Pakistan. Metabolites extracted from culture filtrates with chloroform were separated with the help of Thin Layer Chromatography (TLC), Preparative Thin Layer Chromatography (PTLC) followed by final purification with the help of Reversed Phase High Performance Liquid Chromatography (RPHPLC). Mass Spectroscopic experiments (LRESIMS and HRESIMS) were conducted that revealed the presence of a metabolite having phytotoxic activity.

History & Development of Tourism in the Pak- Himalayas Region

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Abstract

Himalayan's Tourism product consist of cultural, religious and nature base tourism. The lofty mountains, cultural heritage, flora and fauna plays a major role to attract tourist around the globe. During British period in middle of 19th century the present day Hill Stations, were established for the Officers. Nowadays, these Hill Stations are most visited destinations for Pakistani middle-class. The New age tourism in the Himalayan region consist of the activities such as trekking, mountain climbing, sightseeing and winter. These forms of mass tourism have a huge impact on the environment. This paper will illustrate the development of tourism in the Himalaya and discuss the effects tourism on the business and cultural environment in this region.

Keywords: Nature base tourism, Tourism Product, Mass Tourism, alternative tourism

***Calvatia lilacina* Henn. (Gasteromycetes; Basidiomycota) and distribution pattern of Known *calvatia* Spp. from Pakistan**

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Abstract

Gasteromycetes are a morphological category of homobasidiomycetes taxonomically placed in Basidiomycota, traditionally including puff-balls, earth stars, bird's nest fungi and stink horns. *Calvatia* is one of the important genus of this class and is represented by four species in Pakistan to date. In this investigation *Calvatia lilacina* has been described and illustrated from two different localities of Pakistan. It is treated here as new record from the country. As regards its diversity in South East Asia, previously it has been reported in Srilanka. With this addition, no. of *Calvatia* spp. known to this area is five. Current paper also provides a key and distribution pattern of *Calvatia* spp. from Pakistan.

Keywords: Deosai plains, diaphragm, Mansehra, sterile base.

Community based conservation of forest: A critical review of policies and practices

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Abstract

Community stress is provoked by the idea that “if the conservation and development could be concurrently achieved, the interests of both could be served. The principle aim of this paper was to investigate the role of community in the conservation of forest. Secondly analyze the Khyber Pakhtunkhwa forest policies and practices of joint forest management plan (JFMP). For this purpose researcher has gone through the various research material, policies documents and various other reports for collecting the arguments. This study revealed that inclusive, people oriented community-based approaches to conservation are in part a retort to the failures of exclusionary conservation. The study recommended that effectual and sustainable conservation can be better achieved if the policies do not violate the rights of local communities living in and around the forests.

Keywords: Community, conservation, inclusive and policies.

Vegetation Analysis of the of the Kot Manzaray Baba Mountains, of Hindu Raj Series

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Abstract

The study was analyzed in spring 2007. So, it includes the spring flora only. It was based on the phytosociological data and selective physicochemical soil factors the parameter used for the vegetation composition and structure were relative density, relative frequency, relative cover and importance value. The phytosociological analysis resulted in the establishment of eight plant communities on the basis of importance value. Namely *Dodonaea-Stellaria-Imperata* community, *Olea-Acacia-Adhatoda* community, *Adhatoda-Acacia-Olea* community, *Adhtoda-Acacia-Otostegia* community, *Dodonaea-Ahatoda-Acacia* community, *Dodnaea-Eucalyptus-Otostegia* community, *Dodonaea-Imperata-Otostegia* community and *Imperata-Otostegia-Cynodon* community. The area was generally dominated by perennial shrubs i.e. *Dodonaea viscosa*, *Adhatoda vasica*, *Otostegia limbata* etc which form the permanent framework of the vegetation of the project area. The ecological affinities, as a pre-requisite of phytosociological analysis, among the different plant communities were also studied. The co-efficient of different plant communities shows that most of the communities exhibited a continuity of floristic composition. The life form spectra of different plant communities were also determined. It was observed that therophytes were the dominant species of most of the communities. As conferred from the soil analysis, the soil of the area was sandy loam, poor in fertility, and basic in reaction with pH more than seven. The correlation of different environmental variables and their effect on the vegetation were also observed. It was clearly observed that the vegetation was mostly effected by the biotic influence. Among the different biotic factors the most harmful were overgrazing and anthropogenic activity which caused great changes to the composition and structure of the vegetation in the area.

Identification of Pear (Pyrus) Genetics Resources belonging to Northern Pakistan through 18s rRNA

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Abstract

Pear allies belonging to the genus *Pyrus* are the traditional selections widely available as landraces in the field boundaries, conventional forms, kitchen garden and as ferine in nature, mostly in the Himalayan of Pakistan. These landraces possess poor differentiating and overlapping morphological characteristics due to widespread crossability, therefore not identified up-till now. Thus 18s rRNA nucleotide sequence analysis were used to differentiate four landraces at DNA level. The preliminary results obtained for four landraces viz. Khan Tango (Kt), Nashpati, Pekhawy Tango (Pkt) and Nak Tango (Nk) communicated here. The landrace, Khan Tango (Kt) closely related to *P. pyrifolia* cv. Nijiseeki and *P. pyrifolia* cv. Okusankichi. The landrace, Nashpati had close affinities with *P. pyrifolia* cv. Minibae, Pekhawy Tango (Pkt) showed its affinity with *P. pyrifolia* cv. Mansoo whereas the landrace Nak Tango (Nk) showed maximum identity with *P. communis* cv. Favorite. The study concluded that landrace Kt is *P. pyrifolia* in origin and might be a hybrid of *P. pyrifolia* cvs. Nijiseeki and Okusankichi.

Key Words: Northern Pakistan, Pears (*Pyrus*), 18s rRNA analysis.

Intra and inter specific profiling of Pakistani Quercus species growing in the hilly areas of District Dir Khyber Pakhtunkhwa

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Abstract

The intra and inter genetic diversity among 20 Genotypes of Pakistani Quercus species (sp): 10 genotypes of *Q. incana*, 8 *Q. baloot* and 2 *Q. dilatata* were analyzed using morphological characterization and proteomic profiling. A total of 14 morphological traits were scored for estimation of genetic diversity (descriptive statistics), traits similarity index and estimation of phylogenetic relationship among Quercus species through cluster plotting. Similarly, seven loci (bands) were spotted in the collected germplasm of Quercus sp. Intra species locus contribution toward genetic diversity (LCTGD) was 42.9% in *Q. baloot* and 14.2% in *Q. incana*. Similarly, inter species LCTGD was 71.43% in the collected germplasm. Out of seven loci, locus-1, 5 and 6 showed polymorphic in *Q. baloot*, and locus 6 in *Q. incana*. Importantly, locus 3 and 4 was monomorphic in all collected lines and marked as generic specific locus for Quercus. SDS-PAGE profiling based on one-way cluster plotting successfully resolved the three species into separate cluster. The present data reflects that though the Quercus sp. showing intra and enter species genetic diversity but maintained species specific identity in the area regardless of environmental fluctuation.

Keywords: Genetic diversity in Quercus, SDS-PAGE, cluster analysis, locus variation

**Effect of Maleic Hydrazide on Enhancing the Flowering Time
in Chrysanthemum (*Chrysanthemum morifolium*)**

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Abstract

The study on “Effect of Maleic Hydrazide on enhancing the flowering time in *chrysanthemum*” was conducted to evaluate the effect various concentrations i.e., 0, 1000, 1500, 2000, 2500 and 3000 mg l⁻¹ of Maleic Hydrazide (MH) on plant height, number of branches, leaves, flowers plant⁻¹, leaf area, days to flowering, blooming period, flower size and flower fresh weight. The experiment was laidout in Completely Randomized Design with 6 MH concentrations. MH solution was sprayed on plants in the morning at fortnightly intervals. Data regarding vegetative and flowering attributes indicated that flowering in chrysanthemum varied significantly for most of the studied parameters. The plants sprayed with MH @ 3000 mg l⁻¹ produced significantly more number of branches (10.2), leaves (47), and days to flower (160), while the untreated chrysanthemum plants had more plant height (47.6 cm), least number of branches (6.9), but had higher leaf area (92.8 cm²), less days to flower (136), bigger flower size (4.9 cm) and higher flower fresh weight (3.5 g). Although plants treated with MH @ 3000 mg l⁻¹ produced small sized (4.01 cm) and less weight (2.9 g) flowers, yet it was considered better as it produced flowers 26 days late (on 16th November) different from the normal season.

Keywords: Maleic Hydrazide, chrysanthemum, flowering time.

Haplotypic Diversity of Y- chromosome STR loci in major ethnic groups from Hazara region

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Abstract

Short tandem repeats (STRs) loci have been extensively used for human evolutionary studies. In this study we have co-amplified and analyzed 17 male specific Y- chromosome STRs markers: DYS19, DYS389I, DYS389II, DYS390, DYS391, DYS392, DYS393, DYS385a/b, DYS438, DYS439, DYS437, DYS448, DYS458, DYS456, DYS635 and Y-GATA-H4 using oral samples of 25 unrelated male of the major ethnic groups from Hazara region. Discrimination capacity for Karlar 60%, Gujars and Deshan Swati 80%, Tanoli 60% and Kohestani 40% respectively and haplotype diversity (0.939858, 0.940317, 0.940176, 0.998864 and 0.821988) were calculated. A total of 16 haplotypes for the 17 Y-STR markers were identified, of which 10 were unique (2 in Karlar, 3 in Gujars, 3 in Deshan Swatis, 1 in Tanoli and 1 in Kohestani). Neighbor joining tree of the five ethnic groups showed a close relationship between Tanoli and Kerlar population while the other three populations out clustered separately. The Swati and Gujars were closely related while the Kohestani population was distantly related from the other four groups.

**Morphological study and Optimization of DNA Isolation Protocol of Dragonflies
(Anisoptera: Odonata) in District Swat, KP, Pakistan**

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Abstract

An extensive field survey was conducted to collect Dragonflies (Anisopterous) fauna of Swat, during April to June 2014, in the different sites of the study area. A total of 300 specimens identified 11 species in 6 genera, belonging to 3 families. Family Libellulidae having 8 species belongs to 4 genera, while Family Aeshnidae having 2 species belongs to 2 genera and family *Gomphidia* having 1 specie belongs to 1 genus. The family Libellulidae includes the major numbers of species as compare to Aeshnidae and Gomphidia family. The specie were slender skimmer *Orthetrum Sabina*, *Orthetrum pruinosum neglectum*, black tailed skimmer *Orthetrum cancellatum cancellatum*, *Acisoma panorpoid panorpoid*, Black Stream Glider *Trithemis festiva*, Long-legged Marsh Glider *Trithemis pallidinervis*, *Crocothemis nigrifrons*, *Crocothemis erythraea*, *Anax imperator*, *Anax parthenope* and *Gomphidia t- nigrum* were identified. In the present study the most common specie was *Orthetrum cancellatum cancellatum* from which 43 specimens were collected. Details for the identification i.e. valid names, their synonyms, measurement of body length, wing span, habitat and morphological description were given. A simple and cheap genomic DNA isolation protocol for dragon fly was developed that will help for further molecular studies in future. It is concluded that there is a vast diversity to explain dragonfly fauna of Swat. Further research should be carried out with larger population size for biodiversity.

Diversity of Microalgae in the Himalayas of Pakistan

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Abstract

The greater Himalaya range runs west to east, from the Indus river valley in northern Pakistan to the Brahmaputra river valley in northern India and Tibet, forming an arc 2,400 km long, which varies in width from 400 km in Northern Pakistan to 150 km in the eastern Tibet. The Western Himalayas are situated in Kashmir valley and Northern Pakistan. The region is of great significance regarding biodiversity and wild life. In the current study we explored the diversity of microalgae in Neelum River. Microalgae were isolated from water samples on BG11, Walne and a locally developed culture media. Axenic cultures of the isolated strains were identified by comparing their sequences of internal transcribed spacer (ITS) with that of the previously identified strains. We identified 31 genera of green algae with two genera reported for the first time from Pakistan. 17 genera of diatoms and diatoms were identified from the collected samples with one genus not reported previously from the Pakistan. 10 genera of cyanobacteria were also identified. Order of dominance of microalgae was green algae, diatoms, diatoms and cyanobacteria. Among green algae, Hydrodictyon and Hematococcus were the most abundant genera. Gongrosira and Echinospaerella (genera of green algae) and Zooxanthellae (a diatom) were not reported previously from Pakistan. It may be concluded that River Neelum of the Pakistani Himalayas host excellent diversity of microalgae from different taxonomic groups.

Keywords: Microalgae, internal transcribed spacer, diversity and Himalayas

Vegetation Profiling of the Mount Eelum District Swat through Multivariate Analyses

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Abstract

An ethno botanical Survey on the medicinal Plants was conducted during the summer 2010 in various part of U/C Kala Kaly. The people belonging to Kala Kaly are farmers and far away from the hospitals of Saidu Sharif and Kabal. Due to this reason the people of these hilly area depend upon the Medicinal plants of the near by forest and hills. The study revealed 71 Species belonging to 40 families of ethno medicinal importance. Out of these 71, there are 2 species belonging to Pteridophytes from family Pteridaceae and Equisetaceae. 1 species belongs to Gymnosperm and from family Pinaceae & 1 species from fungi. The remaining 67 species belonging to Angiosperms in which 64 are dicot and 2 are monocot belonging to 37 families in which the largest family is Lamiaceae having 8 Species following by Asteraceae having 5 Species which is followed by Rhamnaceae and Polygoniaceae having 3 Species each Others including Moraceae, Pinaceae, Myrsinaceae, Celastraceae, Asclepiadaceae, Apiaceae, Amaranthaceae, Verbenaceae, Urticeae, fagaceae, Buxaceae, have only one or Two species each. These plants were used by the native peoples as medicinal and crude drugs. The description of each Species its local names and diseases treated were recorded! The people collect these species for their own uses. Some species are threatened due to some factors inward by the native or by the dwellers of the near cities through cutting, overgrazing and unauthorized collection, from the survey it is obvious that the people of the hilly area have very good and vast knowledge about medicinal Plants

DNA Barcoding: A method for quality assurance of medicinal plants

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Abstract

The authentication of medicinally important species belonging to family Lamiaceae has become an important area of research work as these species have wide range of applications in treatment of diseases. Accurate morphological identification of these species is often hard to conduct due to phenotypic resemblance among them and with their adulterants. Incoherent therapeutic effects along with quality control problems in the herbal medicine industry may be caused by adulteration. The objective of the present work is to appraise the effectiveness of “DNA barcoding” approach as a tool for the recognition of these species and to discriminate them from their adulterants. Previous work has proposed three cpDNA regions i.e. the ribulose-1, 4-bisphosphate carboxylase large subunit gene (*rbcl*), maturase gene (*matK*) and the *psbA-trnH* intergenic spacer (*psbA- trnH*) either as single region or as multiregion barcodes based on the criteria determined by Consortium for the Barcode of Life (CBOL). Therefore, by using universal primers same gene regions were opted for amplification and sequencing. *matK* and *psbA- trnH* proved to be helpful in discriminating species of the Lamiaceae and their adulterants. The quality control of medicinal preparations and the management of medicinal herb trade in the markets could be monitored by the application of DNA barcoding.

Keywords: DNA barcoding, Lamiaceae, *matK*, *rbcl*, *psbA- trnH*, identification, quality control.

Rust fungi of Himalayas of Pakistan: An overview

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Abstract

Himalayas of Pakistan are most attractive with varying degree of coniferous species, including various evergreen and deciduous patches of broad leaved forests. These forests of Pakistan merge downward with the tropical thorn forests and upwards with the alpine meadows. Being rich in plant diversity, these forests harbor a large number of rust fungi that are obligate parasites of plants from which they obtain nutrients, and on which they reproduce and complete their life cycles. Although the fungal flora of Pakistan has been explored by several workers in the past, a very important group of fungi has largely been neglected resulting in the paucity of literature and very fragmentary knowledge of these fungi, particularly in Himalayan Moist Temperate forests of Pakistan. Keeping in view these facts, the present study was undertaken to explore and assess the diversity and distribution of rust fungi along with their respective host plants in this floristically rich area. This preliminary study of the hosts and their rusts includes approximately 244 species and 20 genera of rust fungi on approximately 300 species of host plants. These rust fungi include one (01) species each of genus *Chrysomyxa*, *Cronartium*, *Leucotelium*, *Masseella*, *Milesia*, *Miyagia*, *Monosporidium*, *Puccinosira*, *Pucciniostele*, *Ravenelia*, *Roestelia*, *Trachyspora*, *Transchelia*, *Uredinopsis*, *Uredopeltis* respectively; two (02) species each of *Gymnosporangium*, *Hyalopsora*, *Peridermium* and *Uredo*; three (03) of *Caecoma*, *Phakopsora* and *Pucciniastrum*; four (04) species of *Coleosporium*; eight (08) of *Melampsora*; eleven (11) of *Aecidium*; fifteen (15) of *Phragmidium*; thirty one (31) species of *Uromyces* and One hundred and forty (140) species of largest genus of rust fungi, *Puccinia*. This study enlists rust fungi of Himalayan Moist Temperate forests of Pakistan and presents their species richness and geographical distribution. This work will help to prepare a checklist of rust fungi of this area and will ultimately lead to the documentation and preparation of monograph of the rust fungi of Pakistan.

Keywords: Monograph, Pakistan, Rust fungi

Mitochondrial DNA Mutations associated Genetic diseases among the Himalayan Populations

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Abstract

Every living organism fight against disseises either through their developed body immune system or any other approach. Most common diseases found in humans are Epilepsy, Hypertension and Diabetes. These are type of disseises whose mutation can be studied in mitochondrial DNA. Mutations in mitochondrial DNA that interfere with ability of mitochondria to perform their role in aerobic respiration are known to cause Epilepsy. Hypertension is very common, occurring in over 50% of older people; the hypertension creates a greater pressure load on the heart to induce the hypertrophy and is a major risk factor for stroke and ischaemic heart disease. Diabetes is also common disease almost found in every adult male/female. The most common mutations associated with epilepsy are in the mitochondrial transfer RNA gene for amino acid lysine. Present study was aimed to determine the mtDNA mutations associated with epilepsy, Hypertension and Diabetes in patients and their families of Himalayan population. An economical and high yield protocol was established for the isolation of good quality genomic DNA from saliva. The isolated genomic DNA was used as a template for the PCR amplification of mitochondrial transfer RNA gene for lysine. The PCR product of about 500bp was purified from agarose gel and analyzed for nucleotide sequence. The nucleotide sequence of mtDNA from all family members was compared with each other and with that of control sequence available in the gene bank. The study with a local family from Mansehra has shown mutations 8252G>A and 8357T>G was found in the patient. No such mutations were observed in the samples from other family members. Our study has established a procedure for the detection of mutations in tRNA Lys gene of local population.

Key Words: Genetic diseases, tRNA gene, Himalayan populations

Species Distribution along Ecological Gradients in Tropical Dry Deciduous Forests of Foot Himalayan Hills of Pakistan

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Abstract

Tropical dry deciduous forests of Pakistan are largely neglected resources of the country. A broad survey was carried out for phytosociological exploration to quantify the current significance of tropical dry deciduous forests of Pakistan in relation to ecological variables. A total of 140 woody plant species, belonging to 52 families were recorded from the study area. Cluster analysis illustrates the distribution of 9 plant communities in 5 clusters. Results are further authenticated by the analysis of DCA and CCA, indicating that altitude, together with precipitation and temperature were the main influencing factors which impact the distribution and composition of these forests. Higher elevated forests are exposed to extensive tree logging, over grazing and browsing. At the same time these forests have low regeneration rate due to large scale anthropogenic activities. A remarkable difference was found in the disturbances of protected and unprotected forests.

Keywords: Ecological variables, Ordination analysis, Phytosociology, Tropical dry deciduous forests, Two way cluster analysis, vegetation analysis

Variations in 14 Non-Metric Dental traits of different Ethnic Groups of Hazara Region

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Abstract

Biological affinities of five different ethnic groups of Hazara region were estimated using comparative analyses of 14 dental morphological traits. It was revealed that these five ethnic groups show major differences among themselves. Assuming estimate of genetic variation, samples of Hazara region of KP indicates that traits frequencies of these ethnic groups are not closely related to each other as well as some traits frequencies also shows significant differences with the published data of worldwide samples of sub-Saharan Africa, North Africa, Europe, Sundadonts, Sinodonts from Turner 1985 and JD Irish 1997. Syed ethnic group shows significant differences to the worldwide distribution of non-metric shovelling UI1 trait, Double shovel UI1, T D UI2, DAR UC, Hypocone, Metaconule and Four Cusp number LM2. Gujjar's differ completely in Carabelli's UM1, DAR UC, Y Groove pattern LM2 and Protostylid LM1 as well as Awan's vary completely in traits like Shovel UI1, Double shovel UI1, T D UI2 and cusp number LM2. Abbasi's shows complete differences from worldwide distributions in Winging UI1, Shovelling UI1, Hypocone, Metaconule, Carabelli's UM1, Protostylid, deflecting wrinkles and Y Groove pattern LM2 while Karlar ethnic group also shows differences in Shovelling UI1 trait, T D UI2, Hypocone, Metaconule and in Y Groove pattern LM2. Cusp number LM2 and seven cusp was completely absent in all the five observed groups showing variation in their prevalence from Sub-Saharan Africa in seven cusp M2 while six cusp number shows high prevalence in the Sundadonts and Sinodonts. Affinities among the ethnic groups of northern Pakistan are diffuse and suggest the biological origins of northern Pakistani ethnic groups are multiple.

Key Words: Dental anthropology, 14 dental non-metric traits, Hazara, KP region, worldwide frequencies comparisons.

The behaviour of genomes and alien chromatin in wild and hybrid *Triticeae*

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Abstract

Triticeae crops, including wheat and its wild relatives, are important to study, and their chromatin structure and recombination contribute to exploitation of diversity. Triticeae species include:

- the world's major food source
- found and used at diploid, tetraploid, hexaploid and higher ploidies
- a large pool of germplasm diversity across 19 genera and hundreds of species
- large genome sizes of 5000-9000 Mb for haploid genome
- DNA is more than 75% repetitive DNA
- hybrids and synthetic polyploids that can be readily made.

Genes across the species show high levels of conservation, but the repetitive DNA is very variable in sequences and amount. Analysis of evolutionary diversification within Triticeae based on *in situ* and Southern hybridization and DNA sequence analysis shows various amplification mechanisms for different repeat types. Hybrids can be used both as crops (such as the wheat x rye species Triticale), or backcrossed to introgress alien chromosomes or chromosome segments via recombination into a crop species. In both cases, our work has been aiming at understanding the interaction of chromatin from different origins. We studied epigenetic modification using diploid and polyploid progenitors as well as hybrid lines using Southern hybridization with methylation sensitive restriction enzymes and immuno-labelling to detect 5-methylcytosine and histone modifications at mitosis and meiosis. The results show that patterns of chromatin modification vary between species, and can be transferred between genomes during their interactions in hybrids. *In situ* hybridization with cloned repeats and genomic DNA, along with chromatin antibodies, shows chromosome behaviour in parents, hybrids and introgression lines. The major species used have been *Thinopyrum intermedium*, *Aegilops tauschii* and *Triticum aestivum* (bread wheat) with a number of hybrids and backcrosses.

Gasteroid Fungal Resources of Western Himalayas - An Overview

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Abstract

Gasteroid fungi formerly known as “Gasteromycetes” is a heterogeneous group of fungi belonging to phylum Basidiomycota, produces spores inside their fruit bodies rather than on their outer surface. These are diverse and cosmopolitan in distribution occurring in temperate to tropical regions but commonly found in warmer areas. These fungi are also reported from plains with lower altitudes to hilly and mountainous regions with high altitude, however, there are some species which are restricted to the deserts and sand dunes of temperate areas. The major importance of this group lies in its role to form ectomycorrhizal association with coniferous and broad-leaved trees. In Pakistan, exploration efforts for this group of fungi never remained uniform; it only faced its climax from 1939 to 1956 as afterwards number of published reports of gasteromycetes became scant. In this study, an overview of diversity and resources of gasteroid fungal flora in Pakistan part of Himalaya is given from the period 1947 to 2014. Edibility and ectomycorrhizal status of gasteroid fungi reported from Himalaya is also provided.

Floristic Biodiversity and Ethnobotanical Study of the Bagrote Valley Central Karakoram National Park of Gilgit District, Gilgit-Baltistan, Pakistan

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Abstract

The present study was carried out to explore natural flora, and the ethnobotanical uses of plants by the inhabitants of Bagrote valley, Gilgit-Baltistan of Pakistan during 2013-2014. Bagrote is located at the junction of three great mountainous ranges i.e. Karakoram, Himalaya, and Hindukush. Central Karakoram National Park is situated in the Gilgit-Baltistan region of Pakistan and is the country's largest Protected Area, covering over 10,000km² and encompassing the world's largest glacier outside the Polar Regions. It is an ecologically fragile region, characterized by extremes of altitudes that range from 2000m to over 8000m. Bagrote valley forms part of the CKNP buffer zone and is the model region for CKNP, owing to its socio-ecological significance. The valley is approximately 20 km from Gilgit Town. The valley floor ranges in altitude from 1,500m to 2,900m. Alpine pastures are located on the valley slopes up to an altitude of nearly 5,000m. Outstanding physical features in the vicinity include Rakaposhi and Diran peaks in the northwest and northeast respectively, and Dubani peak in the east. Bagrote valley is inhabited by approximately 15000 people in villages. The detailed information of the flora with respect to their uses were collected through various field trips, specimen collection and using open ended questionnaire and detailed interviews from the native herbal healers (*Hakeems*), elderly known people and shepherds. For each species, botanical name, local name, habit, locality, parts used, medicinal and other multifarious uses have been recorded. During the survey, all collected plant specimens which were identified and deposited in the herbarium Department of Biological Sciences Karakoram International University Gilgit. Global Positioning System (GPS) was used to record coordinates of the 30 different localities and their distribution map is designed by using ArcGis 10.2. In total 66 different plant species the highest numbers of species (57) are used as medicinal purposes, followed by fodder and forage (48 species), fuel and timber (23 species), veterinary uses (12 species). Some species rare, endangered while some have new and additional uses. These villages and alpine and sub alpine zones were first time properly surveyed and gathered the specimens and indigenous knowledge from the native inhabitants of the area. The highest number of plant species belonging to the families Asteraceae, followed by Papilionaceae, Rosaceae, Lamiaceae, Chenopodiaceae, and

Polygonaceae. Distribution of knowledge about these medicinal plants between men and women were examined and find that older people especially women were more informative and habitual to use these medicinal plants as a folk racepies. Due to the rapid urbanization natural ecosystem is declining at rapid pace due to overgrazing and un-sustainable management, deforestation of flora causing threat to local biodiversity and need a comprehensive plan to protect natural resources.

Keywords: Central Karakoram National Park, Ethnobotany, Medicinal Plants, Global Positioning System, Gilgit-Baltistan

***Parthenium hysterophorus* phytoremediation potential: Identification and expression of GR and PLD genes**

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Abstract

Parthenium hysterophorus have strong phytoremediation potential by accumulating heavy metals like Cr, Cu, Ni, Zn, Pb and Cd in industrially contaminated soils. Our current study deals with the *Parthenium hysterophorus* potential to decontaminate the heavy metals affected soils as well as to identify the *PLD* and *GR* genes through their expression study by RT-PCR. *GR* and *PLD* genes are important components of the antioxidant machinery that plants use to respond against heavy metals and other abiotic stresses. *Parthenium hysterophorus* can adapt to heavy metals stress by altering expression of both these genes. Our results demonstrate that up-regulation of *GR* and *PLD* gene expression may act as a defense mechanism against heavy metal-generated oxidative stress. Current findings at the molecular level provide new opportunities for the possible roles of these functional genes in heavy metals stress tolerance of *Parthenium hysterophorus*.

Keywords: Heavy metals, *Parthenium hysterophorus*, *GR* and *PLD* gene expression

Potential of Wheat (*Triticum Aestivum* L.) Advanced Lines for Yield and Yield Attributes under different Planting dates in the Peshawar Valley

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Abstract

Development of new lines in wheat and their evaluation under different planting dates is pre requisites for enhancing productivity on sustainable basis. In this respect an experiment was conducted at Cereal Crops Research Institute, Pirsabak, Nowshera during 2013-2014. The study was carried out to evaluate six wheat advanced lines (PR-103, PR-105, PR-106, PR-107, PR-108 and PR-109) under six different planting dates (Oct. 25, Nov. 5, Nov. 15, Nov. 25, Dec. 5, and Dec.15). The Experiment was laid out in randomized complete block design with split-plot arrangement replicated thrice. Sowing dates were assigned to main plot and wheat lines were assigned to subplots. Sowing dates, as well as the genotypes, and wheat lines both significantly affected yield and yield components. Days to maturity, plant height, spike length, spikelets spike⁻¹, grains spike⁻¹, 1000-grain weight and grain yield of various wheat advance lines decreased by 19.0, 15.0, 5.0, 7.5, 16.0, 26.7 and 35.2 percent each respectively when sowing was delayed from Oct. 25th to Dec. 15th. The average grain yield for all six sowing dates was highest for the genotype PR-107 (4803 kg ha⁻¹) as compared to the rest of the lines. Significant differences were found among various wheat advance lines for days to heading, spike length, spikelets spike⁻¹, grains spike⁻¹, plant height, lodging score (%), and 1000-kernel weight. In case of planting dates, statistically greater grain yield (5196 kg ha⁻¹) and (5008 kg ha⁻¹) was recorded for Oct 25th and Nov. 05th sown crop respectively compared to Dec. 5th sown crop (3366 kg ha⁻¹). Thus, it is concluded from the current study that the optimum period for growing wheat crop in general, and varieties derived from the advanced lines in particular, is Oct 25th to Nov. 05th for obtaining maximum grain yield in Peshawar valley of Khyber Pakhtunkhwa and similar agro-climatic zones. Moreover, on the basis of greater grain yield, PR-107 is recommended for further adaptability tests at national and regional levels.

Keywords: Wheat advance lines, planting dates, yield components and grain yield

Studies on Air Pollen Spora of Abbottabad City, KP, Pakistan

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Abstract

A study was designed to investigate the air pollen spora of Abbottabad city, KP, Pakistan, In all, 117 pollens belonging to different plant species were trapped using the Gravity Slide method, from December 2012 to December 2013. Of these, 80 species were identified and confirmed on morphological basis. Annual pollen count of *Pinus roxburghii* was 17965, *Cannabis sativa* 10251 *C. semipervirens* 9593, *Eucalyptus globules* 7789, *Thuja orientalis* 5470 and *Cenchrus pennisetiformis* was 3663. Seasonal fluctuation was found to be related with environmental factors, especially, relative humidity. The month of March was the richest with respect to the pollens concentration followed by August, September and April. Similarly, the occurrence of pollen grains was minimum during the months of January and February 2013.

Keywords: pollens count, occurrence, fluctuation, spora, concentration

Antimytotic activity of *Tamarix aphylla* (L.) Karst. flowers extract against some fungi

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Abstract

Three concentrations of crude ethanolic extracts 2000 ppm, 1000 ppm and 500 ppm were tested against six pathogenic fungi: *Aspergillus flavus*, *Aspergillus fumigatus*, *Aspergillus niger*, *Fusarium oxysporum*, *Penicillium notatum* and *Saccharomyces cerevisiae* using five different solvents: acetone, chloroform, distilled water (DW), ethanol and methanol. Percent inhibition in growth of fungi was found to be dose dependent. The standard antifungal synthetic drug, Terbenafine, was used in different concentrations mixed with distilled water against different test fungi. Terbenafine completely controlled the growth of *A. flavus*, *A. fumigatus*, *A. niger*, *F. oxysporum*, *P. notatum* and *S. cerevisiae* with the concentrations of 75 ± 0.58 , 72 ± 1.00 , 50 ± 1.15 , 59 ± 1.00 , 60 ± 0.58 and 70 ± 0.58 ($\mu\text{g/ml}$ of PDA medium), respectively. *T. aphylla* flowers caused $97.71\% \pm 1.00$ and $96.91\% \pm 0.67$ inhibition in the growth of *A. niger* and *F. oxysporum*, respectively. Finally, our results suggest that *T. aphylla* flowers extract illustrated maximum percent inhibition with acetone followed by chloroform. Key words: Terbenafine, inhibition, crude extract.

STR Polymorphism in major Ethnic Groups of Hazara Region of Pakistan

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Abstract

X-STR polymorphism of five ethnic groups of Hazara region, northern Pakistan is reported here. The ethnic groups included; Gujar, Karlarr, Kohistani, Swati and Tanoli. DNA was extracted from saliva samples of 30 individuals, 15 male and female, of each ethnic group and were typed with 5 X-STR markers using 5 pairs of primers with one primer fluorescently labeled of each pair. The markers included DXS-101, DXS-6789, DXS6809, DXS-7132 and HPRTB. The PCR amplified products were run on ABI-3100 machine and analyzed using Gene Mapper software version 4.0. The forensic efficiency of STRs based data was tested for kinship with respect to P_{Dm}, P_{Df}, P_{IC}, H_{et}, G_D, L_D and P_E, using Arliquin software version 3.1. The number of alleles per marker, scored across all the whole populations was 12, 14, 8, 12 and 7 for DXS-101, DXS-6809, DXS-7132, DXS-6789 and HPRTB respectively. The P_E and H_{et} were in the range of 0.194 for DXS-6789 to 0.555 for DXS-7132, whereas H_{ETf} ranged from 0.5075 for DXS-6789 to 0.7761 for DXS-7132. The value of P_{Df} ranged from 0.900 for HPRTB to 0.903 for DXS-7132 while P_{Dm} ranged from 0.736 for HPRTB to 0.831 for DXS-6789. The high value of Power of Discrimination in males and females supported the importance of X-STRs multiplex in forensic identity testing. The least discriminating locus was HPRTB. The genetic distance analysis based on allele frequencies showed that Kerlal and Tanoli people are nearer to one another. Both of these ethnic groups have phylogenetic affinities with Swati, whereas the Gujar and Kohistani people has retained their individuality as distinct races.

Key words: STR, X chromosome, Hazara Pakistan, Population data

Evaluation of the Conservation Status of *Rhododendron collettianum* Aitch. & Hemsl.: An Endangered Species of Pakistan

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Abstract

Rhododendron collettianum Aitch. & Hemsl, belong to the family Ericaceae and is endemic plant species to Kurram Agency and Chitral District, Pakistan. This species was previously reported from one locality i.e. Shend-toi for Kurram Agency. In the current assessment, further 8 localities were traced out from Kurram Agency during 2011 and 2012. For population size, about 4019 mature individuals were observed. Extant of occurrence is 464.485 km² and Area of occupancy is about 160.196 km². Further, the taxon also faced multiple threats as: habitat degradation due to mining, excavation and soil erosion. Based on its population size (≥ 5000) mature individuals, Extant of occurrence (≥ 5000 km²), Area of occupancy (≥ 500 km²) and various threats, this species has been categorised as Endangered (EN) according to the IUCN Red list categories and criteria 2001. Remedial measure is also suggested.

Genetic Analysis of some Threatened Peacocks found in Himalayan region of Pakistan

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Abstract

Hazara Division extends North-Eastwards into the outer Himalayan range tapering to a narrow point at the head of Kaghan Valley. There is a vast variety of birds in this region including crows, myna, sparrows, doves, peacock species and pheasants with a wide range of colours and size. Present study describes the use of mitochondrial DNA markers for the analysis of genetic diversity among the threatened peacock species of this region. Cytochrome c oxidase gene I and cytochrome b genes were PCR amplified using universal bird specific primers and nucleotide sequences were analyzed for 4 threatened peacock varieties. The phylogenetic tree constructed on the basis of nucleotide sequences has shown a close relationship of these varieties with each other indicating hybridization process in the past. There was 87% to 100% homology among the nucleotide sequences obtained from peacock varieties with that of different bird species available in the gene bank. Present study provides a baseline in cataloguing the local bird species and conservation of their genetic record.

Key Words: Peacock, threatened bird species, Himalayan region forests

Diversity of Dragonflies dwellers of the upper Siren valley in Mansehra

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Abstract

The present work is aimed to study diversity of dragonflies species encountered in the upper Siren valley in Mansehra. This study has been carried out in ten stations for two consecutive years 2012-2013. The dragonflies were investigated by monitoring numerical, locality abundance, and periodical abundance diversity. The numerical diversity showed twelve dragonflies species. A total of 300 specimens were collected from the study area. Which yielding, 12 species, 7 genera and 2 families, Libellulidae and Gomophidae the identified species were Spine-legged Redbolt, *Rhodothemis rufa* (Rambur, 1842), Black tailed skimmer, *Orthetrum cancellatum* (Linnaeus, 1758), Blue or Black percher, *Diplacodes Lefebvrei* (Rambur, 1842) Common red skimmer, *Orthetrum pruinosum neglectum* (Rambur, 1842), Clubtails, *Onychogomphus bistrigatus* (Selys, 1854), Ground skimmer, *Diplacodes trivialis* (Rambur, 1842), Aeshna minuta, *Palpopleura sexmaculata* (Fabricius, 1787), Blue Marsh Hawk, *Orthetrum glaucum*, (Brauer, 1865), Common skimmer, *Sympetrum decoloratum* (Selys, 1884), Eastern Least Clubtail, *Stylogomphus albistylus*, Triangle Skimmer, *Orthetrum triangulare triangulare* (Selys, 1878), *Sympetrum commixtum* (Selys, 1884). The most encountered species found was *Orthetrum pruinosum neglectum* whose 55 specimens were collected. The least encountered species was *Orthetrum triangulare triangulare*, 42 followed by *Rhodothemis rufa*, 39. The Siran Valley is rich in insect biodiversity, the dragonflies fauna of this valley needs to be further explored and Similar surveys on large scales are recommended to fully evaluate the dragonfly fauna of District Mansehra.

**Sampling Blood From Birds: A Technique and an
assessment of its effect**

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Abstract

The aim of the present study was to describe a technique and apparatus for extracting blood samples from birds in the field. We tested the effect of our technique on the health and behavior of captive pheasants, peacocks and aquatic birds. We found that captive birds that had been bled did not lose any more weight than birds that had not been bled. Female pheasants, peacocks and aquatic birds that were bled did not differ significantly in their fecundity rate relative to females that were not bled. We conclude that blood sampling is not obviously harmful to wild birds as long as proper precautions are taken. Given the ease of the field technique and the vast potential for information to be gained, field ornithological researchers should not prevent adding laboratory blood analyses to their research program because of concerns about the technique negatively affecting the birds' health or behavior.

Keywords: Blood sampling, pheasants, peacocks, Aquatic birds, weight loss, Fecundity rate

Characterization of drought resistant genes in tomato

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Abstract

Drought is one of the major abiotic stresses causing severe reduction in tomato production. Up till now, limited studies have been reported about the response of tomato plant to drought stress at various growth stages. In this investigation, effects of five different PEG-6000 concentrations (0, 2, 4, 6 and 8%) on two tomato varieties; Var. Nagina and Var. 17905 were evaluated at agronomic and molecular level. Our results clearly demonstrated that seed germination and shoot length reduced significantly with increasing concentration of PEG-6000 in both varieties. However, leaf area, leaves number and fresh biomass decreased significantly at 8% PEG-6000 in both varieties. On the contrary, root length of both varieties was found to be increased as the PEG-6000 concentration elevated. At molecular level, the four selected genes *i.e.* *TD1*, *TD2*, *TD3* and *TD4* expression was studied by RT-PCR and our findings revealed that all the genes were over expressed with increasing PEG-6000 concentrations. Moreover, *TD3* gene was highly expressed which has not been reported in the drought stress. The in silico characterization of these genes revealed many important conserved domains that are involved in drought stress. Highly expressed genes in the tomato crop under drought conditions suggested that in the future it is important to clone one or more of the above genes, which can then be introduced in the commercially important drought sensitive tomato varieties for an enhanced drought tolerance.

Keywords: Tomato, *Lycopersicum esculentum*, abiotic stress, drought, gene expression

Morpho-Palynological Studies of Certain Plants Belonging to the Genus *Solanum* from the Lesser Himalayas, Pakistan

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Abstract

Six species of genus *Solanum* belonging to family Solanaceae from Abbottabad have been studied using palynological techniques. Solanaceae is a eurypalynous family. Grains usually are 3 (4) colporate, radially symmetrical, isopolar, prolate-spheroidal to oblate spheroidal, sub-prolate to per prolate, suboblate to oblate, size range from 8.55 - 72 μm , ambicircular, semi-angular or sub-angular, aperture drop type, labrum common type, exine usually 2 μm thick, nexine 1-1.5 μm thick. Tectum usually psilate, sexine reticulate, granulate or striato-reticulate, usually with OL or obscure pattern, 1-2 μm thick, nexine 1-1.5 μm thick. Most striking variation is found in the shape class, aperture type and tectal surface. However the grains of this family which are usually tricolporate have direct relationship with the certain members of Scrophulariaceae.

Keywords: Solanaceae, *Solanum*, Palynology, Lesser Himalayas, Pakistan.

Analysis of some selected Pesticides in the Vegetables of Siran Valley

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Abstract

The study was made to investigate the residue level of selected pesticides (Cypermethrin and Paraquat) in the vegetables of Siran Valley. A new method was developed for the determination of part per million levels of widely used Cypermethrin and Paraquat. The method is based on hydrolysis of both the pesticides. In the first step, cypermethrin was reacted with NaOH to form a hydrolyzed product which was then reacted with HCl was added to neutralize the solution which further reacts with potassium iodide solution to liberate iodine ion and the liberated iodine selectively oxidizes the malachite green dye. Then the solution was diluted upon the mark with distilled water. Absorbance of the resulting solution was observed from 400 to 800 nm using CT0648 UV spectrophotometer for finding the optimum wavelength. The maximum absorbance was recorded at 617nm. For the Cypermethrin the limit of detection (LOD) and limit of quantification (LOQ) was calculated and found to be 0.078ppm and 0.261 ppm correspondingly and the molar absorptivity was calculated $2.3 \times 10^5 \text{ Liter mol}^{-1} \text{ cm}^{-1}$, while for the Paraquat limit of detection and limit of quantification was calculated and found to be 0.078ppm and 0.261ppm. The molar absorptivity for paraquat was calculated $1.22 \times 10^4 \text{ Litre mol}^{-1} \text{ cm}^{-1}$. From the result it is concluded that method is sensitive, sample and free from interfering of extra pesticides. The method can be satisfactorily used for the determination of both selected pesticides i.e. Cypermethrin and Paraquat in biological and environmental samples.

Keywords: Vegetables, Pesticides (Cypermethrin and Paraquat), Determination, Siran Valley.

Current status of *Berberis vulgaris* root bark based on inventory design in Usheri Dara, Dir Upper.

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Abstract

This paper focused on *Berberis vulgaris* inventory design to quantify its root bark, evaluate its status keeping the IUCN criterion in background, provide a base line for future research work, assess its Ethno medicinal use and existing market trends in 2012-13. It also illustrate the responsible factor for change its percent cover and a way to sustainable use. Owing to inhospitable condition, terrain and rough topography, most of high altitude plants were found little bit exposed in first ever inventory study in particular area. A systematic inventory survey was designed and Composite Plots were laid out for root bark assessment and for soil sampling in different strata in Usheri valley while the required questionnaire were filled from those specific old age peoples who were highly esteemed in this regard.

During 2012 inventory survey quantified 194917.5 kg root bark while in 2013 this figure reduces to 187766.25 kg with .408 percentage reduction. Locally usage of *Berberis vulgaris* was for 13 different disease /conditions with highest percentage for bones fracture, stomachic problems, wound healing, jaundice, kidneys and various other type of infections. Big gap was present between buying and selling price. *Berberis vulgaris* though locally pushed in vulnerable category due to traffic of stresses, has potential to act as a source of livelihood for ultra-poor and marginalized people and can provide opportunity for enterprises development.

Keywords: *Berberis vulgaris* inventory, Quantification of root bark, Local conservation status, Ethno medicinal use, Market trend.

Growth and Yield attributes of Lentil Crop influenced by different Nutrients Treatment

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Abstract

The maximum yield of lentil crop may be obtained by using the foliar spray as supplement for mineral nutrition because plants absorb most of the mineral nutrients more easily and more rapidly through leaves. An experiment was conducted to observe the growth and yield attributes of lentil crop influenced by different nutrients treatment at the experimental field, Department of Botany, Hazara University Mansehra during 2013. Randomized Complete Block Design (RCBD) was used which consists of three replicates with four treatments and a control i.e. commercially available foliar spray named as 'Planto-fuel' containing (N + Zn, Fe, Mg, Cu, B and Mn mixture), DAP + Urea (solid form), foliar (N + DAP) labeled as 'Fozan' and foliar K-Sol (NPK). The experimental results revealed that foliar spray labeled as 'Planto-fuel' obtained the maximum plant fresh weight, No. of flowers plant⁻¹ (27.3), No. of pods plant⁻¹ (33.6), 1000 seeds weight (32.3g), biological yield and harvest index (37.1%), it also produced the maximum grain yield (930 kg ha⁻¹). It is concluded that the treatment of foliar micronutrients (Zn, Fe, Mg, Cu, B and Mn) in mixture with N is considered as the most applicable nutrients treatment to improve the yield of lentil crop.

Taxonomic Study of Puccinia of Hindu Kush of Malakand Region

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Abstract

Five species i.e., *Puccinia aestivalis* Dietel, *Puccinia duthiei* Ellis & Tracy, *Puccinia conclusa* Thuem., *Puccinia striiformis* Westend. and *Puccinia violae* (Schumach.) DC. were collected on different host plants in Hindu Kush range of Malakand region. All the five taxa were described morpho-anatomically.

Guava Wilt in the Area of District Malakand, KP, Pakistan

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Abstract

Wilt disease has severely decreased the production of guava, a highly profitable crop in Malakand District of Khyber Pakhtunkhwa, Pakistan. Besides the other factors, *Fusarium spp* plays the main role in the production and development of this disease. As to determine the causal agents of this disease in the study area, the samples of roots, branches and leaves from the infected plants and soil of the rhizosphere region were collected and surface disinfested. Three species, *F. solani*, *F. oxysporum* and *F. verticillioides* were isolated from diseased guava plant specimens and soil of the rhizosphere region. The *Fusarium* species growing on PDA medium were identified on the basis of morphologic and microscopic features consulting the authentic literature. Isolation percentage of *F. solani* was maximum (56.5%) from plant parts and soil, followed by *F. oxysporum* (28.9%) and *F. verticillioides* (14.4%). During the pathogenicity test, maximum disease intensity was observed in roots followed by leaves and soil inoculations with *F. solani* and minimum disease intensity was due to leaves inoculation with *F. verticillioides*. It is concluded that *F. solani* is the main guava wilt pathogen in district Malakand, present predominantly up to 15cm depth of soil.

Keywords: *Fusarium*, guava, wilt, pathogenicity, rhizosphere

Comparative Analysis of Toxic Metals (Pb²⁺ And Cd²⁺) In Road Sides Dust and Dust Deposited 15m away along Motorway (M-3) and National Highway (N-5), Pakistan

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Abstract

Research evaluating levels of toxic metals along busy pollution prone, due to exhaust smoke and sand dust roads is timely gesture. Five (5) sampling sites were chosen for sampling along Motorway (M-3) and National Highway (N-5) in Pakistan. The sites were respectively designed as; M-3a, M-3b, M-3c, M-3d, M-3e and N-5a, N-5b, N-5c, N-5d and N-5e. In each case dust was accumulated 24hours within two consecutive months, in petri plates encrusted with polystyrene foam kept 15 m away from roads as reference control and its corresponding road sites dust deposit near the roads as test. The lead (Pb²⁺) and cadmium (Cd²⁺) contents were estimated using AAS. The result shows high Pb²⁺ conc. along M-3 and N-5 road sides sand dust deposit compared to the controls. High Cd²⁺ contents were also recorded in road sides deposit at M-3e and M-3d compared to the controls at 15m away from the roads. Although high level of these toxic metals were detected in the road sides sand deposit compared to controls. The controls may be considered to harbor reasonable concentration of the metals. The correlation co-efficient between the metal contents and traffic density proved that Pb²⁺ & Cd²⁺ were constantly totting up from vehicular (exhaust dust). The finding may therefore indicates that settlers along these roads are at risk of toxic effects by these metals.

Plant Communities and Vegetation Ecosystem Services in the Naran Valley, Western Himalaya

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Abstract

Owing to its geographical, geological and climatic setting the, Western Himalayas is of high floristic interest and show resemblances with adjacent Hindu Kush and Karakorum parts where rugged terrain and geopolitics restrict plant biodiversity and conservation assessment. There has been very limited previous quantitative ecological or ethnobotanical research in this location, thus this study was designed in a Western Himalayan Valley, the Naran Pakistan, to meet three objectives: (i) assess species distributions and plant communities using phytosociological techniques; (ii) identify environmental gradients responsible for vegetation variation; (iii) quantify vegetation ecosystem services for indigenous people. Species attributes were measured along altitudinal gradients using transect and quadrat methods on slopes with different aspects (elevation range 2400-4100 m). In total, 198 plant species from 68 families were quantified along 24 transects. Classification and ordination techniques (PCORD & CANOCO) identified the major plant communities. Indicator Species Analysis (ISA) and assortment of fidelity classes identified indicator/characteristic species. Detrended Correspondence Analysis (DCA) and Canonical Correspondence Analysis (CCA) were used to analyse vegetation-environment relationships. Altitude and aspect were the strongest drivers of community classification. The vegetation changed from a moist-cool temperate community characterised by woody species, to dry-cold subalpine and alpine herbaceous communities both along valley sides and at higher elevations. Plant species diversity reached an optimum at mid-altitude (2800-3400 m) as compared to lower (2400-2800 m) and higher elevations (3400-4100 m). Questionnaire methods were used to record and quantify plant uses and indigenous ethnobotanical knowledge. Plant Use Values (UV) was calculated using quantitative ethnobotanical techniques while the phytosociological data yielded Importance Values (IV). UV and IV data were combined to illustrate vegetation anthropogenic influences, with a focus on rare, endangered and endemic species.

Alleviation of Chilling-Induced Proline Contents by Salicylic Acid in Germinating Maize (*Zea mays L.*) Seeds

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Abstract

Free proline accumulates in plants in response to biotic and abiotic stresses and play role as osmoregulator as well as amino acid pool. Salicylic acid (SA) is an active molecule involved in mediation of these responses and alleviates the extremes in detrimental effects. In present study, SA was used to study the alleviation of chilling effect during germination in five maize varieties i.e., Islamabad Gold, Rakaposhi, Sawan, Islamabad White and Margala by estimating free proline accumulation. The seedlings from seeds presoaked in 10⁻⁴M SA were exposed to chilling stress for four and six hours. It was observed that the free proline contents increased in shoot when seeds were treated with SA (1.247 mg.g⁻¹ fresh leaf) as compared to that treated with water (1.864 mg.g⁻¹ fresh leaf). Maximum proline contents were observed in seedlings chilled with four hours (2.087 mg.g⁻¹ fresh leaf), followed by six hours (1.667 mg.g⁻¹ fresh leaf) as compared to that (0.913 mg.g⁻¹ fresh leaf) of control. Islamabad White showed maximum proline contents (2.106 mg.g⁻¹ fresh leaf) in shoot significantly followed by all other four varieties non-significant to each other. Similarly it was also observed in root that the free proline contents increased when seeds were treated with water (2.453 mg.g⁻¹ fresh leaf) as compared to that (2.396 mg.g⁻¹ fresh leaf) presoaked with SA. In root, maximum proline contents were observed in seedlings chilled with six hours (2.753 mg.g⁻¹ fresh leaf), followed by four hours (2.580 mg.g⁻¹ fresh leaf) as compared to that (1.940 mg.g⁻¹ fresh leaf) of control. Sawan showed maximum proline contents (3.050 mg.g⁻¹ fresh leaf) in root significantly followed by all other four varieties non-significant to each other. Stability analysis for seedling yield was conducted using Eberhardt & Russell model and found that Sawan was best variety among all the five varieties in all the environments tested.

Flora of Maidan Valley, District Lower Dir: A case study of Conservation Assessment.

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Abstract

The present study was carried out to assess the conservation status of some ethnobotanically important plants of Maidan Valley, District Lower Dir. Out of 753 Angiosperms, 9 Gymnosperms and 18 Pteridophyte, 96 (12.33%) species were assessed to be threatened plant, of which 34 (4.37%) species were critically endangered, 26 (3.34%) species were endangered, 20 (2.57%) species were vulnerable and 16 (2.06%) were evaluated as infrequent. Loss of habitat and overexploitation of medicinal plants and ruthless cutting of timber trees were found to be the major causes of loss and extinction of valuable flora.

Floristic Studies of Phanerogams of District Shangla, Pakistan

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Abstract

Floristic surveys provide the necessary base-line data for preparing inventories of the plant wealth of a region to plan effective management practices and conservation interventions. District Shangla, located in the western extremities of the Himalayan range, is phyto-ecologically diverse and floristically rich. Comprehensive field studies of the area were conducted during 2011-2013 to document the floral diversity of the area assess their conservation status. A total of 31 localities, ranging in altitude from 900 to 4000 masl, were selected on the basis of variety of habitat and climatic condition as identified by studying the Google earth topographic sheets and personal observations during extensive field visits. During the survey, a total of 1965 specimens were collected comprising of 512 taxa belonging to 107 families and 340 genera. Among the collected specimens, Asteraceae emerged as the largest family represented by 58 taxa; followed by Labiatae, Rosaceae, Ranunculaceae, Papilionaceae, Brassicaceae and Polygonaceae each represented by 33, 32, 25, 21, 18 and 14 taxa respectively. Among the taxa studied, 266 species were perennial herbs, 103 were annual herbs, 89 were shrubs, 47 were trees and 10 species were biennial herbs. Therophytes, represented by 222 species, constituted the most frequent (43.3%) plant life form. Phanerophytes, Chamaephytes, Cryptophyte, Hydrophyte and Hemicryptophytes were represented by 137 (26.8%), 56 (10.92%), 50 (9.85%) 28 (5.44%) and 10 (1.98%) taxa respectively. Herbal coverage was 69.31% followed by shrubs 18.1%, Trees 9.158% and Climbers 3.4%

Keywords: Floristic studies, District Shangla, Vascular Plants.

Conservation Status of threatend Endemic Flora of District Shangla, Pakistan

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Abstract

The present study reports the findings of field surveys conducted over a three year period (2011-2013) in 31 localities of district Shangla of north-west Pakistan. The district is located in Sino Japanese region in western extremities of the Himalayas. During the survey the conservation status of plants was assessed in accordance with the IUCN's 2001 Red Data List Categories and Criteria. A total of 1965 specimens were collected comprising of 512 taxa belonging to 107 families and 340 genera, in which conservation status assessment has been scored for 161 species. Among these species 29 (18%) were critically endangered (CR), 55 (34%) were endangered (E), 51 (32%) were vulnerable (V), and 26 (16%) species were infrequent (INF), while the remaining 133 species were common (C) and 139 species were very common. Results of the assessment of 512 taxa included 47% in some threat category. The study concludes that district Shangla has a great potential for cultivation and propagation of plants resources. In order to ensure the sustainable use of plant resources, ex-situ as well as in-situ conservation measures needs to be undertaken. Simultaneous consciousness raising and participation of the local communities are inevitable for the desired outcome.

Keywords: Conservation, Threatened endemic, District Shangla.

Studies on Genetic Diversity in Common Oak (*Quercus*) Species Using SDS-Page

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Abstract

Common Oak (*Quercus*) belongs to family Fagaceae and comprises mostly monoecious evergreen or deciduous trees. *Quercus* species are commonly found in temperate regions of the world. Five Oak species found in Pakistan are *Quercus baloot*, *Quercus dilatata*, *Quercus incana*, *Quercus glauca* and *Quercus semecarpifolia*. Oak are generally used for making furniture, forming tools, used as fuel, fodder, and as medicinal plants. The seed storage proteins in five species of Oak found in Pakistan were analyzed. Proteins were extracted at room temperature for about 20 minutes in extraction buffer containing 0.05 M Tris, 2.0 % SDS, 5 M Urea, and 1-2% beta mercaptoethanol. Gels were prepared in 30% Acrylamide solution having Acrylamide: bisacrylamide ratio of 30:0.8. One sample of *Quercus incana* collected from Shaver; Swat was identified where a protein band was missing indicating possibilities of previously miss identification of the species. More research work is needed for better understanding of the genetic structure of the species.

Keywords: Oak, *Quercus*, Fagaceae, Seed storage Protein, SDS-PAGE, *Quercus incana*, Shaver Swat.

Effect of Temperature in Breaking Bud Dormancy in Tea

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Abstract

In present study nine (09) tea varieties (Roupi, Jueking, Chyue, Hangshah, P-3, Turkish, Indonesian, Japanese and Serilankan) were evaluated against four temperature treatments ($T_0=10^{\circ}\text{C}$, $T_1=22^{\circ}\text{C}$, $T_3=34^{\circ}\text{C}$ and $T_4=46^{\circ}\text{C}$) to select the most optimum temperature for breaking bud dormancy tea. The research was carried out at National Tea and High Value Crop Institute (NTHRI) Shinkiari, Mansehra during 2012-13. Data on various parameters viz; plant height, number of buds, number of leaves, leaf length, leaf width, stem thickness, chlorophyll contents and photosynthetic activities were recorded. Maximum number of buds was observed in Hangshah and Turkish at T_2 . On contrary minimum numbers of buds were observed in Indonesian, Jueking and Serilankan at T_3 . Significantly higher number (39.66) of leaves were recorded in Roupi followed by Turkish (35.66) and Hangshah (33) at T_2 , while minimum number of leaves (02) was recorded in Serilankan at T_3 . Our results showed that though response of each tea variety to temperature treatments was different from one another however maximum; plant height, stem thickness, number of buds and number of leaves were observed at T_2 (34°C) in all the tea varieties. While there was a differential response of each variety to all the treatment regarding leaf length and leaf width. It is concluded from the study that T_2 (34°C) is the most suitable/optimum temperature for breaking bud dormancy and increasing plant growth, number of buds, number of leaves, and ultimately yield of different tea varieties.

Foot-and-mouth disease in Himalayan region

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Abstract

Livestock is one of the main economy driving forces in Himalayan region as it fulfills the needs of milk, food and cash income on daily basis. Livestock is considered as the most secure source of income for the small farmers and landless poors as well as an important source of employment generation. Manure provided by animals enhances productivity and fertility of the land that is deficient in organic matters. Various diseases, both infectious and non-infectious, affect livestock production in this region. Among infectious diseases, foot-and-mouth disease is a highly contagious viral disease of cloven-hoofed animals including cattle, buffaloes, sheep, goats and about 70 wildlife species. The disease is caused by infection with foot-and-mouth disease virus (FMDV), a picornavirus. Seven different serotypes (and numerous variants) of FMDV have been identified of which three serotypes (and many variants) are currently prevalent in this region. The present study compares genotypes of FMDV that are responsible for the outbreaks in Himalayan regions of Pakistan, India, Nepal, Bhutan and China. The challenges and opportunities for improving the control of the disease in the region are discussed, including the role of the FAO/EuFMD/OIE Progressive Control Pathway for FMD (PCP-FMD).

Effect of Five Indigenous Plant Extracts on the Mortality of Red Flour Beetle *Tribolium Castaneum* (Coleoptera; Tenebrionidae)

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Abstract

Five Indigenous plants extract viza viz. *Mentha longifolia* (Mint), *Momordica charantia* (Bitter Guard), *Luffa aegytiaca* (Sponge Guard), *Carum copticum* (Ajwain) and *Curcuma longa* (Turmeric) were evaluated with concentrations of 0, 25, 50 and 75% to check its mortality effect against *Tribolium castaneum* after exposure for 10 days. Complete mortality exhibited with *Mentha longifolia* at 75% dosage followed by *Momordica charantia* (90%), *Luffa aegytiaca* (86.67%), *Carum copticum* (83.33%). Minimum mortality was shown by *Curcuma longa* (80%). The natural plant extracts can prove the best alternatives to chemicals.

Keywords: *Tribolium castaneum*; Plant extracts; Mortality; Red Flour beetle

Estimation of Protein and Sugar in Medicinal Plants Based on Their Ethnomedicinal Uses

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Abstract

Himalayan flora is not only a rich source of herbal remedy to human ailments but is also the cheapest source to meet the daily requirement of protein to poor people. During ethnomedicinal survey of District Abbottabad we came across certain plants which were being extensively used for their high protein contents and as remedy to different ailments. Quantitative analysis of total protein and sugar content in five plants was carried out. Among these plants highest protein content was found in *Potentilla gerardiana* Lind.ex Lehm. (21.57mg/ml) followed by *Cissampelos pareira* Linn. (12.166mg/ml). Minimum amount of protein i.e 3.071mg/ml, 2.39mg/ml and 0.0615mg/ml was recorded in *Ajuga bracteosa* Wall. ex Benth., *Incarvillea emodi* (Royle ex Lindl.) Chatterjee and *Portulaca quadrifida* Linn. respectively. Highest amount of sugar was recorded for *Potentilla gerardiana* (11.50 mg/ml) followed by *Incarvillea emodi* (6.643mg/ml), *Cissampelos pareira* (5.985mg/ml), *Portulaca quadrifida* (5.241mg/ml) and *Ajuga bracteosa* (3.409mg/ml). In our ethnomedicinal survey we found *Potentilla gerardiana* and *Cissampelos pareira* being used for back ache and muscular pains by the local inhabitants. Both these plants were found to be rich source of protein. *Ajuga bracteosa* and *Incarvillea emodi* both due to their highly bitter taste are being used by the indigenous people to cure diabetes.

Use of rpoB Chloroplast Marker to Study the Evolutionary Status of Modern Sugarcane Cultivars

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Abstract

Sugarcane (*Saccharum* hybrids L.) is an important cash crop grown all over the world including Pakistan. The present study was carried out to Understand and identify the phylogenetic status of modern sugarcane cultivars on the basis of PCR based DNA markers. We selected chloroplast partial sequence of rpoB gene to characterize commercially grown sugarcane cultivars. A fragment of 500 bp was amplified against the genomic DNA of CSSG-668, SPSG-26, NSG-555 and CoJ-84 and eluted from agarose gel for sequences. Three amplified fragments generated complete sequences from sugarcane cultivars. The nucleotide sequences were aligned and only one nucleotide (A) was substituted in cultivar CoJ-84 at 22 positions. The retrieved sequences were further analysed by doing BLAST in NCBI database search to obtain a similar kind of sequence and phylogenetic tree was constructed to define the taxonomic position of interested cuties. Our sequences clustered with *Miscanthus* spp. and *Saccharum* hybrids. This study indicates that these commercially grown cultivars are hybrids and evolved from *Miscanthus* genus. This could be elaborated by extending sample numbers and DNA marker size. This is a baseline to define commercially grown crops at the nucleotide level using chloroplast DNA markers.

Keywords: ropB gene, PCR, ugarcane

Life Form and Leaf Size Spectra of Plant Communities Thandiani Forests, District Abbottabad

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Abstract

The flora of Thandiani forests, District Abbottabad Consisted of 90 plant species belonging to 50 families. The biological spectra showed that Hemicryptophytes (24 spp with 26.67%) were dominant followed by Therophytes (23 spp with 25.55%) Megaphanerophytes (23 spp with 25.55%) were co-dominant Hemicryptophytes are the indicators of temperate vegetation while Therophytes are the indicators of disturbed vegetation. At the low altitude Megaphanerophytes were dominant which can be clearly seen the dominantly by trees. Most of the plants in the investigated areas were Hemicryptophytes. The area lies in temperate zone where Hemicryptophytes Should be dominant. Leaf spectra tell us about the plants association in the community. In the investigated area Microphyll (42 spp with 46.66%) were dominant followed by Nanophyll (23 spp with 25.55%) were co-dominant. Microphyll normally were the character of temperate zone, as the area here an altitude of 1191meter to 2626meter Microphyll were dominant in upper ridges while the low ridges Nanophyll were dominant, soil moisture was the character which per metres Microphyll species.

Keywords: Thandiani forests, Biological spectra, Vegetation

**Floral Biodiversity and Conservation Status of the Himalayan Foothill Region, Thandiani
Sub Forests Division, Abbottabad, KP**

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Abstract

The floral diversity of the Himalayan foothill region, Thandiani Sub Forests division including the forests of Mandroach (Mandroach, Mandroch Darra, Barri Bahk, Lower Danna, Danna, Upper Danna), Neelor (Neelor, Battanga, Pkheer Bandi, Pejjo, Lower Ballolia, Upper Ballolia), Kakul (Malach Lower, Malach Upper, Kakul Reserve Forests Cathment, Mathrikka, Mathrikka Top, Jabbra, Pallu Ziarat), Qalandarabad (Qalandarabad, Bandi Toondan Cathment, Mera Bunn, Loonrr Pattian), Kala pani (Gali Bannian, Upper Gali Bannian, Chattri, Lower Kala Pani, Upper Kala Pani, Reserve Forests Cathment, Lower Thandiani, Upper Thandiani Catchment), Larri (Larri Track, Larri, Sawan Gali, Larri Top), Riala (Riala, Riala Cathment, Upper Riala, Terarri, Terarri Cathment, Darral, Makali, Ladrri, Parringa, Sattu Top) and Sikher (Mera Rehmat Khan Cathment, Mera Rehmat Khan Top, Lower Nammal, Upper Nammal, Sikher), was explored to assess the vegetation structure and conservation status of economically important species. The vegetation was studied by the quadrat method during 2012-13. A total of 252 species belonging to 97 families were recorded from the area, where Rosaceae was the largest family with 20 species. This was followed by Asteraceae with 14, Ranunculaceae with 12 and Papilionaceae with 7 species. Species diversity was quite high, which seemed to be highly influenced by topographic characteristics like altitude, slope and aspect. Many areas were invaded by exotic species like *Dodonaea viscosa*, which was the most dominant shrub at lower altitudes. *Punica granatum* also dominated lower altitudes along with *D. viscosa*. *Themeda anathera* dominated higher altitudes along with *Polygonum amplexicaule*, *Bergenia ciliata* and *Impatiens sps*, whereas *Cynodon dactylon* and *Rumex nepalensis* were dominant at lower altitudes along with *verbescum thapsis*. Among conifers, *Pinus roxburghii* was recorded from moderate heights, while *P. wallichiana*, *Abies pindrow* and *Cedrus deodara* from the highest peaks. Conservation status of many economically important species was overall very poor, which was ascribed to anthropogenic activities and habitat destruction.

**Altitudinal Variation in Plant Species Diversity
and its Components at Thandiani Sub Forests Division, Abbottabad, KP, Pakistan**

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Abstract

The present study reveals species diversity and its components along the altitudinal gradient ranged from 1290m to 2626m at Thandiani sub Forests Division. Thandiani Sub Forests division including the forests of Mandroach (Mandroach, Mandroch Darra, Barri Bahk, Lower Danna, Danna, Upper Danna), Neelor (Neelor, Battanga, Pkheer Bandi, Pejjo, Lower Ballolia, Upper Ballolia), Kakul (Malach Lower, Malach Upper, Kakul Reserve Forests Cathment, Mathrikka, Mathrikka Top, Jabbra, Pallu Ziarat), Qalandarabad (Qalandarabad, Bandi Toondan Cathment, Mera Bunn, Loonrr Pattian), Kala pani (Gali Bannian, Upper Gali Bannian, Chatrri, Lower Kala Pani, Upper Kala Pani, Reserve Forests Cathment, Lower Thandiani, Upper Thandiani Catchment), Larri (Larri Track, Larri, Sawan Gali, Larri Top), Riala (Riala, Riala Cathment, Upper Riala, Terarri, Terarri Cathment, Darral, Makali, Ladri, Parringa, Sattu Top) and Sikher (Mera Rehmat Khan Cathment, Mera Rehmat Khan Top, Lower Nammal, Upper Nammal, Sikher), was explored to assess the vegetation structure and conservation status of economically important species. The vegetation was studied by the Shannon – Weaver index method during 2012-13. A total of 252 species belonging to 97 families were recorded from the area. Species diversity and its components values were high in the tree layer (*Pinus* communities) in the middle and upper regions of the altitudinal gradient. It decreases both towards upper and lower altitude, which was due to different environmental and anthropogenic factors such as deforestation, human interaction, encroachment pressure, low number of species and soil erosion. There is great need of reforestation in the area. Alternate sources of fuel must be provided to local inhabitants to minimize the pressure on wealth of wild plants.

Keywords: Thandiani, species diversity, species richness, Equitability, deforestation

Ethnobotany and Conservation Status of Some Traditionally Valued Plants of Kaghan Valley, Mansehra, KP, Pakistan

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Abstract

There are many sites in the Himalayan region where comprehensive floristic studies and their documentation are required in connection with conservation status of important plant species. In Pakistan there are only few reports available which have indicated the conservation status of some plant species. Approximately 37 species have been cited as threatened from Ayubia National Park (Shah 2001). Using IUCN criteria 1970, fifty five medicinal plant species from three districts of Malakand Division have been reported as threatened (Gul *et al*, 2000). Adopting IUCN criteria 1994, twenty plant species have been identified as target species from Pakistan (Shah and Baig, 1999). With this objective in mind, a study was conducted to find out the conservation status of traditionally valued medicinal plants of Kaghan Valley. It was found that 108 plants are used for various ailments. The results regarding conservation status have shown that the entire threatened flora is of ethnobotanical value and these plants are utilized for various purposes in the Valley. There are 30 threatened plant species in Kaghan Valley, (comprising herbs, shrubs and trees) of which 3 plant species are Critically Endangered, 14 are Endangered, 10 are Vulnerable and 3 are Near Threatened. Thus 27.77% of the total ethnobotanically valued plants of Kaghan Valley are at risk, of which 2.77% are critically endangered, 12.96% are endangered, 9.25% are vulnerable and 2.77% are nearly threatened.

Plant biodiversity along an altitudinal gradient to assess microclimatic zones of the Tormik Valley, Karakoram

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Abstract

The Tormik valley is located in Karakoram Mountains of Baltistan (Northern Pakistan), encompasses 2750 Km² land areas with altitudinal amplitudes of 2000 to ± 6000m harboring remarkable plant biodiversity. The aim of this study was to provide first floristic overview at local and regional level in context of Baltistan Karakoram, including its microclimatic zones, floristic composition and species diversity along an altitudinal gradient. Based on habitat, microclimate, altitude and indicator species, study area was classified into seven different zones viz. desert type zone, Stable and mobile scree zone, frequent mobile scree zone, riparian zone, agro climatic zone, sub alpine zone and alpine zone experiencing several and severe natural and human made threats like weathering of rocks, land sliding, excavation for gems, deforestation and overgrazing etc. Maximum number of species (ca.80 species) was found between altitudinal range of 2700-2900m i.e. 200m with the association of agroflora and showed decline in number at lowest (2024-2465) and highest (4000±6000) elevations. Floristic composition was represented by three major plant groups i.e., Pteridophyte, Gymnosperms and Angiosperms. A total of 189 species of vascular plants were collected belonging to 53 families. Asteraceae (39 species), Polygonaceae (12 species), Papilionaceae (11 species), Chenopodiaceae (8 species) and among genera Artemisia (7 species), Chenopodium (4 species), Astragalus (4 species) and Geranium (3 species) were identified as dominant taxa. Due to harsh climatic conditions herbaceous species (91.53%) were more prevalent than shrubs (7.89%) and trees (1.50%). Biological spectrum showed that Hemi cryptophytes lead with 76 species (40.21% followed by Therophytes with 48 species (25.21%), Chamaephytes 40 species (21.16%), Nanophanerophytes 14 (7.40%), Megaphanerophytes 2 (1.05%), Geophytes 4 (2.11%) and Liana 5 species (2.64%). Plant species richness and imposed threats suggest that this Karakoram valley needs further precise botanical expeditions as well as strong and prompt conservatory management for plant diversity for national and global interest.

Keywords: Plant biodiversity, life form, microclimate, altitude, Tormik valley, Baltistan

Systematics and Diversity of the Genus *Poa* (*Poaceae*) in the Western Himalayas Pakistan

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Abstract

Poa L. with more than 500 species is the largest and type genus of the grass family *Poaceae*. It forms the dominant component of vegetation in alpine meadows and temperate forests in Himalayas. Taxonomy and classification of Himalayan *Poa* is little understood and the circumscription of species in many cases is not clear. The aim of this work was to study in detail and update the systematics, circumscription and classification of *Poa* distributed in the Hindukush, Himalaya and Karakorum ranges of Northern Pakistan. We were able to collect sixteen species of *Poa* in wild from the study area. The species were classified and incorporated in the recent classification system proposed. These sixteen species were classified into three subgenera and six sections. *Poa annua*, *P. infirma*, *P. bulbosa*, *P. alpina* and *P. supina* constitute Subgn. *Ochlopoa*. Plants of this category often have bulbous culm bases, with often villous palea keels, absence of wool at the lemma base, and some annual species. Subgenus *Poa* has six species in the study area, which are *P. pratensis*, *P. stapfiana*, *P. himalayana*, *P. nepalensis*, *P. polycolea* and *P. aitchisonii*. This subgenus is characterized by having the uppermost culm sheaths closed for over 1/4 their length. Subgenus *Stenopoa* consist of five species in the study area. These are *P. trivialis*, *P. nemoralis*, *P. glauca*, *P. versicolor* and *P. sterilis*. The species of this group are mostly without rhizomes, with the upper most culm sheath only slightly closed (1/5-1/15), shoots mainly extravaginal, angles of the panicle branches scabrid, and 3-veined lower glume. Systematically important vegetative features distinguishing *Poa* from other related genera are: presence of more or less straight roots, blades two-grooved, prow-shaped and sheaths of flag leaf more or less closed. The taxonomically important characters of spikelets include, terete rachillas, multiple florets per spikelet, floret without awns, webbed calluses and well developed palea keels. A key based on morphological characters is given for the species. Phlogenetic analysis based on matK gene sequence variation has been done using MEGA 6. One new subspecies has been suggested in *Poa trivialis* i-e *P. trivialis* sbsp. *himalensis* Z. Ullah.

Conservation Problems and Proposed Strategies for the Archiological Sites of Mansehra

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Abstract

Mansehra has most important archaeological sites of Pakistan. Different dynasties like Mauryan, Greek, Kushans, Turks, British Empire and sheikhs rule here and constructed beautiful cities and religious edifices. As seen by new sites according to me Buddhist brought this city to its climax. The archaeological sites of Mansehra are unique frugal and urban settlement. A fortification wall, Buddhist monasteries, Islamic tombs, graveyards and figural decoration on stupas and in buildings attracts the local visitors across the Province.

Deterioration of archaeological monument, historical sites and historical buildings has become a serious issue. The weathering and decay of cultural heritage is a complex process which is caused by the interaction of many physical, chemical and biological agents. The different biological deterioration such as bacteria, algae, cyan bacteria, bryophytes, mosses, fungi, insects, rodents, birds and human beings play a drastic role in decay of historical monuments. And agents of deterioration i.e fire, water, pests, air, physical forces, humidity and temperature also plays a adverse effect on our cultural assets. Microorganisms can colonize on the surface of the stone monuments under the presence of suitable growth conditions. Microbial growth on monuments not only decrease their aesthetic values but also cause the structural damage depending upon the chemical composition of stone substrate and if we talk about physical damage of historical assets.

Few of the historical sites of Mansehra were explored before but for this time the surveyed sites were collected with detailed information; map, local elder people were interviewed and other connected information. The issues connected with conservation of the following sites will increase the revenue and proper measures to conserve heritage.

- SherGhar
- Nawab Fort
- SiriMahrGul
- BajjiMung
- Ram Lee
- Chatter Kot
- Tareen Gal

Preservation of Local Ancient Games of Hazara (Himalayas)

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²*Department of Archaeology, Hazara University, Mansehra, Pakistan*

Abstract

The area which is considered Hazara has the quality of multiple cultural and traditions of many groups; it also absorbed foreign cultural influence of invaders/visitors. Atmospherically this area; Hazara, is unique and geographically the significance of Hamalia and Karakoram mountains chain were passage to other areas. The upper area of Hazara is considerable mountainous and people living on the heights are strong physically and by attitude but the people living in plain area are opposite. Due to their different attitude and behavior the interests are vary, particularly the entertainments. The sports they play are also changed by the area, age and gender.

The games which are played locally are decaying but some remote areas we can see the people are playing ancient games and follow the defined rules and regulations as inherited through tradition. Following boundaries are considered:

- Games are selected and played according to the weather; games in summer are different than the games played in winter.
- Games played in rainy weather are defendant than games played at sunny day.
- Kids and elders play separate games – some games played at day time and some played at night.
- Female games are different and can be considered indoor games.

Effect of Planting Density on the Yield of Onion Under Agro-Climatic Conditions of Mansehra

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Abstract

Present study was designed to evaluate the effect of planting density on yield and yield attributing traits of onion variety (Swat-1). The research was carried out at Agricultural Research Station Baffa, during December 2012 to July 2013. The experiment was laid out in Randomized Complete Block Design (RCBD) with nine treatments and three replications. Planting densities showed significant effect on various quantitative and qualitative characters such as plant height, number of leaves per bulb, leaf length, bulb weight, small bulb, medium bulb and total yield. There was a decreasing trend in all the physiological characters such as survival percentage, plant height, number of leaves, leaf length and bulb weight of onion with increasing plant density except root shoot ratio and total yield. Maximum yield (56.894, 55.714 and 53.758 t/ha) was recorded in T1 (2x6), T2 (3x6) and T3 (4x6) with very small size bulb but at medium plant density better yield (53.491, 52.183 and 51.247 t/ha) with maximum bulb size was recorded in T4 (5x6), T5 (6x6) and T6 (7x6) non-significantly different from T1, T2 and T3. Moreover, plant height, number of leaves per bulb, leaf length and bulb weight have positive and highly significant correlation with each other. On the other hand total yield has negative and highly significant correlation with survival percentage, plant height, number of leaves, leaf length and bulb weight, while it has positive and highly significant correlation with small size bulb and root shoot ratio. Based on these results we recommend T4, T5 and T6 to get maximum yield with medium size bulb.

Application of Foliar Anatomy to Understand the Taxonomic Position of Weedy Grass Species from Lesser Himalaya, Pakistan

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Abstract

This study presents investigations into the foliar epidermal features of weedy grass species collected from fields of two major crops (wheat and maize) grown in the lesser Himalayas, Pakistan. Fresh leaves samples was collected and used for the further study following the modified method of Clarke technique. All the anatomical characters were considered both for adaxial and abaxial surfaces for microscopic study. Epidermal features of the different weedy grass species showed slight differences for both the adaxial and abaxial parts with respect to prickles, papillae, macro and micro hairs, long cells, short cells, stomata and silica bodies. The weeds from two different crops showed a very different anatomical make-up on the basis of characteristics of shape of stomata, long cell morphology, micro hairs availability, silica bodies shapes and papilli presence/absence. The study and identification of these anatomical characters of the epidermis of leaves afford us the opportunity to classify and identify grasses into their various tribes and genus and adds to our knowledge on the biosystematics of grass species.

Keywords: Leaf epidermal anatomy, epidermis, weedy grasses, Lesser Himalaya, silica bodies, micro hair, and papillae

Effect of Pre-Sowing Treatments on seed germination of *Quercus glauca* Thunb. collected from the Himalayas of Pakistan

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Abstract

This paper deals with seed germination treatments of *Quercus glauca* Thunb., a member of the family Fagaceae from Himalayan region of Pakistan. Seeds of the species were collected from District Mansehra, Batagram and Muzaffarabad Districts in November, 2013. Mature and ripened seeds were collected in suitable season from the selected sampling sites in polythene bags. Some of these collected seeds were scarified while others were subjected to stratification treatment only. Stratified treatments were given to the seeds for 10, 15 and 20 days in the lab. Others were scarified with knife and forecep. In stratified seeds, maximum germination rate i.e. 95.45% were observed in seeds collected from Batagram District while the lowest rate was observed in seeds collected from Mansehra District. Like-wise, for scarified treatment, maximum germination rate i.e. 100% was obtained in seeds collected from Batagram and Mansehra districts while in Muzaffarabad District lowest rate of germination i.e. 83% was observed. Scarified treatments proved to be more effective for this species as compared to stratified seeds. Therefore, these methods should be followed for the seed germination practices of these species and regeneration on larger scale.

LIST OF INVITED SPEAKERS

1. Prof. Dr. Munir Ozturk, Ege University, Turkey
2. Prof. Dr. Ahmet Ruhi Mermut, Saskatchewan University, Canada
3. Prof. Dr. Brian Hamphil, University of Alaska, USA
4. Prof. Dr. Ahmet Aksoy, Akdeniz University, Turkey
5. Prof. Dr. Chun-Lin Long, Minzu University, China
6. Prof. Abdul Ghafoor, New Castle University, Australia
7. Dr. Tijen Demiral, Harran University, Turkey
8. Dr. Ahmad Khan, Maryland University, USA
9. Prof. Dr. Shahida Husnain, Women University, Multan
10. Prof. Dr. Muhammad Qaiser, University of Karachi, Karachi
11. Prof. Dr. Anwar Nasim, Pakistan Academy of Science, Islamabad
12. Prof. Dr. Khan Bahadar Marwat, Shaheed B B University Dir
13. Prof. Dr. Qasim Jan, COMSTIC Islamabad
14. Prof. Dr. Muhammad Ashraf, University of Sargodha
15. Prof. Dr. Amir Khan , University of Peshawar
16. Prof. Dr. Abdul Rashid, University of Peshawar
17. Prof. Dr. Salim Ahmad, University of the Punjab, Lahore
18. Prof. Dr. Mir Ajab Khan, Quaid-i-Azam University Islamabad
19. Prof. Dr. Raza Bhatti, HEC, Islamabad, Pakistan
20. Prof. Dr. Zabta Khan Shinwari, Quaid-i-Azam University Islamabad
21. Prof. Dr. Siraj ud Din, University of Peshawar
22. Prof. Dr. Rahmatullah Qureshi, Arid Agriculture University Rawalpindi
23. Prof. Dr. Ghulam Murtaza, AJ & K University Muzafarabad
24. Prof. Dr. Islam Mehmud Khan, Hayatabad Peshawar
25. Dr. Abdul Nasir Khalid, University of the Punjab, Lahore

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