EDITORIAL

ABOUT THE UTTARAKHAND AYURVED UNIVERSITY

The Uttarakhand Ayurved University (UAU) was established by the Government of Uttarakhand vide Uttarakhand Ayurved University Act, 2009 as a dream project of Devbhumi Uttarakhand to promote education and research on Ayurved and herbal medicine. The University is spread in 25 acres of land at Harrawala, Dehradun. Besides already established faculties (Faculty of Ayurved and Faculty of Biomedical Sciences), the University is in progress to establish faculty of Yoga and Naturopathy, Pharmaceutical sciences, Homeopathy, Unani and Siddha System of medicine. University has three Campuses; the main campus is situated at Harrawala, Dehradun and centaury old historical campuses Rishikual and Gurukul are at Haridwar Uttarakhand. The university is recognized by UGC, New Delhi and CCIM, New Delhi, and currently running almost all courses of AYUSH Education at UG, PG and PhD level including BAMS, BUMB, BHMS, MD/MS, PhD, etc.. Nineteen 19 Ayurvedic, Homoeopathic and Unani Colleges are affiliated to the University. The University has centre of excellence in Panchakarma and Marma Chikitisa.

Vision and Mission

To seek not merely to turn out men as Doctors, Scientists, Merchants, Theologians but also as men of high character, probity and honour, whose conduct through life will show that they bear the hallmark of a great University. University is to bring the socio-economic change in difficult geographical conditions. Despite its economic backwardness state is enriched with its vivid flora and fauna and is well-known specifically for the vast potential of high altitude medicinal plants and herbs. The economic and scientific usage of such diversified resources is to prove the primary source of overall economic viability and sustainable growth culminating into radical economic growth of local people.

ABOUT THE FACULTY OF BIOMEDICAL SCIENCES

The main objective of Faculty is to promote the application of basic sciences in the investigation of Ayurvedic concepts, procedures, products and nurture in the discipline of Ayurved biology and evidence-based medicine. Faculty is validating the time tested Ayurvedic concepts on the platform of modern sciences with plan to develop personalized medicine and search new ways to treat disease in modern world with the help of Ayurved. Research in the faculty is being carried out in basic science to ensure that University produces documented scientific evidence on Ayurvedic concepts which are need of the hour and growing demand of the scientific community world over. Faculty is running various research and herbal garden project from different funding agencies to serve humankind in better way and spreading awareness among student and society for medicinal and aromatic plants.

The Faculty of Biomedical Sciences has five departments, Ayurved Biology, Biotechnology, Clinical Pharmacology, Molecular and cellular biology and Phytochemistry. The Faculty was started functioning with two faculty members in 2015 at the main campus. In a short time, the faculty has attracted almost one crore rupees from different funding agencies to conduct research and other activities in the University. More than 15 MD/MS/ PhD scholars have done their dissertation/ thesis work in the Biomedical Laboratories. More than 25 research papers have been published in various journals of International repute. In addition, 4 books and 4 book chapters have been published by the faculty members in past 4 years.

ABOUT THE NATIONAL MEDICINAL PLANTS BOARD

In order to promote medicinal plants sector, Government of India set up National Medicinal Plants Board (NMPB) on 24th November 2000. Currently, the board is working under the Ministry of AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha & Homoeopathy), Government of India. The primary mandate of NMPB is to develop an appropriate mechanism for coordination between various ministries/ departments/ organization and implementation of support policies/programs for overall (conservation, cultivation, trade and export) growth of medicinal plants sector both at the Central /State and International level.

National Medicinal Plants Board (Ministry of AYUSH) has drawn policies and strategies for conservation, proper harvesting, cost-effectiveness, cultivation, research and development, and processing of raw material from medicinal plants. India is one of the richest countries in the world in terms of biodiversity, has 15 agro-climatic zones. Out of the 17000-18000 species of flowering plants, more than 7000 are estimated to have medicinal usage in folk and documented systems of medicine like Ayurveda, Unani, Siddha & Homoeopathy (AYUSH System of Medicine). Medicinal plants are not only a major resource base for the traditional medicine & herbal industry but also provide livelihood and health security to a large segment of the Indian population. About 1178 species of medicinal plants are estimated to be in trade of which 242 species have annual consumption levels in excess of 100 metric tons/year. The domestic demand for medicinal plants has been estimated 1,95,000 MT for the year of 2014-2015 and export demand of medicinal plants has been estimated 1,34,500 MT during 2014-2015. Total consumption of herbal raw drug in the country for the year 2014-15 has been estimated at 5,12,000 MT with corresponding trade value of ₹ 5,500 Crore. The major increase has been recorded in export value which has increased from ₹ 345.80 Crore in 2005-06 to ₹ 3211 Crore in 2014-15, registering a nine-fold increase in during last decade.

Vision and Mission

The primary mandate of NMPB is to develop an appropriate mechanism for coordination between various ministries/ departments/ organization and implementation of support policies/programs for overall (conservation, cultivation, trade and export) growth of medicinal plants sector both at the Central /State and International level. To meet the increasing demand for medicinal plants NMPB focuses on in-situ & ex-situ conservation and augmenting local medicinal plants and aromatic species of medical significance. The NMPB also promote research & development, capacity building through training, raising awareness through promotional activities like creation of Home/School herbal gardens. NMPB also seeks to support programs for quality assurance and standardization through development of Good Agricultural and Collection Practices (GACPs), development of monographs laying down standards of quality, safety and efficacy; development of agro-techniques and credible institution a mechanism for certification of quality of raw drugs, seeds and planting material.

STATUS OF MEDICINAL AND AROMATIC PLANTS (MAPs) SECTOR IN UTTARAKHAND

Uttarakhand is one of the hubs for medicinal and aromatic plants and almost all the most demanded herbs are grown in this state due to the most favourable environment for the growth of such plants. In this direction, state Govt. has established State Medicinal Plants Board, Herbal Research and Development Institute and Centre for Aromatic Plants to promote the MAPs sector in the state. Besides, many NGOs are also working in this area for the livelihood and socio-economic development by cultivation of medicinal and aromatic plants.

ABOUT STATE MEDICINAL PLANTS BOARD

State Medicinal Plants Board (SMPB), Uttarakhand was established on 14 August 2001 under the Chairmanship of Hon'ble Chief Minister. In May 2013, SMPB has been registered as a society and designated as an apex body for overall co-ordination of activities in Medicinal & Aromatic Plants sector.

Presently under SMPB, two separate units are working for the overall development of the Medicinal & Aromatic Plants Sector (MAPs). For medicinal plants related activities, Herbal Research & Development Institute (HRDI), Gopeshwar and for Aromatic Plants, Centre for Aromatic Plants (CAP) Selaqui is working in the state of Uttarakhand. State Government is providing 50% financial assistance for cultivation on shortlisted 28 Medicinal & Aromatic Plants. Central Sector Scheme on Conservation, Development and Sustainable management of Medicinal Plants of National Medicinal Plants Board, New Delhi are also being implemented in state of Uttarakhand by State Medicinal Plants Board Uttarakhand.

Mandate of SMPB

- To assess demand/supply position relating to medicinal plants and to coordinate with National Medicinal Plants Board New Delhi.
- To advise concerned departments on policy matters relating to schemes and programmes for the development of medicinal plants.
- To provide guidance in the formulation of proposals, schemes and programmes etc.
- Identification, inventorisation and quantification of medicinal plants.
- Promotion of cultivation and ex-situ / in-situ conservation of medicinal plants.
- Promotion of cooperative efforts among collectors and growers and assisting them in transportation and marketing of their products effectively.
- Setting up of data-base system for inventorisation and dissemination of information.
- Matters relating to import/export of raw material as well as value-added products including adoption of better techniques to market these products.
- Undertaking and awarding scientific, technological research and cost-effectiveness studies.
- Development of protocols for cultivations and quality control.
- Encouraging the protection of Patents Rights and IPR.

ABOUT HERBAL RESEARCH AND DEVELOPMENT INSTITUTE

Uttarakhand is known for its important diversity of medicinal plants all over the World. Sanjeevani mentioned in Ramayana is still a main subject of research. It is told about these miracle plants that they speak about their uses during the certain time of the year to important Divya persons. Maharshi Charak's main research was based on this subject. More than 700 medicinal plants are found in Uttarakhand Himalaya out of these more than 150 are only found in high altitude meadows of the Himalaya. The climate of Uttarakhand Himalaya is suitable for growing medicinal

plants for which the Government of Uttarakhand is giving special attention. Conservation, sustainable collection and development of medicinal plant diversity have great impact in the development of the State and thus it is important to conserve medicinal plants in situ and to augment cultivation of species having larger demand in the national and international market. Keeping in view all the above facts, the Govt. of U.P. decided to establish Herbal Research & Development Institute (HRDI) at Gopeshwar in 1989 and the directorate was established at Gopeshwar in 1993.

Objectives

- Survey, documentation, conservation and cultivation of important medicinal and aromatic plants of the Himalaya
- Research and development on biodiversity, biotechnology, quality control, value addition, and genetic improvement of medicinal and aromatic plants of the Himalaya
- Establish nurseries in various altitude of the Himalaya
- Development of agro-technique of Himalayan medicinal plants and transfer of technology to the local farmers
- Documentation of traditional and ethnobotanical knowledge
- Impart training on cultivation, nursery development, post-harvest technology and marketing of medicinal plants
- Coordination among the various research and development organizations

Policies

- Prioritization of medicinal plant species for the cultivation of medicinal plants in different agro-climatic zones of Uttarakhand
- Registration of farmers and preparation of database
- Providing free planting material to the local farmer up to 5 Naali
- Provide 50% subsidy to registered farmers on 26 prioritized species
- Provide transit pass to the registered farmers
- Promote the participation of registered farmers in local and national jadi-buti fairs and exhibitions

Centrally sponsored project

HRDI is implementing National AYUSH mission sponsored by National Medicinal Plants Board, Govt. of India, New Delhi. In this scheme, the subsidy is being provided to different stakeholders to establish nurseries, cultivation, home and school herbal gardens, and provide facilities for post-harvest management.

ABOUT CENTRE FOR AROMATIC PLANTS

Centre for Aromatic Plants (CAP) has established by Government of Uttarakhand in 2003 at industrial area Selaqui, Dehradun. CAP is a complete business incubator centre for the development of aromatic sector in Uttarakhand. It is equipped with end to end facilities and support services like survey, training, research, production of quality planting material, extension, distillation and marketing etc. The focus is to make these all facilities available to the farmers, entrepreneurs, researcher, buyers, distillers, perfumers and traders under one roof.

Uttarakhand is blessed with a variety of soil types and varying agro-climatic conditions, ranging from sub-tropical to alpine. These zones are divided as alpine (above 3500 m), sub-alpine (2200-3500 m), temperate (1700-2200 m) and sub-tropical (350-1700 m above sea level). Further,

these zones can be categorized as upper hills (alpine and sub-alpine), middle hills (temperate) and lower hills (sub-tropical) for agricultural point of view. These zones possess a rich and diverse variety of aromatic plant resources and these diverse climatic conditions of the state are conducive for cultivation of various aromatic crops.

Uttarakhand agriculture has some inherent constraints of remoteness and inaccessibility, marginality and fragility. Added to these are socio-economic constraints such as poor productivity, poor irrigation infrastructure, poor production management, labour shortages, poor post-production management, poor marketing and networks and lack of entrepreneurship. As a result, traditional agriculture has become un-economical and farmers have left out their agriculture and migrated to elsewhere for better livelihood and employment opportunities. This resulted the large part of agriculture land in hills are abundant. These abandoned lands were threatened with problems like soil erosion, loss of fertility, depletion of nutrients, less percolation of water in soil, drying of natural water resources and infestation of obnoxious exotic weeds like Lantana, Eupatorium, Gania grass, Artemisia and Bhakumbar.

Considering the problems in traditional agriculture and other barriers, cultivation of aromatic crops seems to be a viable solution for raising the livelihood of the farmers of Uttarakhand, as aromatic crops are suitable for rain-fed agriculture and can be grown successfully in stress and adverse conditions. These crops are generally safe from wildlife and domestic animals.

The final product of aromatic produce is easy to transport due to its very lesser amount of weight as compared to its production in field. This provides solution to transportation challenges in hilly area. An aromatic oil can store for a longer period because of its non-perishable quality farmer can decide its sale as per the market demand and feasible rates above all aromatic oils have a regular market.

Conceptual Framework

CAP is working as a business incubator to support marginal farmers called Very Small Enterprises (VSEs). These farmers are availing services like technical training, quality planting materials, agro-technology, exposure visit, subsidies and supervision. With the facilitation of CAP these VSEs are doing cultivation, nursery raising and marketing of aromatic crops. At the cluster level some farmers are identified as entrepreneurs called Small Medium Enterprises (SMEs). To promote these entrepreneurs CAP is providing facilities like Field Distillation Units (FDUs), skill training, technical know-how, testing facility, storage, marketing etc to them. Through these training and various activities the skill of these entrepreneurs' farmers to produce quality essential oil and dealing with market leaders i.e. Oil Industries is developing. SMEs are facilitating VSEs to distillation of aromatic produce as essential oil. CAP is also facilitating oil industry to link with SMEs for business activities

Scope and Functions

- Demarcation, survey, identification, authentication, conservation and bio-prospecting of Aromatic Plants (AP's) biodiversity.
- To develop cultivation techniques (planting materials, pre and post-harvest practices, processing) which are cost-effective in different agro-climatic regions of the State.
- To develop effective compounds from AP's for perfumery and aroma industries through tissue culture technology.
- Production and propagation of genotype of commercially important AP's.
- Conduct Research & Development, extension and train human resources for fragrance and flavour industries.
- Extension of AP's cultivation and conservation technology through demonstration.

- To develop market provisions in the interest of farmers of Uttarakhand and perfumery industry and to support the aromatic sector.
- To provide support for quality certification to farmers, industries, researchers etc.
- Entrepreneurship development through AP's in Uttarakhand.
- To employ the latest techniques to improve the production system so that the AP's produced in the State may compete in the international market.
- To provide advice on policy-related matters of programmes and schemes for research and development of AP's.
- Encouraging the protection of Patent Rights and Intellectual Property Rights (IPR) in AP's and their products.
- To create optimum awareness and interest among people and farmers about AP's cultivation.
- To organize cultivation in wastelands and unutilized lands involving local farmers.
- To collect germplasm of AP's.

Source of information

1. http://www.uau.ac.in (Uttarakhand Ayurved University)
2. https://www.nmpb.nic.in (National Medicinal Plants Board)
3. http://www.smpbuk.org (Uttarakhand State Medicinal Plants Board)
4. http://www.hrdiuk.org (Herbal Research and Development Institute)
5. http://capuk.in (Centre for Aromatic Plants)

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BIOACTIVE SECONDARY METABOLITES FROM HIMALAYAN MEDICINAL PLANTS

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Natural products have been a reservoir of diverse structures that lead to pharmacologically active compounds, lead compounds or new chemical entities in drug discovery. Presently, more than 50% of all approved molecular drugs are based on natural products or natural product derivatives. In India, Himalayan medicinal plants are a major source of natural products with complex biodiversity. A good number of research articles has been published by our research group so far, for evaluating antioxidant, the anti-microbial and anti-diabetic activity of different secondary metabolites which have been extracted from various plants. Especially plants used in traditional medicine systems are mostly chosen as material for chemical investigation to discover pharmacologically active compounds. The structure of the isolated compounds was unambiguously elucidated by one- and two-dimensional NMR spectroscopy, mass spectroscopy and by comparison with literature data. The isolated compounds were tested for their antifeedant, antibacterial and antidiabetic activities. All obtained results were published for publication in respective international journals. The lecture will focus upon the chemical structures and biological activities of new and known isolated secondary metabolites from medicinal plants *viz. Boenninghausenia albiflora, Skimmia anquetelia, Glycosmis arborea, Hemidesmus indicus, Zanthoxylum alatum, Melia azedarach, and Tanacetum nubigenum* collected from high altitude of Himalayan region. Besides the above, we have also worked in the area of green nanotechnology and have synthesized some Zinc oxide nanoparticles from medicinal plants which were found to have promising biological activities.

Biography: Prof. D. S. Negi (MNASc, FRSc) is currently head of the Department of Chemistry, HNB Garhwal University and a coordinator of UGC-SAP (DRS-II). He served as Pro Vice Chancellor of HNB Garhwal University (A Central University), Srinagar. He has been Fulbright Fellow Ohio State University, Columbus, USA; Commonwealth Fellow University of Manchester, UK; INSA-Royal Society Visiting Fellow University of Manchester, Oxford University and Cambridge University UK; INSA-RS Visiting Fellow: University of Manchester, UK; DFG Visiting Professor Technische University, Braunschweig, Germany; Visiting Professor, Institute of Organic Chemistry, University of Pavia, Italy; DST Visiting Fellow Indian Institute of Science, Bangalore; Elected Member Physical Sciences, National Academy of Sciences, Allahabad, 2010; Principal Investigator Indo-US Workshop on Green Chemistry. He has been participated in Science popularization programme of Indian Academy of Sciences, Bangalore; He is Associate Editor and Reviewers of many International Journals including International Journal of Nanotechnology, Heterocyclic Chemistry, Organic Medicinal Chemistry Letters (Springer), Medicinal Chemistry Research, Fitoterapia, Natural Products Research. He is Member of Royal Society of Chemistry, UK; American Chemical Society; Chromatographic Society of India; Uttar Pradesh Academy of Sciences; BOS Chemistry, HNB Garhwal University and Fellow of Indian Chemical Society. He has published more than 100 research papers in various journals of International repute and presented his work in different conferences as a resource person. He has guided 15 PhDs and 2 PDFs. His current areas of research are natural products, synthesis and nanotechnology.

ASSESSMENT OF THE ROLE OF KAEMFEROL IN PROTECTING PANCREATIC β-CELLS BY AUTOPHAGY IN A LIPOTOXIC ENVIRONMENT

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Pancreatic β-cells are affected by fatty acids which plays a vital role in the pathological manifestation of obesity linked to type II diabetes. Thus, rescuing β-cells from fatty acid induced apoptosis is linked to prevent obesity liked to type II diabetes. Kaemferol, a natural flavonoid, has been previously shown to have extensive therapeutic implications for its inherent anti-oxidative, anti-inflammatory, anticancer and anti-microbial activities. In the present study, we intended to determine the cytoprotective effect of kaemferol on pancreatic β-cells undergoing apoptosis under the palmitic acid-stressed condition. We found that kaemferol could show prominent increase in cell viability by attenuating palmitic acid-induced lipotoxicity of pancreatic β-cells; subsequently its anti-apoptotic activity was elucidated by DNA fragmentation assay, RT-PCR and immunoblot analysis. Furthermore, kaemferol's ability to instigate autophagy was illustrated by MDC-Lyso Tracker red staining and TEM analysis which corroborated well with the observed increase in LC3 puncta and LC II protein expressions along with the concomitant decline in p62 protein expression. Suppression of autophagy by wortmannin and chloroquine abrogated the cytoprotective and anti-apoptotic effects of kaemferol which further substantiates the role of autophagy in pancreatic β-cell rescue. Our data showed that kaemferol also up and down-regulates phosphorylation of AMPK and mTOR respectively. Subsequently, upon inhibition of AMPK phosphorylation by compound C (an inhibitor of AMPK), kaemferol mediated autophagy was abolished which further led to the decline in β-cell survival. Such observations collectively lead to the conclusion that, kaemferol exerts its cytoprotective role against lipotoxicity by activation of autophagy via AMPK/mTOR pathway.

Biography: Prof. Partha Roy has completed his PhD from Visva Bharati University and postdoctoral studies from Institute of Reproductive & Developmental Biology, Imperial College London, UK. Currently he is a Professor in the Department of Biotechnology, Indian Institute of Technology Roorkee. His current research interest is development of drugs from medicinal plants with special emphasis on diseases like diabetes, obesity and cancer. He has published more than 100 research papers in reputed journals and having high number of citations. He is the recipient of Outstanding Teacher Award 2014, 2019 and Outstanding Teaching and Research Award 2016 at IIT Roorkee. Also he is serving various scientific and academic bodies in India as panel members. He has visited various universities/institutes across the world as visiting faculty.

COMMON ANCESTRAL KNOWLEDGE ON THE USES OF MEDICINAL PLANTS BETWEEN MAURITIUS AND INDIA

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Mauritius is famous for its floricultural diversity and traditions practiced across the island by various ethnic groups. During the British rule in the 1835s, Indian indentured labourers migrated to Mauritius and played a very important role in shaping the Mauritian culture. They brought along their high heritage of traditional knowledge of certain medicinal herbs and spices. In this respect, we undertook a comparative study to compare the traditional uses of medicinal herbs and spices brought by Indian indentured labourers with their current uses in Mauritius and India, and to review pharmacological studies of such plants. Locally published textbooks, research dissertations, and relevant records from the 'Mauritiana' section of the University of Mauritius library were scrutinised for possible early records of such herbs and spices brought by Indian indentured immigrants. Field trips and site visits to Mauritius Herbarium and The National Folk Museum were conducted to gather data on their traditional uses as practiced by the Indian indentured immigrants. A literature search was performed to gather the current ethnomedicinal uses of these plants in Mauritius and India using key databases such as ScienceDirect and PubMed, as well as thesis from local university website. Pharmacological studies on these plants were also reviewed in an attempt to compare the ethnomedicinal uses against reported ailments. This presentation will highlight current findings. This investigation can be considered as a first attempt to document and compare traditional knowledge of medicinal plants brought by Indian immigrants. We observed that some of these knowledge are preserved and still practiced in Mauritius. It is anticipated that this study will revive the interest in safeguarding and promoting the ancestral knowledge on the uses of such plants.

Biography: Dr. Fawzi holds a life sciences degree and is Harvard University Alumni with a deep rooted interest in biopharmaceutical and biomedical sciences. He has served as the Head of Department andpresently associate professor at the University of Mauritius and visiting professor in China. He is recipient of >52 fellowships/travel grants/ and invited as plenary/keynote/invited speaker to present in international conferences. Fawzi is the scientific editor/reviewer/book proposal and grant evaluator and PhD examiner of >100 peer-reviewed international scientific journals, books, and international grant reviewer (>15 - for MRC-UK, Poland, Germany, UNESCO, South Africa, and Netherlands). Fawzi is ranked by Clarivate Analytics as the top most prolific author from University of Mauritius, collaborating with more than 20 international team and has authored >365 scientific publications with cumulative impact factor for his publications over 400.

CHALLENGES & ISSUES OF QUALITY ASSURANCE OF RAW MATERIAL IN DEVELOPING NOVEL STANDARDIZED HERBAL DRUG/FORMULATION

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There has been an increasing realization that the herbal drugs are effective but also safer and this has led to the spurt in the use of plant based medicines across the world and in India too. The global herbal market is about US$ 90 billion which is growing at the rate of approximately 8-10% annually and is expected to cross 5 trillion US$ by 2030. Although the global market of herbal drug is growing at a fast pace, the Indian share is appr. 2%. The major reason for this being the lack of proper quality and documentation of scientific validation of safety and efficacy of most of herbal drugs/formulations. There are opportunities in 21st century for developing countries like India with traditional knowledge base to develop globally acceptable herbal drugs/ nutraceuticals by convert their rich bio-resources & associated traditional knowledge systems for economic wealth & thereby bring prosperity to the nation. Introduction of New category of drug 'Phytopharmaceutical' in 2016 in our country has open great potential of its use and also export of plant based drugs. Indian herbal drug industries generally face the problem of adulteration & substitution. It is observed that in herbal markets of the country, sometimes not only the various species of particular genus but entirely different taxa are being sold under the same vernacular name.The lack of confidence in the quality of drug in traditional medicine in hindering us from capitalizing these systems at global level. It is well documented that the quantity and nature of secondary metabolites in medicinal plants is influenced by growth, season, edaphic and environmental factors. Therefore, it is necessary to procured raw material as per pharmacopeial quality parameters, proper collection and processing along with HPTLC/HPLC finger printing to get desirable quality of raw material. Indian government has taken a number of initiatives including the preparation of the Ayurvedic Pharmacopoeia of India (AYUSH) and also preparation of monographs of individual plants in Quality standards of Indian medicinal plants (ICMR/CSIR). Such initiatives are mainly aimed at providing the quality parameters for standardization of herbal drugs. Ministry of AYUSH, CSIR, ICMR & few Private herbal companies are working together for validation of number of herbal/Ayurvedic formulations for global market. In the whole process development of herbal drug/product based on traditional knowledge needs proper taxonomically identified, safe raw material and scientific validation of the products. Further get constant supply of right raw material whether procured from wild or cultivated and their storage one has to follow. Good Agriculture Practices (GAP), Good Collection Practices (GCP), Good Ethical Practices (GEP), Good Procurement Practices (GPP), Good Safety Practices (GSP) [Pesticide, heavy metal, microbial load as per WHO guidelines] and Good Storage Practices (GSP).

Biography: He is an Executive Director of Ethnomedicinal Research Centre, Hengbung, Manipur. Dr. Ajay Kumar Singh Rawat was Former Scientist & Head of Pharmacognosy & Ethnopharmacology Division & Professor A-CSIR Academy at CSIR-National Botanical Research Institute, Lucknow having more than 30 years research experience. He has made major contributions to Pharmacognosy/ quality of herbal raw drugs/products, medicinal plant survey & conservation, chemotaxonomy, bio-prospecting and natural product development. He has developed quality assurance parameters of more than 160 single crude drugs and also quality parameters of more than 30 Ayurvedic formulations and published more than 210 original research papers and filed 30 patents. 7 patented technologies namely Anti-diabetic herbal formation BGR34, Herbal Dental cream, Cough syrup, Nutri-Jam, Hand sanitizer, Cosmaceuticals etc. have been transferred.

Proceedings of the International Conference on "cultivation and sustainable use of high-altitude medicinal and aromatic plants for the socio-economic development" organized by Uttarakhand Ayurved University on 29-30 November, 2019 at Dehradun, India.

CONSERVATION AND SUSTAINABLE UTILIZATION OF MEDICINAL PLANTS IN UTTARAKHAND HIMALAYA

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Medicinal plants have been recognized as a natural source of diverse life saving drugs and therefore, gaining popularity in pharmaceutical, perfumery and cosmetic industries. The present study initiated cultivation of medicinal plants at the farm level is one of the interventions being focused to meet their increasing demand. Therefore, medicinal plants were prioritized on the basis of ethnobotanical uses i.e. *Asparagus racemosus, Ocimum basilicum, Rosmarinus officinalis, Valeriana jatamansi, Cinnamomum tamala* and *Cymbopogon flexuosus* were used in the present study. Before initiation of cultivation practices in the region, it observed that the local people were dependent on wild medicinal plants for utilization of traditional health care system; therefore, perceptions of the villagers were assessed for purposes of collection, quantity and problems faced at the collection time. The cultivation of selected species was demonstrated to rural inhabitant through capacity building training programme and participatory action research approaches. Towards, capacity building, a series of meetings and exposer visits were organized. After successful cultivation and demonstration of selected medicinal plant species, 132 farmers of the different village clusters have adopted the cultivation of MAPs and successfully marketing their produce in the nearby markets. This has not only improved their socio-economic conditions of the farmers but also reduced the pressure on natural diversity of medicinal plants.

Biography: Prof. P. P. Badoni is currently serving as Head of Chemistry department at Pauri Campus of HNBGU. He has a rich experience of teaching and research, and already supervised more than 10 PhDs. He has been a principal investigator of many research projects and published more than 35 papers in various journals. He has been Incharge Officer for Sparsh Ganga, and Uttarakhand Govt. initiative. In addition, he served as a coordinator for NSS at state level. He is member of many academic and scientific societies. His current research areas are natural products, synthesis and natura dyes.

SUSTAINABLE USE OF HERBS IN BHUTAN

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Herbs were used since ancient times for meeting the health needs of civilization, and practice of herbal formulations existed in different regions of the world using different philosophies. A small, sovereign, landlocked country between two Asian giants and with rich biodiversity over 5369 plant species, 46 species of rhododendron, Bhutan is recognized as an area of high biological diversity and eastern hotspot for the bee family. Available documented history on Bhutan mentions the practice of herbal use as early as the 8th Century AD. The practice of Traditional Medicine gained prominence after arrival of Zhabdrung Ngawang Namyal in the 17th Century AD. Many Bhutanese went to Tibet to learn Medicine and on their return, eminent Doctors worked as personal physician to important figures and others practiced in their locality, until it was formally recognized and integrated under health system of the country in 1968. Thereafter, indiscriminately Traditional Medicine system is functioning alongside with modern medicine under the same roof. Today, more than 200 plants, collected from wild, are used in producing traditional medicines.

Bhutan's socio-economic development is being guided by the principle of Gross National Happiness; sustainability has been and will be priority. The Constitution of the Kingdom of Bhutan mandates, Bhutan preserve (at all times) 60 percent of its land under forest cover. However, the country has 74 % forest coverage as of now. Most of the areas (43%, 16396sq km) of Bhutan is marked as national parks, wildlife sanctuaries and nature reserve. Additionally, 3307 sq km as biological network corridors linking nine protected areas, putting 52% of country under protection. For the conservation, numerous Acts and Guidelines are in the place; Nature conservation act and its regulation, National biodiversity act and its regulation, ABS policy of Bhutan and its regulation, Intellectual property right act & its regulation, Bhutan Medicine Act and its regulation & Forest Act and its regulation. All together, the there are multiple approach towards preservation of biodiversity in the country. The Menjong Sorig Pharmaceutical Corporation Limited (MSPCL) along with other relevant stakeholders plays the primary roles in conservation.

Division of Medicinal and Aromatic Plants (MAP) under the Ministry of Agriculture and Forestry (MoAF) has a research centre, whereby the mandates are; domesticating the herbs, identification of alternate place for cultivation, propagation and so on. MSPCL has been collecting medicinal plants from Lingzhi region in Thimphufor about 50 years and therefore the ecological pressure on these plants have increased. On other side, due to global warming, some herbs like Aglaia perviridis, Aquilaria etc are on the verge of extinction. If the raw materials are being harvested from one region, next cultivation is done from other region giving former minimum time duration of 3 years.

Menjong Sorig Pharmaceutical Corporation Ltd. is the only pharmaceutical company owned by state in Bhutan as of now, and its primary mandate is to manufacture 124 essential medicines to be supplied to Ministry of Health, that is further being distributed across the country. On the other hand, it produces numerous heath supplements that are for the commercial purposes. Ninety percent of the raw materials are collected from within country and 10% being imported from India and Nepal. In order to scale-up production and improve the lives of people living in rural areas, Agriculture Ministry trains local farmers on sustainable collection, and gives technical support for good collection practices of medicinal plants including general requirement, Technical planning, Specific requirement for collection/harvesting, Personnel/Collectors, Equipment, Post-harvest care & processing, Bulk packaging & labeling, Storage & transportation, Quality Assurance and documentation for the arable medicinal herbs. After mass production, it is being supplied to MSPCL. The Department of Forestry issues license/permit to locals for the collection of herbs available in wild.

Proceedings of the International Conference on "cultivation and sustainable use of high-altitude medicinal and aromatic plants for the socio-economic development" organized by Uttarakhand Ayurved University on 29-30 November, 2019 at Dehradun, India.

Bhutan has strong regulations and regulatory body to monitor medicines and health supplements. Ninety percent of the raw materials are being collected from within the country and it has no adulteration, however, the challenge is with imported raw materials. The products are all based on natural raw materials and Drug Regulatory Authority of Bhutan strictly monitors the produce.

Different parameters are in the place to assure quality of raw materials. According to g.so-wa Rig–pa, to give a strong efficacy of the medicines, following seven precious limbs should be endowed; Growth on natural habitat, timely harvest, well defined process for drying, timely utilization, removal of toxicity, smoothing the potency and compatible compounding. Besides aforementioned elements, the raw materials have to undergo identification test (*Botanical description, g.so-wa rig-pa identifications*), Physical test *(organoleptic character like colour, taste, scent)*, Specific Chemical test (*Chemical content test)*, Foreign materials (accepts up to 2% of foreign substances) and loss on drying/moisture content (*water content*).

Although few literature reviews on medicinal plants of Bhutan are published, no major scientific research is being conducted so far. However, new projects are being under taken in terms of commercial product development.

Likewise, some Traditional Medicine practitioners in the country have started clinical research on effectiveness of herbs on diabetes and gastro intestinal diseases. Bhutan strives to preserve centuries old wisdom of traditional medicine to provide alternative and holistic healthcare to its citizens. As plants are essence of traditional medicine, protecting it would help protect natural ecosystem.

Biography: Dr Phuntsho Wangdi is practicing Traditional Medicine Physician with National Traditional Medicine Hospital, Ministry of Health, Bhutan. Recognized by Bhutan Medical and Health Council of Bhutan. He has bachelors of Science in Traditional Medicine from Faculty of Traditional Medicne, Khesar Gyalpo University of Medical Sciences of Bhutan. Besides, practicing Physician he is also serving as an editorial board member with Bhutan Health Journal for past five years, and recently joined editorial Board member of International Journal of Ayurveda and Traditional Medicines. He had participated in conference of World Association of Medical Editors, 2015 in Delhi, and Regional Workshop on Clinical Research Methodologies in Traditional Medicine for WHO South-East Asia Region, Jamnagar, Gujarat, India, 9-11 September 2019. His interest is more on adventure, exploring the beauty of nature.As of now he is taking up his first research project on the quality of sample of the urine analysis.

QUALITY CONTROL PARAMETERS AND STANDARDISATION OF HERBAL DRUGS

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Biography: Prof. Prajapati is presently serving as a Managing Director I/C IMPCL and Head of Dept. of Rasashastra & Bhaishajya Kalpana in All India Institute of Ayurveda (AIIA), New Delhi. He has been served as Director of Institute for Post Graduate Teaching & Research in Ayurveda, Gujarat Ayurved University, and I/C Director Pharmacy, Gujarat Ayurved University, Jamnagar. Prof. Prajapati having 24 years of experience in teaching PG/PhD at top most institutes of Ayurveda i.e. IMS, Banaras Hindu University, Varanasi; National Institute of Ayurveda, Jaipur; and IPGT & RA, Jamnagar and AIIA, New Delhi. Many prestigious awards such as Nagarjuna silver medal, Teacher's Excellence Award, Rasaacharya Award and IASTAM Rasavaidya Nagindas Shah Award are already in his credit. He has 24 years of experience in handling commercial and laboratory level of manufacturing in different Ayurvedic dosage forms. He produced 20 PhDs and 40 Masters, and also completed many research projects. He has published three books, 3 mongraphs and more than 280 peer reviewed research papers. He is a visiting Professor in AIIMS Rishikesh and IIT hospital New Delhi. He has been delivered several lectures in India and overseas in a capacity of resource person. He is a member of Indian Science congress, All India Ayurvedic Teachers Association and Ayurvedic Pharmacopoeial Committee, Ministry of AYUSH.

STANDARDIZATION OF SUBSTITUTE SPECIES OF BOTANICALS USED IN THE MANUFACTURING OF AYURVEDIC MEDICINES

Mayaram Uniyal
Ex-Director CCRAS, Ministry of AYUSH, GoI

In the current scientific age, it is absolutely necessary that Ayurveda should be an exploration and research work for recognition on world stage. Using modern techniques research on old misconceived ideas and medicinal species new scientific tools can be established in medicine making. According to Maharishi *Charaka* all the matter of the world are useful provided that those substances should be used by doing research work carefully.

Yatha Vanaushdhi Bhootam Jagti Kishchit Drvya Muplabhyte Tantan Yaktiyarth Chah
TanmamiPretya // Charak /// Evam Preesthkarino Kushalabhavanti // …. Charaka/ Susruthah

Yatha-Kadachit Dravya Mekam Va Yoge Yantram Nlabhyate /
Tathtad Gunyuktam Dravya Parivartnen Grahyto //…… (Aushdhi Vigyan)

Even today the entire world respects ancient *Ayurveda* science with medicinal experiments. There is also some reference in the Rigveda to treat herbs by 1500- 2000 BC. In 1963 archaeological evidence found from the tomb in Iraq during 5000 BC, prove that people were aware of the use of herbs. Rarely found herbs are replaced with some other botanical species having similar qualities of herbs. Substituting botanical species is due to the unavailability of a substance is inaccessible, inelastic exploitation of herbs, Apathy in standardization of representative liquids and lack of proper judgment of certain suspected forest drugs prevalence of vegetative species is similar. Therefore keeping in view the above reasons recognition should be given to the use of the same species is used in the manufacture of medicine for inclusion in the Ayurvedic Pharmacopoeia. Keeping in the view of traditional knowledge, the research paper presented in the above mentioned topic has been made in the form of studies related to the substitute botanical species and suggested to the Ayurvedic committee, Ayush department for standardization and research work.

Biography: Dr. (Vaidya) Mayaram Uniyal born in 1940 at Tehri Garhwal, Uttarakhand. He is one of the most experienced and prominently known experts of Ayurveda Herbs in India. Dr. Uniyal has done unique work in the field of Ayurveda science that made his place in the specific litigants of Ayurveda. His work in the field of forest medicine is highly appreciated. His research has made significant contributions in Ayurveda. He was member of Ayurvedic Pharmacopoeia Committee (Department of AYUSH, Union Ministry of Health and Family Welfare), GoI of India; former Consultant Herbs & Organizations, GoI Uttarakhand, Former Technical Advisor Ayurveda at National Institute of Physical Sciences, Himachal Pradesh, Fellow of National Ayurveda School Department of AYUSH GoI of India; and Former Member of National Board of Medicinal Plants. He published more than 30 research article in National and International journals and more than 25 books are already in his credit.

RASAYANA POLYSACCHARIDES FROM FOREST: CHALLENGES AND PROSPECTS

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Since antiquity, medicinal plants have been used as main source of bioactive polysaccharides and oligosaccharides in Ayurvedic formulations called as 'Rasayanas' to cure dreaded diseases and documented in Ancient Indian Medical Literature including *Sushruta Samhita*, *Charak Samhita*, *Bhav Prakash*, *Nighntu* etc. The Rasayanas containing polysaccharides have been known for various ethnotherapeutic effects viz. gastro-protective, lipid lowering, antioxidant, tumor preventive and cytotoxic, macrophage activation properties, immunomodulating, free radical scavenging, and anti-diabetic activities etc. In recent years, significant phytochemical and pharmacological interventions have revealed wide range of carbohydrates including acetylated glucomannans, fructans, glucans, arabinogalactans, xylans for treating influenza, cancer, inflammation, blood coagulation, tumor, bacterial and viral infections, colitis, human immunodeficiency virus (HIV), Alzheimer etc. In our laboratory Rasayan polysaccharides of forestry species from *Tinospora sinensis*, *Dalbergia sissoo*, *Acacia tortilis*, *Hippophae salicifolia*, *Malvastrumn coromandelianum*, *Cassia tora* have been thoroughly investigated by isolation, purification, chromatographic separation, degradative and spectroscopic analyses to understand their chemical composition and therapeutic effects thereof. A comprehensive account of the status of oligosaccharide and polysaccharide based drug development, underling challenges and future perspectives will be thoroughly discussed.

Biography: Dr. Vineet Kumar is presently Scientist-G and Head, Chemistry and Bioprospecting Division, Forest Research Institute, Dehradun. He has ~26 years research experience in the area of natural products chemistry in India, Germany and USA. He has published 80 research papers in prestigious journals with high impact factor including RSC Advances, Planta Medica, Carbohydrate Polymers, International J. Biological Macromolecules, Phytochemical Analysis, Food Hydrocolloids, Industrial Crops and Products, Arabian J. Chem., Journal of Applied Polymer Science, Starch/Starke, Indian J. Chemistry, etc. The current approach of his research work at Chemistry and Bioprospecting Division, Forest Research Institute, Dehradun is directed towards Structural analysis and functionalisation of natural products including polysaccharides for value addition. Besides significant publications, he has transferred technologies from laboratory to four industries so that these can be multiplied on large scale. He earned several awards including Dr. H.C. Srivastava Young Scientist Award by Association of Carbohydrate Chemists and Technologists (ACCTI), India; National Award for Excellence by Indian Council of Forestry Research and Education (ICFRE), Dehradun under the category 'Young Scientist Award; C.G Merchant Award-2018 by ACCTI and National Award for Excellence -2018 by ICFRE under the category 'ICFRE Best Research Paper Award'. He is Editorial Board Member of the journal 'Trends in Carbohydrate Research' and 'Journal of Medicines Development Sciences'. He implemented a series of projects sponsored by DST, DBT, ICAR, NMPB, ICFRE and industries and guided twelve students for Ph.D. degree. He is also an expert reviewer of leading journals viz. Biomacromolecules, RSC Advances, Beilstein J. Organic Chemistry, Carbohydrate Polymers, Int. J. Biological Macromolecules, J. Advanced Research, Carbohydrate Research, J. Molecular Structure, etc.

STUDIES ON PHYTOCHEMICAL COMPOSITION OF *OSYRIS QUADRIPARTITA* SALZM EX. DECNE

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Osyris quadripartita salzm ex. Decne also known as *'African sandalwood'* or *Nepalese sandalwood* belongs to the family *Santalaceae* have many similarities in their physical and chemical characteristics with *Santalum album* (Sandal). It is a hemi-parasitic tree known for its fragrant wood. The essential oil extracted from the heartwood of the tree is used by the perfume industry. It is used in traditional medicine to treat a wide variety of diseases including; kidney infection, diarrhoea, cholera, coughs, malaria, gynaecological disorders, infertility, venereal diseases, cancer, and insanity. Different parts of the tree have is also known to possess various medicinal properties. *Osyris quadripartita* has recently entered the international market as a substitute of the traditional sandalwood oil originally sourced from Asia and Australia. It is being used as a substitute of sandal wood in other parts of world especially in African countries. In India, it is also used as an alternative to sandalwood oil. However, the entire requirement is being fulfilled through import from African countries. The species grows in certain parts of India including Uttarakhand, Himachal Pradesh, Kerala and Western Ghats primarily on stony and rocky soils or sporadically in rocky sites and along the margins of dry forests, evergreen bush land, grassland, and thickets at an altitude range of 1500-2250 m above sea level. The present study was undertaken to elucidate the phytochemical composition of different plant parts of *O. quadripartita.* Qualitative phytochemical analysis of different plant parts (wood, leaves and bark) was carried out. Phyto-constituents like total phenolic content (mg GAE/g), total flavanoid content (mg QCE/g), total terpenoid content (mg UAE/g) and total alkaloid content were quantitatively determined in different plant parts. *O. quadripartita* plant parts extracts were also analysed for their antioxidant capacity. Wood and leaves of the tree exhibited good antioxidant activity.

Biography: Dr. Pandey is Scientist-G and Head of Extension Division, Forest Research Institute. He is renowned Scientist researching in the area of Non Timber Forest Products, Chemistry of Forest Products, Medicinal and Aromatic plants, Sustainable harvest of NTFPs, Cultivation of medicinal and aromatic plants, documentation of traditional knowledge, livelihood generation and biofuel. He has published more than 100 research papers in International and national journals of repute, 20 popular articles, three books, 15 book chapters; participated in about 125 scientific events.

CULTIVATION, PROCESSING, VALUE ADDITION AND MARKETING OF HIGH VALUE AROMATIC CROPS

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The farming communities in India as well as in various other parts of the world are facing hard times to earn sufficient economic returns with traditional farming and cropping system. Aromatic (aroma producing) crops are some of the most profitable but underutilized crops, which have immense potential to alleviate socio-economic conditions of small and marginal farmers. These are low input crops requiring little care once they are established in the field and have much higher economic returns per unit area as compared to many of the traditional crops. Several high-value industrial aromatic crops and their elite varieties have been developed by Council of Scientific and Industrial Research (CSIR), India providing higher economic returns than conventional crops. Most of these crops can also be cultivated on degraded, waste, saline, rainfed or low irrigated lands without affecting the area for cultivation of traditional food crops. Essential oils of these aromatic crops have very high demand in national and international market. However, the growth opportunities in this sector have not yet been fully utilized. In the present lecture we will discuss about scope of cultivation of aromatic crops, their market potential, growth opportunity and scientific interventions in the areas of agriculture, processing and product development from aromatic crops. Cultivation, processing, value addition and marketing of some of the high value aromatic crops like Lemongrass hybrids, Palmrosa, Lavender, *Jammu Monarda*, *Salvia sclarea*, Mentha spp., *Ocimum* spp. and *Pelargonium graveolens* will be discussed. In addition participants will be apprised about CSIR-Aroma Mission project which is providing end-to-end technology and value-addition solutions to the farmers and bringing transformative change to the aroma industry in India.

Biography: Dr. Sumeet Gairola is a senior scientist with over 14 years of research experience in the field of taxonomy and ecology of Western Himalayan flora viz., Uttarakhand, Himachal Pradesh, Jammu & Kashmir and Ladakh. His work is focused on understanding the effects of altitude, slope aspects and anthropogenic disturbances on the phytodiversity, forest composition, regeneration, biomass, carbon stocks and physico-chemical properties of different forest types. Besides that he has also worked on the assessment of forest resources utilization pattern in relation to socio-economic status of the people of the region and ethnomedicinal plants used by various indigenous communities of Western Himalaya. Under CSIR-Aroma Mission he along with his team is responsible for extension of high value aromatic crops on 5000 acres area across India. He has published two books and more that 60 research papers in various national and international journals. He has handled two industry projects and six research projects received from various funding agencies viz., UGC, CSIR and DST. He is nodal scientist of CSIR-Aroma Mission and Co-nodal scientist of CSIR-Phytopharmaceutical Mission from CSIR-IIIM, Jammu.

UTILIZATION OF AROMATIC PLANTS FOR THE SOCIO-ECONOMIC DEVELOPMENT IN UTTARAKHAND

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Uttarakhand is blessed with a variety of soil type and varying agro-climatic conditions, ranging from Sub-Tropical to Alpine, which is conducive for wild occurrence and growing wide range of aromatic plants. The total geographical area of the state is 56.73 lac ha., out of which forest area covers 34.84 lac ha. and agriculture /cultivable land is 15.27 lac. ha., while 3.66 lac ha. area is cultivable waste land. This cultivable waste land has become abandoned because of several problems in hill agriculture such as continuous fragmentation of land holdings, far-off agriculture land from farmers houses, high cost of agricultural inputs, damage of traditional crops by wild and domestic animals, high transportation cost of agri-horti produce, non-availability of agricultural labour, lack of processing facilities at farmer fields, rainfed cultivation and lack of irrigation etc. Owing to the above reasons, traditional agriculture of the State has become un-economical, therefore, the problem of migration has become intense and a large number of villagers/ farmers have left out their cultivation and migrated elsewhere for better livelihood and employment opportunities. The environment and biodiversity has also been affected adversely due to soil erosion, loss of fertility, depletion of nutrients, less percolation of water in soil, drying of the natural water resources and infestation of obnoxious weeds like Lantana and Kalabansa etc.

Keeping in view the problems in traditional agriculture and other barriers, cultivation of aromatic plants has become a viable solution for raising the economy of the farmers of Uttarakhand. The strategy was made to cultivate aromatic crops as additional income generating crops in existing cropping system or in abandoned lands, for which, several extension programmes have been undertaken, such as Rehabilitation of abandoned land through aromatic grasses; Mint as inter crop with wheat and sugarcane; Damask rose as boundary crop; Chamomile as short duration crop; Cinnamon in agro-forestry system. For the promotion of aromatic cultivation, promotional schemes were provided to the farmers such as free of cost training, free planting material to marginal farmers, subsidy on cultivation cost of aromatic crops, 50 to 75% subsidy on field distillation units, MSP for cultivated and Himalayan minor essential oils etc.

CAP has also introduced "Himalayan Minor Essential Oils" to aroma trade and industry which were lesser known thus far. Considering immense possibilities such oils offer in supplementing income of local inhabitants, CAP has been working on their availability in fields, extraction techniques on Surai (*Cupressus torulosa*), Kunja (*Artemisia vulgaris*), Lantana (*Lantana camara*), Gania Grass (Cymbopogon distans), Kalabansa (*Eupatorium adenophorum*), Bhukamber (*Pogostemon benghalensis*), Jwarancosa (*Cymbopogon jwarancusa*), Van Tulsi (*Ocimum gratissimum*) and other minor aromatic plants. By adopting the above strategies for extension of aromatic crops in a systematic and scientific manner, CAP has successfully developed and commercialized aromatic sector in Uttarakhand. As a result, presently more than 21000 farmers have been engaged in cultivation, processing and marketing of aromatic crops, covering more than 7600 ha. area under cultivation. Aromatic crop cultivation in the State has been extended in a cluster approach and 109 aroma clusters have been developed in which 187 field distillation units are working in the farmer's field.

Biography: Dr. Sunil Shah is currently working as Scientist-C in the department the Phytochemistry Division. He obtained his master and PhD in Botany. His is current engaged with doing survey, identification and chemo-taxonomical study of commercially important aromatic plants. He is also working as Incharge of Aromatic Clusters developing in various district of Garhwal region. As a training coordinator, he is responsible for preparation of training calendar for programmes, course material, lectures and practical demonstration to the participant and organizing the training programme. His current area of interest is extension of aromatic crops and R&D work related with aromatic species.

Proceedings of the International Conference on "cultivation and sustainable use of high-altitude medicinal and aromatic plants for the socio-economic development" organized by Uttarakhand Ayurved University on 29-30 November, 2019 at Dehradun, India.

SMART-SENSOR: A NON-INVASIVE ELECTRONIC SENSOR FOR QUALITATIVE AND QUANTITATIVE ANALYSES OF PLANT NATURAL PRODUCTS

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SMART sensor is an emerging technology for non-invasive, rapid qualitative and quantitative analyses of plant natural products. 'Withaferin A' is an economically important plant metabolites present in *Withania somnifera* and its Ayurvedic products. Withaferin A exhibits numerous medicinal uses. In the present work, we developed a low cost volatile based sensor to discriminate different verities of *W. somnifera* based on 'withaferin A' content. The *W. somnifera* plants with different origins and, in some cases, different years of crop, were clearly separated with the electronic nose sensor. The sensor can tell the content of 'withaferin A' from plants parts in 45 second exposure time in a sunny weather. Principal component analysis (PCA) and discriminant factor analysis (DFA) were done on the 'withaferin A' values measured by sensor. The *W. somnifera* samples were clustered into two categories (high and low 'withaferin A' content) after being analyzed by PCA and DFA. This sensor can be used for the quality control of *W. somnifera* and its medicinal products. Furthermore, our group has developed a genetically modified *cisgenic W. somnifera* cell culture, which can produce 4-fold higher level of 'Withaferin A' under laboratory conditions.

Biography: Dr. Debabrata Sircar, completed his doctoral degree (PhD) in plant natural product biology from Indian Institute of Technology Kharagpur, in 2010. He has obtained his Post doctoral research training from Institute for Pharmaceutical Biology, Technical University Braunschweig Germany. Currently he is an Associate Professor in the Department of Biotechnology, Indian Institute of Technology Roorkee. His major research interest is plant metabolomics. He has published more than 30 papers in reputed journals and has been serving as a number of scientific bodies in India.

TREE-BORNE OIL SEEDS AND PLANT MATERIALS AS A SUSTAINABLE ALTERNATIVE TO PETROLEUM RESOURCES FOR CARBON OFFSETTING

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India is the second largest populous country and its energy needs are growing as is for the world. India imports the huge petroleum resources for meeting the enormous energy needs as the indigenous production (~35 million tons) is low against the total consumption. The automobile sector is the biggest responsible for high India's oil import bills. India needs about ~250 million tonnes of petroleum products every year. India aims to bring down to about 67 % by 2022 by replacing it with local exploration, renewable energy and indigenous alternative fuels. Tree-borne oilseeds and plant materials assume greater significance as an alternate to the petroleum resource and can significantly contribute to averting this situation. This talk is accounting the major breakthrough and recent progress in utilization of the tree-borne oilseeds and plant materials for producing the bio-fuels, bio-lubricants. The detailed discussion will cover the waste materials routed for fuels production along with bio-additive development employing natural biopolymers and biomaterials through organic transformations.

Biography: Dr. Raj Kumar Singh completed his Ph.D. in the field of organic synthesis from the Indian Institute of Technology Roorkee, in 2007. He has done postdoctoral work in the synthesis and fuel research division of the Indian Oil Corporation Ltd. R&D centre, Faridabad, Haryana. Currently he is a Senior Scientist and head at Advanced Crude Oil Research Centre of CSIR-Indian Institute of Petroleum. His research interests are in the development of the new base oils for lubricant formulation as well as the development of new lube and fuel additives. He is also working on the Multifunctional additives, Bio additives and the polymer synthesis. New are of interest is towards the combating the problems in heavy crude oils. He has published more than 60 research papers in National and International Journals and 2 Patents have also been filled.

PHYTOCHEMICAL AND BIOLOGICAL POTENTIAL OF SOME MEDICINAL AND AROMATIC HERBS GROWING WILDLY IN HIMALAYAN REGIONS OF UTTARAKHAND

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The medicinal and aromatic flora is well recognized world over for their biological efficacy in healthcare system from time immemorial. The medicinal and aromatic flora is a big biochemical factory of secondary metabolites. The phytoconstituents, biosynthesized in plants are being explored continuously since ancient time for their chemical structures and biological potential as lead molecules for new drugs development, in the area of fragrance, dyes, biopesticide, neutraceuticals etc. Uttarakhand Himalaya is considered as a big repository of aromatic and medicinal plants. The exploration of natural flora from this region could not only open the avenues for resident people for their livelihood but can also be helpful for proper documentation of the flora to generate database. It has been evidently reported that the plants of family Lamiaceae, Zingiberaceae, Araceae growing in India contains many species which are traditionally used by local and tribal people for their health care and food. Proper documentation and *in-situ* preservation of widely growing plants is essential for the generations to come so that the plants can be exploited scientifically and judiciously in future. In present study the plant species like *Kolius, Ajuga, Mentha, Acorus*. *Zingiber,* etc were collected from different ecological niches of the Uttarakhand Himalaya. The essential oils and extract obtained from plant parts were subjected to chromatographic techniques to get the isolated compounds. The essential oils were identified by GC/MS and pure compounds were characterized by various spectroscopic techniques. Mono, sesqui and diterpenoids like linalool, carvone, asarone and clreodane-diterpenoids, foskolin etc were characterized. The essential oils, extracts and pure compounds exhibited significant biological activities viz; pharmacological activity, antioxidant activity, anti-feedant activity, herbicidal activity etc.

Biography: Dr. Om Prakash completed his doctoral degree (PhD) from Kumaun University, Nainital. Currently he is a Professor in the Department of Chemistry, College of Basic Science and Humanities G.B. Pant University of Agriculture and Technology, Pantnagar. His major research interest is natural products. He has Published 120 research papers in National and International Journals and has been serving as a number of scientific bodies in India.

ANTI-INFLAMMATORY AND ANTIMICROBIAL ACTIVITIES OF A CYCLIC PEPTIDE - CURCACYCLINE ISOLATED FROM *JATROPHA GOSSIFOLIA*

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The present study was done to investigate the anti-inflammatory and antimicrobial effect of compound curcacycline isolated from methanol extracts of *Jatropha gossifolia.* We have determined the anti-inflammatory and antimicrobial activity of compound by Oral administration at doses of 100 and 200 mg/kg/day of body weight to healthy animals. The extracts were studied for their anti-inflammatory activity in carrageenan-induced hind paw oedema in rats and the paw volume was measured plethysmometrically at 0 and 3 hr after injection. The compound was also evaluated for antimicrobial activity using well diffusion method. The compound, significantly ($P<0.05$) reduced carrageenan-induced paw oedema in rats and antimicrobial activity evidenced by zone of inhibition by Well diffusion method. The compound show greater anti-inflammatory a comparative to the standard drugs, diclofenac sodium. These results indicated the compound exhibited more significant activity in the treatment of pain and inflammation.

Biography: Dr. M.C. Purohit is presently working as associate professor in the department of Chemistry, H.N.B. Garhwal University BGR Campus Pauri (Garhwal). He did his Ph.D from H.N.B. Garhwal University and Post-Doctoral from High Altitude Plant Physiology Research Centre of same university. He has been working with Indian Institute of Petroleum Dehradun for two years and HESCO for a year. Dr. Purohit has 25 years of research and teaching experiences in the undergraduate and postgraduate classes. He has been presented research paper on the occasion of International year of Chemistry (2011) at Bangkok and Singapur. He has been published 50-55 research paper in the reputed national and international journal. 8 students were awarded Ph.D degree under his supervision and 3 are working at present. His area of research interest is chemistry of natural product, natural dyes and nanosciences.

AROMATIC PLANTS WITH THEIR MEDICINAL IMPORTANCE

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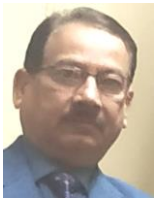
The importance of aromatic crops in the national economy and their potential for the rapid growth of phyto-pharmaceuticals, perfumery and allied industries in India has been emphasized from time to time. The essential oils, perfumes and flavors have been associated with the Indian civilization for several thousand years. Brhat Trayi extensively described *Piper nigrum* as appetizer, carminative and anti-microbial. *Elettaria cardamomum* is a well-documented aromatic condiment in Indian medicine and tradition. In charak samhita, in the context of timira treatment, ela powder is soaked in goat's urine for 3 days and applied as collyrium. Clove oil is used for dental caries and gingivitis and also applied externally to relieve joint pains and headache. Cinnamon oil having bactericidal effect. *Myristica fragrans* oil a flavouring agent is used in small doses in pharmaceutical preparations. Sandalwood tree is the source for commercial production of sandalwood oil which is used in inflammation of bladder, gonorrhoea, and cough, called as the liquid gold of Karnataka. Talisha patra used as antispasmodic, expectorant, diuretic. Here we are going to discuss medicinal values of some aromatic plants.



Biography: Prof. Dinesh Chandra Singh completed his doctoral degree (PhD) from Banaras Hindu University, Varanasi, India in 1993. Currently he is professor and head in the Department of Dravyaguna, Rishikul Campus, Haridwar, Uttarakhand Ayurveda University. His major research interest is identification and therapeutic actions of original drugs and their substitutes. He has Published 60 research papers in National and International Journals and has been serving as a number of scientific bodies in India.

NEW ERA OF HERBAL THERAPY

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Herbal sources have been an integral part of several traditional medicine systems like Ayurveda, Chinese medicine, Siddha and Unani system. The universal role of herbal sources in the treatment of disease is exemplified by their employment in all the major systems of medicine, irrespective of the underlying philosophical premise. Herbal medicinal agents are efficacious and safer to be used for the management of various diseases. Ayurveda is a lifestyle science that was developed in India nearly 4000 years ago. In the Ayurvedic era, the herbal sources were the only way of medication for majority of population pertaining to the holistic approaches consisting of easier method of use, low cost of treatment and better results. Moreover, use of herbal medicines is very important in developing countries where the cost of conventional medicines is a burden to the population. More than 30% of all plant species, at one time or another was used for medicinal purposes. Ayurveda offers a wide choice of products for daily well-being, for adjuvant support in disease treatment, for treating health conditions with fewer side effects. According to WHO report, more than 100 plant-derived medicines are being used in the modern medicine. Moreover, many pharmaceutical companies are exploring plant materials for their potential medicinal value. Ayurvedic management of numerous diseases should be focused on the need of investigating new potent, safer as well as standardized herbal medicines. It is important that suppliers of Ayurvedic products educate retailers and consumers about the herbs *i.e.* medicinal value, storage conditions, dosage, low cost and side effect, methods of use to get more effect etc. which is a way that creates differentiation. Ayurvedic products must stand out rather than "blend in" to the crowded field of herbal supplements. Without this, there may not be a compelling reason for consumers to switch from an herb (or brand) that they are already using. However, there is a particular need for education on healthy diet and for interventions that show potential improvement in the quality of a patient's life.

Biography: Dr. Randhir Singh has done his B. Pharm from Guru Jambeshwar University, Hisar, M. Pharm from Poona College of Pharmacy, Pune (BVDU Pune) and Ph.D from Punjabi University, Patiala. Presently, he is working as Professor in Department of Pharmacology in M. M College of Pharmacy, M.M. (Deemed to be university), Mullana, Ambala, India. He has an experience of more than 15 years in teaching and research. He has published more than 90 researches and review articles in peer reviewed International Journals and his work is cited in highly reputed journals. He is a reviewer in many peer reviewed journals and an editorial board member of several journals. He has guided 08 Ph.D students (07 Awarded, 01 Submitted) and 05 students are currently pursuing Ph.D under his guidance. He has also guided 08 M. Pharm students. He has received 02 projects from Govt. agencies in which one project was under SERB, Fast Track Scheme for Young Scientists (FAST) form Department of Science and Technology (DST), New Delhi, Govt. of India (SERC/LS-468/2012) for an amount of 23,09,800/- while another project was from Central Council for Research in Homeopathy, Department of AYUSH, Govt. of India, 2012 for an amount of 19,56,200/-. He has received Prof Saroj V.N Sharma Award for best paper published in cardiovascular sciences in India in 2011 and APP Best Faculty Award**,** from Association of Pharmacy Professional, West Indies in January 2018. He has authored 09 books with reputed national and international publishers. He has also filed 06 patents. His area of research is diabetes and diabetic complications, obesity and hypertension.

PHARMACOGNOSTICAL STUDIES AND EVALUATION OF QUALITY PARAMETERS OF *SOLANUM HISPIDUM PERS.* LEAVES

Kumud Upadhyay, Harbola Ruchi[1], Kaur Virender[1], Pandey Madan Mohan[2], Bisht Dheeraj[1]
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Solanum hispidum Pers (Solanaceae) is a traditional medicinal plant found in hot valleys of Himalayas and is known for its medicinal value. Commonly known as Devil's Fig, native to Mexico, Central America and also found in Dehradun and Southern part of India the plant is well studied for its pharmacological activity and phytoconstituents, there is not much data available on pharmacognostic standards and physico-chemical parameters. The present investigation was designed to establish the pharmacognostical and quality control parameters of *Solanum hispidum leaves*. *Solanum hispidum Pers.* was subjected to pharmacognostic, qualitative, and quantitative evaluation. The average results of the loss on drying, total ash, acid-insoluble ash, and water-soluble ash values were 9.1%, 13.17%, 3.04% and 3.08%, respectively. The average results of the water, alcohol, chloroform and hexane extractive values were 6.75%, 10.4%, 4.92% and 2.64%, respectively. The study will provide referential information for the correct identification and purity of crude drug.

Biography: Dr. Kumud Upadhyaya (M. Pharm. Ph.D. DSM, Ayrvedratan) is son of Late Sri Gopal Upadhyaya, a renowned writer of Uttarakhand. He has more than 23 years of University and professional experience. He has held many posts of responsibility in Kumaun University, Uttarakhand Technical University and Uttarakhand Ayurved University, Dehradun. He is involved in active teaching in Uttarakhand since 1996 Dr. Upadhyaya is credited with establishing pharmacy education in Uttarakhand. He presently holds the post of State Coordinator, Indian Society of Pharmacognosy. He is pioneer in establishing Pharma. education in Uttarakhand and has the distinction of organizing States first National and International Seminar in Pharmaceutical Sciences. He is working as Pharmacy faculty in this region since 1996. He is serving as Assistant Professor, Department of Pharmaceutical Sciences, Kumaun University, Nainital. .ased on length of service. He has published extensively National and International journals. He has organised/actively participated in national and intrnational conferences by means of lectures, poster evaluator, Chair session and invited speaker. Presently he is guiding students for Ph.D. enrolled at UTU, Dehradun and Kumaun University. Beside this he has also guided M. Pharm students for project work working in Institute of repute like FRI Dehradun, NBRI, and CIMAP Lucknow. He has served for four years as Professor at UTU, Dehradun. Under his leadership two UCOST Young scientist awards were won by students.

ROLE OF BIOMARKERS IN THE QUALITY CONTROL OF HERBAL PRODUCTS

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Central Himalaya is known for a hub of many useful medicinal and aromatic plants. They have a remarkable physiological action on living beings. Around 75% peoples depend on herbal treatment. However, due to increasing demand of medicinal plants and decreasing level of cultivation leading to adulteration in various important herbal medicine, which affects the efficacy of a particular drug. In addition to the increasing cultivation of medicinal and aromatic plants, a proper quality control is highly important to overcome such issues. The biomarkers are used in the quality control of herbal product to maintain its efficacy. Berberine from *Berberis aristata*, lawsone from *Lawsonia innermis*, morphine from *Papaver somniferum* and withaferin A from *Withania somnifera* are some well-known biomarkers for their respective products.

Biography: Dr. Ruchi Semwal is presently working as Assistant Professor at Pt. Lalit Mohan Sharma, Govt. PG College, Rishikesh, Uttarakhand, India. She has been working as NRF-Postdoctoral Fellow at the Department of Pharmaceutical Sciences, Tshwane University of Technology, Pretoria, and UGC-DSK Postdoctoral Fellow at the Department of Chemistry, Panjab University, Chandigarh. She obtained her PhD in Natural Products Chemistry from HNB Garhwal University, India. She has been an author of many research papers and books and also presented her work at many conferences. She is currently engaged in the research on Phytomedicine, natural products, traditional medicine and natural dyes.

CONSERVATION AND CULTIVATION OF IMPORTANT MEDICINAL PLANTS SPECIES OF HIGH ALTITUDE OF UTTARAKHAND HIMALAYA

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Himalayan medicinal plants are world's most important source of medicines owing to presence of high value efficacious active ingredients. Most of the species are in high demand throughout the global herbal market. Most of the species have perennially been illegally and unscientifically collected in the past for the purpose of medicine from different wild sources for local, national and international trade and as a result most of the species are enlisted as rare and endangered categories. Finally they are banned by the Government for collection from the natural pockets which ultimately affected both the quality and quantity of herbal-based medicine. Ashtaverga group of medicinal plants are unique example just to quote here. Some important species of Himalaya are *Atis* & *Meetha* (*Aconitum* spp.), *Jamboo/Faran* (*Alliums* pp.), *Balchad/Laljadi* (*Arnebia benthamii*), *Choru* (*Angelica glauca*), *Cheepi/Gandrayan* (*Pleuropsermum angelicoides*), *Satuwa* (*Paris polyphylla* and *Trillium govanianum*), *Kuth* (*Saussurea costus*), *Van-lahsun* (*Fritillaria roylii*), *Van-kakdi* (*Podophyllum hexandrum*), *Jatamansi* (*Nardostachys grandiflora*), *Kutki* (*Picrorhiza kurrooa*), *Chirata* (*Swertia chirata*) etc. The best way to provide the plant material needed for medicine is to cultivate them. This is far better than collecting the plant material from the wild since it does not deplete wild stocks, and in many cases, the declining habitat of native plant can no longer supply the expending market for medicinal plants products. In the case of rare, endangered or over-exploited plants, cultivation is the only way to provide material without further endangering the survival of the species. Cultivation also has other pharmacological advantages over wild-collecting. Wild collected plants normally vary in quality and compositions, due to environmental and genetic differences. In cultivation, this variation and the resulting uncertainty of the therapeutic benefit is much reduced. Cultivation also greatly reduces the possibility of mis-identification and adulteration. As per the guidelines of WHO, IUCN and WWF (1993), following points should be taken into considerations before any specie is being brought into cultivation:

1) Collect propagating material of the most suitable genetic material and improve the stock genetically
2) Find the best form of propagation
3) Find the optimal cultural conditions (e.g. soil, climate, shading, watering regime)
4) Find ways to protect the plants from pests and diseases
5) Find ways to control weeds
6) Choose the best time of harvest
7) Consider the possibility of mechanization
8) Develop the best system for post-harvest storage

Biography: Dr. Bhatt is a senior scientist in HRDI, Gopeshwar, He has a rich experience in the medicinal and aromatic plants cultivation and propagation. He has been a resource person for various conferences, trainings and workshops in India and overseas. He has published many research papers in reputed International journals. Presently, he is a member of many medicinal plants policy making comittees of UK Govt.

APPLICATIONS OF NOVEL DRUG DELIVERY SYSTEM FOR HERBAL FORMULATIONS

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An extensive research is going on in the area of novel drug delivery and targeting for plant actives and extracts. Over the past several years, great advances have been made on development of novel drug delivery systems (NDDS) for plant actives and extracts. However, research in this area is still at the exploratory stage. The variety of novel herbal formulations like polymeric nanoparticles, nanocapsules, liposomes, phytosomes, nanoemulsions, microsphere, transferosomes, and ethosomes has been reported using bio-active and plant extracts. The novel formulations are reported to have remarkable advantages over conventional formulations of plant actives and extracts which include enhancement of solubility, bioavailability, protection from toxicity, enhancement of pharmacological activity, enhancement of stability, improved tissue macrophages distribution, sustained delivery, and protection from physical and chemical degradation. The present review highlights the current status of the development of novel herbal formulations and summarizes their method of preparation, type of active ingredients, size, entrapment efficiency, route of administration, biological activity and applications of novel formulations.In addition, more attention should be paid to the research on the carrier materials in order to develop more suitable carriers which can reduce the toxicity of drugs, enhance their activity and improve the overall quality of the agents. Herbal drugs have enormous therapeutic potential which should be explored through some value added drug delivery systems.Several excellent phytoconstituents have been successfully delivered using NDDS. Hence there is a great potential in the development of novel drug delivery systems for the plant actives and extracts.

Biography: Prof. Sanjiv Mittal is currently Director of School of Pharmaceutical Sciences, RIMT University, Mandi Govindgarh (PB). He has done his PhD in Pharmacognosy form Dr. H S Gour University Sagar (M.P.). He has 25 year's academic and industry experience. He has published more than 20 research paper in National and International Journals and also Author of books (Pharmacognosy). He has guided more than 30 PG and PhD students. He is the Chairman of IAEC nominated by CPCSEA since 2010 to till date. He was the member of Indian Pharmacy Graduate Association (1995), Association of Pharmaceutical Teacher of India (2004) and Indian Pharmacy Association (2004). His current areas of research are pharmacognosy, phytochemistry, pharmacology, Ayurveda and herbal medicine.

REVIEW OF VATSANABH (*ACONITUM FEROX*) WITH SPECIAL REFERENCE TO PHARMACOLOGICAL ACTIONS AND THE PROBLEM OF ADULTERATION

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Vatsanabh (*Aconitum ferox*) is known to Indian Physicians since the period of Vedas. It is a plant drug of high altitude described in Ayurveda under 'Mahavisha Varga' which means a group of deadly poisonous drugs. Toxicity and toxicology of Vatsanabh along with its antidote is available in details in different Ayurveda and Rasashastra texts. Ancient Indian physicians developed the methods of detoxification and converting this poisonous plant into nectar. It is a king of medicines. Many researchers have confirmed the antipyretic, analgesic and ant diabetic activity of Vatsanabh. It is also useful in ophthalmic conditions like cataract and glaucoma. Vatsanabh is commonly called as Indian Aconite, which botanically belongs to the family *Ranunculaceae*. The morphological description of Vatsanabh in Ayurveda mostly resembles with the species *Aconitum ferox*. However market samples show adulteration with many other substandard species and substandard material. Most of the time A. ferox is totally replaced with substandard species. This not only threats the efficacy of the medicine but also cause deleterious effects. This review gives us an opportunity to discuss unfold pharmacological properties of Vatsanabh as per Ayurveda, the problems of adulteration and possible remedies.

Biography: Dr. Dilip S. Wadodkar is a Professor & Head in the Department of Rasashastra Bhaishjya Kalpana at Govt. Ayurved College, Osmanabad, under Maharashtra University of Health Sciences, Nashik. He had completed M.D. in Rasashastra Bhaishjya Kalpana at Institute of Post Graduate Teaching & Research, Jamnagar in 1988. He was awarded by Nagarjun Medal for Best Research Work in the year 1988 by The Academy of Ayurveda, Vijayawada (AP) for his contributing work on Tamra Bhasma & Asthma. In the year 2001 he received Best Teacher Award from Pune District Education Institution and in the year 2006. He was selected for Pandit Vaidya Ramnarayan Sharma "Adarsha Ayurved Shikshak Puraskar" award by All India Ayurveda Teachers Association, New Delhi. He has 30 years of teaching experience for under graduate & 26 years experience of post graduate teaching. He is Ph. D. Guide in Maharashtra University of Health Science, Nasik since 2011. For his contributory and innovative work in Rasashastra & Bhaishjya Kalpana, he was honored by International Excellence Award in 2007 by Tathagat Ayurved Foundation, at Singapore. He was invited as a guest speaker/ chairperson of scientific sessions in various International Conferences held in Singapore, Malaysia and Dubai. He was honored as eminent "Rasacharya" at the holy hands of Hon'ble Chief Minister of Maharashtra, Shri Devendra Phadanvis, on 9th Oct 2015. He was the key person in Entrepreneur Development Program organized by D. I. C. & M. C. E. D. Nanded. He rendered expertise on "Industrial Opportunities in Ayurveda" during the period 1997 to 2000. He is keen in social services also. He is Ex Secretary Lion's Club of Nanded Medicos. He is active member of N. I. M. A. Nanded and Ayurved Vyasapith.

CONSERVATION OF HIGH ALTITUDE MEDICINAL PLANTS

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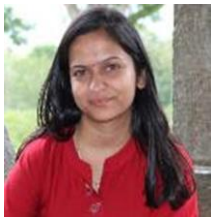
Himalayan region is known for home of many high altitude medicinal plants. The study of WHO has shown preliminary result those individual using medicinal plants is large scale. It is not just in developing countries that medicinal plants are important; many multinational companies are using medicinal plants for drug preparation. In the face of threats posed by increasing demand, increasing population and extensive destruction of plant-rich habitats such as tropical forests, wetlands, ecosystems; no concerted effort has been made to ensure conservation, which is further destroying the habitats. WHO, IUCN, and WWF are working with administrators and policy-makers in health and conservation, and covered the disciplines of ethnomedicine, botany, education, pharmacology, nature conservation and economics.

The race for discovering new wonder drugs has led to threats of extinction or severe genetic loss of many medicinal plants. No or very few conservation actions have been taken, even ex-situ conservation. Medicinal plant conservation is challenging, since the taxa occur in a wide range of habitats and geographic regions. However, it is widely agreed that the conservation of medicinal plants can be achieved through an integrated approach balancing in-situ and ex-situ conservation strategies. The best way to provide the plant material needed for medicine is to cultivate the plants. This is far better than collecting the plant material from the wild since it does not deplete wild stocks, endangered and over-exploited plants and in many cases, the declining habitats of native plants can no longer supply the expanding market for medicinal plant products. Medicinal plant conservation must therefore operate within several spheres; drawing together disparate groups and mutually acknowledging different stakeholders interest in order to succeed. Further for sustainable cultivation of medicinal plants; the Ministries of Agriculture, Forestry and Health should co-ordinate a program to develop policies and programs for cultivation of medicinal plants.



Biography: Dr. Kopila Adhikari an Ayurvedic Physician (MD- Ayu) District Ayurveda Health Centre, Ratnanagar, Chitwan. Dr. Adhikari has expertise in Ayurveda, Panchkarma and Yoga. She is playing an important role in health care system, academic, administration, yoga, panchkarma as well as herbal research research. She has visited several forest areas, industries, farm herbal pharmacy in different countries. She has been delivered lectures as a speaker in National and International Conference. Her area of research is Ayurveda & alternative system medicine traditional of medicine.

INTEGRATION OF CONCEPTS OF *AYUREVED* AND CONTEMPORARY METHODS AND TECHNIQUES FOR THE STANDARDISATION OF MEDICINAL PLANTS

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Standardisation of meditational plants has become a burning problem mainly due to lose of classical expertise, trade, commerce, and economic situations, as against the ancient medical services; and raises serious questions with respect to:

- Definition and Identification,
- Strength and Maturity,
- Purity and Adulteration

The Ayurvedic Pharmacopoeia of India provides only partial solution to overcome these problems. Other texts go for the assay of a single chemical component by HPTLC; instead, it will be more précised, if plant's chemical composition is worked outwith holistic approach, it does not mean few more molecules should be identified and assayed, but some of the chemical groups as whole should be assayed. This will be of great importance with respect to all of the above problems, and will also be helpful towards the concept of *Raspanchak* to some extent, as lot of the components will be quantified collectively. But this alone is not sufficient for the purpose of standardisation of medicinal plants with respect to the classical concepts of *Ayurvved.*

Hence furthermore parameters involving contemporary laboratory methods and techniques are needed, which is not the same as *Raspanchak,* but can go more or less parallel to this concept; thus a pathway may be approached properly. Several experiments in this field and dimension have been performed (by the author) with respect to:

- *Ras*: Experiments with *Shadrasatmak Drvya* on lower animal showed activities of the animals as per the *Panchmahabhautic* composition of the *Dravya*.
- *Guna*: *In-vitro* chemical and biochemical experiments on various *Dravya* with respect to their
- *Gurutva- Laghutva* showed their digestion rate or molecular composition accordingly.
- *Virya: In-vitro* biochemical experiments on various *Dravya* with respect to their *Virya* showed their biochemical activity accordingly.
- *Vipak: In-vitro* chemical experiments on various *Dravya* with respect to their *Vipak*are in accordance with the classical concepts.

Results are encouraging; they may require some improvement and refining. Thus a standard and holistic approach for standardization of the drugs of a holistic system of medicine i.e. *Ayurved* can be developed.

Biography: Dr. Shriramji Girijashankar Jyotishi earned MA in Pub. Admn., MSc in Org. Chem., and PhD in Pharm. Sci. He is visiting professor at Mahatma Gandhi Ayurved College, Wardha, Maharashtra, having 41 yrs of teaching experience. He is member of scientific advisory group, CCRAS, Ministry of AYUSH, Govt of India. Some of his Chem./Biochem./in vitro/in vivo experiments (76 till date) are: Animal model for Shadaras Siddhanta, Agneya dravya and Dhatu development, Agneya dravya and Paka Kriya, Dhoopan effecting biochemical factors, Twak Snigdhata-Colorimetry, Laghu and Guru–chemistry and biochemistry, Tulsi preserving food and water, Vipak in-vitro, Vish and antidote etc. along with several research papers, articles and monographs in API. He is former project officer of Ayu. Pharmacopoeia; Principal Investigator of standards of Cow urine at IIT, New Delhi and prepared kits for testing-Vermi-compost, soil and Bio-manure, and Cow urine. He designed/fabricated/assembled 20 instruments/apparatus most economically. His toxins-testing in crop for the project of Indian school students, brought Silver medal and for change in microbial flora in soil, Bronze medal in US to the student. He is reviewer for JAIM, Bengalore ; and AYU, Jamnagar; and is Member of Managing council for "Bharatiya Bouddhik Sampada", Nagpur. Trustee- World Ayu. Foundn, Bengaluru. & Patron- NASYA; Member- Governing Council, Vijnana Bharati, Bharat, (2012 -2014 and 2016 onwards). He was President-Vijnana Bharati, Vidarbha (2007-2016); Secretory - Vijnana Bharati, Bharat (2010–12).

Proceedings of the International Conference on "cultivation and sustainable use of high-altitude medicinal and aromatic plants for the socio-economic development" organized by Uttarakhand Ayurved University on 29-30 November, 2019 at Dehradun, India.

PLANT GUM BASED NANOGELS AS DURG DELIVERY DEVICE

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Systematic study and development of modern plant based drugs started only in the 19th century but their use as a potential material for curing the diseases is known since ages. Plants are considered as the back bone of the tradirtional system of healing through out the globe. Due to their less toxicity, cost effectiveness, natural healing power and easy availability, they are used as the main source of drugs. In the present paper we are trying to draw the attention that not only viable part of the plants are useful but the gum excuded (secreted) by the plants can also play a significant role in the drug delivery, gums and resins are very less studied for their aplication as drugs. We have used the gum secretion of *Moringa oleifera* plant for the preparation of hydrogel, these hydrogel are very sensitive to pH changes, we have harnessed this property of these gels for the site selective drug delivery. The drug we have used for our study is doxorubicin a very potent cancer drug. In vitro model have shown that these hydrogel are very sensitive and releases the drug only to the targeted site of the cancer growth (particular pH) without affecting the healthy cells.

Biography: Prof. Veena Joshi is currently working in the the department of Chemistry at S.R.T. Campus of HNB Garhwal University. She earned her MSc in 1987 and PhD in 2005. She has a total of 30 years experience of teaching and research. She is member of Association of Chemistry Teachers, Radnet Society, Indian Science congress Association, Geohazard Society and Indian Chemical Society. She has supervised 4 PhDs together with many master students and already completed three research projects funded by DAE-BRNS. She has been an active member of various university level committees. Her current areas of research are natural products, organic synthesis and material Science.

METABOLOMICS TO UNDERSTAND THE CHEMISTRY OF MEDICINAL AND FOOD CROPS OF WESTERN HIMALAYA

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Food crops based medicines and nutrition's are available over the counter at global trade market. *Food crop* species are enriched in phytochemicals including nutrition and claimed to treat various disorders such as diabetes, cardiac and kidney disorders, pain, inflammation and skin related problems. The detailed study to understand the nutrition in different samples of food crop are need of hours. Thus, NMR based metabolomics of different food crop samples collected from different locations of Western Himalaya were carried out. A different class of compounds were unambiguously identified using ^{1}H, ^{13}C, DEPT 135, COSY, HSQC, HMBC techniques and quantified using relative quantification method. Concentration-dependent stacked chart, HCA, and PCA showed the differences and similarities among different samples. The chemical compounds were identified as nutritional value of the food crop. The food crop contains a significant mixture of nutritional molecules within locations of western Himalaya. Trends of metabolites alteration, up and down regulation in food samples were noticed which highlights the responses of the plant at different conditions. NMR based comprehensive metabolite-information developed the chemical signature, quality control chemical markers and strategies to understand nutritional diversity and biochemical synthesis in the crops. Chemo information of food crops will also provide an idea about the extensive utilization in the global market.

Biography: Dr. Dinesh Kumar is presently holding a post of Sr. Scientist of NMR, Metabolomics & Natural Product Chemistry in the Natural Product Chemistry and Process Development Division at CSIR-Institute of Himalayan Bioresource Technology, Palampur. In addition, he is Nodal Scientist for the Technical Services available in the institute. He has awarded PhD in Pharmaceutical sciences in 2012 from University of Kashmir, Srinagar, India. He worked as lecturer at Punjab college of Pharmacy, Ferozpur in 2006-07 and as Asst. professor at Rayat Institute of Pharmacy-Railmajara, Punjab, India in 2009-10. He had worked as Research associate (SMPF) in 2012-2013 at Department of Pharmaceutical Sciences, University of Kashmir, Srinagar, India. He has been a Postdoctoral fellow in Department of Pharmaceutical Sciences, Tshwane University of Technology, South Africa. He is consultant for various herbal and Biotech industries in India and abroad. He has published more than 70 International papers and received many prestigious awards including INSA, CSIR, KU, etc.. He is editorial board member and reviewer of various internationally reputed journals. His major areas of research are metabolomics, herbal drug development and standardization.

PROGRAMS AND SCHEMES OF NMPB: AN OVERVIEW

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National Medicinal Plants Board (NMPB) was set up in the year 2000 vide Resolution No. Z.18020/19/97-MP Cell, dated 24th November, 2000 to look into all the matters related to Medicinal Plants and to formulate policies along with coordination with other ministries and departments dealing with medicinal plants.

NMPB supports cultivation of medicinal plants and marketing research activities that are community-based and engage various stakeholders. NMPB develop all further programmers that can influence sub-national, national and international policy objectives also, principally in the area of Forest & Conservation, Regulations governing MAPs cultivation, marketing and trade, Information Education & Communication, Training & Capacity Building, Research & Development, Cultivation, Sustainable Harvesting & Post-Harvest Management, Export Promotion, Networking, Knowledge Management & IT Intervention, Programs & Schemes. Presently NMPB, Ministry of AYUSH run three schemes i.e. Central Sector Scheme on Conservation, Development and Sustainable Management of Medicinal Plants, ''Medicinal Plants'' Component under Centrally sponsored Scheme of National AYUSH Mission (NAM), and Voluntary Certification Scheme for Medicinal Plants Produce (VCSMPP).

Biography: Dr. N.K. Kumawat is presently a Research Officer (Ayurveda) in NMPB, Ministry of AYUSH, Govt. of India. He has a rich experience of clinical and also worked as a lecturer. He published more than 30 research papers and 2 books on medicinal plants are already in his credit. He is a member of various advisory committees. Besides, he is an editorial board member and a reviewer for many reputed and peer reviewed journals. He attended many national and international conferences and workshops in a capacity of a resource person.

EVALUATIONS OFANTIOXIDANT ACTIVITY OF HIGH ALTITUDE PLANTS CONSTITUENTS TO CONTROL NEURO-INFLAMMATION INDUCED BY HIV PROTEINS GP120-41 AND TAT USING SK-N-SH NEURONAL CELL LINES

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Neuroinflammation is inflammation of the nervous tissue. It may be initiated in response to a variety of cues, including infection, traumatic brain injury, toxic metabolites, or autoimmunity. In order to control the neurological complications associated with HIV, it is pertinent to consider the development of an effective antioxidant therapy. This study aimed to check the antioxidant capacities of compounds of natural origin (CNOs) isolated from high altitude Indian medicinal plants using a standard Oxygen Radical Absorbance Capacity assay based on fluorescein (ORAC-Fl assay). Based on the ORAC-Fl assay, The CNOs were classified on the basis of their antioxidant capacities as weak, moderate and strong. With the exception of one CNO, all the others showed antioxidant capacity. In addition, certain CNOs were found to be effective in reducing gp120-41 and Tat generated oxidative stress in SK-N-SH cell lines, quantitated using a fluorescent probe, 5 (6)-carboxy-2,7-dichlorofluorescein diacetate (CDFH-DA). These encouraging *in-vitro* preliminary findings suggest that use of these CNOs may lead to the development of an effective antioxidant therapy for use in the prevention, progression, and possible treatment of neurological complications associated with oxidative stress generated by HIV proteins.

Biography: Dr. Rajni Kant Sharma did his UG from Kurukshetra University, MSc Pharmaceutical Science from Guru Nanak Dev University Pujab, PhD in Natural product chemistry from HNB Garhwal Central University, Uttarakhand. Postdoctoral research follow from University of Cape Town South Africa (2009-2014). He has 25 Publications in natural product research and drug discovery. He has 3 patents in his credit. Presently he is working as Research Scientist in Central Research Laboratory Shri Krishna AYUSH University, Kurukshetra, Haryana.

RECENT DEVELOPMENT IN THE HERBAL MEDICINE RESEARCH

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Although approximately 80 percent of people today depend upon herbal medication as a component of their primary healthcare according to World Health Organization, there is still great concern about the safety and efficacy of herbal use. Herbal medicine is the use of medicinal plants for prevention and treatment of diseases: it ranges from traditional and popular medicines of every country to the use of standardized and tritated herbal extracts. Generally cultural rootedness enduring and widespread use in a Traditional Medical System may indicate safety, but not efficacy of treatment, especially in herbal medicine where tradition is almost completely based on remedies containing active principles at very low and ultra low concentrations. While herbal medicine can potentially contribute to the advancement of healthcare, many major challenges must be overcome prior to the successful integration of herbal remidies into mainstream medicine. For the incorporation of safe and effective herbs into the medical system to become a reality, more researchers and doctors need to be trained in both modern medicine and herbal drugs that has been accumulated since ancient times. Finally the question how to address the need for standardizing (the basis of modern pharmacology) treatment of herbs must be settled. Once these issues are resolved the prospect exists for widespread use of herbal medicine as a safe, effective and affordable form of healthcare. In the age of globalization assessing the transferability of treatments between different cultures is not a relevant goal for clinical research, while are the assessment of efficacy and safety that should be based on the regular patterns of mainstream clinical medicine. Herbal derived remedies need a powerful and deep assessment of their pharmacological qualities and safety that actually can be realized by new biologic technologies like pharmacogenomic, metabolomic and microarray methology. Because of the large and growing use of natural derived substances in all over the world, it is not wise to rely also on the tradition or supposed millenarian beliefs; explanatory and pragmatic studies are useful and should be considered complementary. There are some obvious reasons for the current condition of research on herbals. The first is lack of sustainable funding in this area. Functional mechanisms for intersectoral, interdisciplinary collaborations on training and sustaining people to do high quality herbal research and on implementation and further refinement of good practices, various expertise needed for high quality herbal medicine research scattered around different parts of the word.

Biography: Prof. Sanjay Goswami is presently a Head Department of Rachna Sharir. He did BAMS from Govt. Gurukul Ayurvedic College, Haridwar and MD from Govt. Ayurvedic College, Nagpur, Maharastra. He has more than 20 years of teaching experience. He has published more than 30 research papers and books.

SCENARIO OF HIMALAYAN MEDICINAL PLANTS PROPOSED AS SANJĪVANĪ - BOOTI

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The herb is mentioned in the Rāmāyaṇa when Rāvaṇa's son *Indrajīta* (Meghanāda) hurls a powerful weapon at *Lakṣamaṇa*. *Lakṣamaṇa* is badly wounded and is nearly killed by *Indrajīta*. *Hanumāna* was called upon to fetch this herb from the mount *Droṇagirī* in the Himalaya. Upon reaching *Droṇagirī Parvata*, Hanuman could not identify the herb and lifted the whole mountain and brought it to the battlefield. Since then, the question of existence of such life giving herb has been floating in the mind of people. According to the *Rāmāyaṇa*, the *Sanjīvanī-Booti* is found in the Himalaya and has the unique properties. According to Hindu mythology *Sanjīvanī* is a magical which have the power to cure every known and unknown malady. Several Plant Species present at Indian Himalayas considered as Sanjīvanī. Sanjīvanī is a Life Promoting herb, so the herbs which are Antioxidant, wound healing action, immunomodulator, adaptogenic, protect from harmful radiation and from heat stroke, cold stroke are believed to be Sanjīvanī Booti. *Selaginella bryopteris*, *Saussurea gossypiphora, Pleurospermum candollei* and *Rhodiola* species most popularly Known as Sanjīvanī.

Biography: Prof. Suresh Chaubey obtained his doctoral degree (PhD) from Dr. Sarvepalli Radhakrishnan Rajasthan Ayurved University, Jodhpur, Rajsthan. Currently he is professor in the Department of Dravyaguna, at Rishikul Campus, Haridwar, Uttarakhand Ayurveda University. He has a total of 16 years experience of teaching and research. His major research interest is identification and therapeutic actions of original drugs and their substitutes. He has Published more than 40 research papers in National and International Journals and has been serving as a number of scientific bodies in India. He is the author of 13 books on Ayurveda.

E-CHARAK - E-CHANNEL FOR HERBS, AROMATIC, RAW MATERIAL AND KNOWLEDGE – A NETWORKING PLATFORM AND VIRTUAL MARKET PLACE FOR MAP STAKEHOLDERS

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India is home to rich herbal biodiversity and traditional medicines. Medicinal plants as a bioresource also has a significant role to play in sustaining the livelihoods of millions of people, especially the marginalized. Scattered sources of supply, unorganised and traditional trade, stress supply, unidentified demand, lack of data on cultivators, traders, aggregators, etc. are bottlenecks to ensuring a fair price for produce of farmers and collectors.

As the cultivation, trade and use of medicinal plants is gaining momentum, use of technology offers an effective and efficient tool for facilitating forward-backward linkages for promoting overall sustainable development of the medicinal plant sector.

A move in this direction, by the National Medicinal Plants Board, is the provision of a virtual platform that facilitates information exchange among various stakeholders involved in the medicinal plants supply chain.

e-CHARAK - e-Channel for Herbs, Aromatic, Raw material And Knowledge is a one-stop virtual platform and marketplace that networks and provides for a seamless flow of information among MAP stakeholders. The platform also acts as a digital repository of stakeholders and medicinal plants related information resources.

Biography: Dr. N.K. Kumawat is presently a Research Officer (Ayurveda) in NMPB, Ministry of AYUSH, Govt. of India. He has a rich experience of clinical and also worked as a lecturer. He published more than 30 research papers and 2 books on medicinal plants are already in his credit. He is a member of various advisory committees. Besides, he is an editorial board member and a reviewer for many reputed and peer reviewed journals. He attended many national and international conferences and workshops in a capacity of a resource person.

ORAL PRESENTATIONS

CULTIVATION OF MAPs AS SUSTAINABLE TOOL FOR ENHANCING SOCIO-ECONOMY AND CONSERVATION: A SPECIAL CASE STUDY OF AN ENDANGERED MEDICINAL PLANT *NARDOSTACHYS GRANDIFLORA* (JATAMANSI) IN CHAMOLI DISTRICT OF GARHWAL HIMALAYAN REGION

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Now days, the environment balance and socio-economic development of the inhabitants have been recognized globally for sustaining biodiversity. The Indian Himalayan region occupies a special place in the mountain ecosystem of the world and support huge biodiversity in its high altitude region. Approximately 80% need of the high altitude inhabitants are derived from biological resources. Climate change coupled with high anthropogenic pressure leads to rapid depletion of plant biodiversity and many of them have been included under threatened category. Today government of Uttarakhand policies focusing not only on conservation of medicinal plants for reducing exploitation of biodiversity as well as to promotes cultivation of medicinal plant for social uplift of farmers. Although, cultivation of high altitude MAP's is a promising option for inhabitants but it also requires scientific and legal knowledge of its agriculture practice. Also, the long time to attain full maturity, lack of information about post-harvest management and trade of produce hesitate them to shift from traditional cultivation to untested high value MAP's cultivation practice. And to address the key issues time to time different activities has been conducted as diffusion and popularization of information, on ground training and support, providing plant material and to make database of high altitude MAPs (*Nardostachys grandiflora*) farmers. *N. grandiflora* is an endangered, primitive and therapeutic herbal agent belonging to family *Valerianaceae*. It is a perennial, dwarf, hairy, rhizomatous medicinal herb and grows in steep, moist, rocky, undisturbed grassy slopes between 3000 and 5000 m asl in random forms in higher Himalayan region. The plant used for therapeutic many activities like antifungal, antimicrobial, antioxidant, hepatoprotective and cardio protective properties, insomnia and CNS disorders. Oil obtained from the roots is used as a drug, in perfumery, as a hair tonic and also imparts black colour to the hair and in many medicinal preparations. Despite a ban on its mass collection, the population of Jatamansi (*Nardostachys grandiflora)* is shrinking due to illegal collection and severe human interference. The proposed study will focus on detailed investigation of the socio economic value, development of sustainable collection and cultivation of this highly valuable plant. To meet these objectives the study was carried out in selected villages of different developmental block of districts Chamoli of Garhwal region. Semi structured questionnaires were prepared, group discussion and personal interview with inhabitants was used at village level to know the status of cultivation, collection and trade of this species. It can be observed from the data that cultivation of *N. grandiflora* plant can play important role in the livelihood strategies of inhabitants as well as to sustain conservation in the high altitude region of Garhwal, Uttarakhand. Similarly the success of cultivation of this species will largely depends upon the return from its produce compared to other crop. From field survey and collected data it can be evaluated that cultivation of *N. grandiflora* plant is a viable option to lift up economic condition as well as to sustain its natural habitat.

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ROLE OF HERBAL MEDICINE FOR PREVALENCE AND TREATMENT OF DENGU FEVER IN INDIA

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Dengue is endemic in more than 128 countries; about half of the world's populations are at risk for infection. In the last one decade several minor or major outbreaks have been reported from various parts of India**.** In India during the period 1996-2015, dengue cases reported more than 5 times due to increase global warming unplanned urbanization, changes in environmental factors, host–pathogen interactions and population immunological factors**.**In India monsoon usually starts in July and ends in September–October, this is common season for dengue fever also. Main endemic state for dengue in India is Assam, Bihar, Uttarakhand, Jharkhand, and Orissa. Dengue viruses are the causative organism of dengue fever (DF) and dengue hemorrhagic fever (DHF). Dengue virus belongs to family Flaviviridae. Dengue virus has four serotypes (DENV-1, DENV-2, DENV-3 and DENV-4) that spread by the bite of infected *AedesAegypti* mosquitoes. In *Ayurvedic* perspectives, Dengue fever comes under the group of *AbhishangajaJvara*. Dengue fever can be controlled and prevented by the number of herbal drugs which is free from any side effects. Very limited number of plants show efficacy against dengue virus. Aqueous extract of Neem leaves which have Azadirachtin compound have action against replication of dengue virus type-2 (DENV-2). *Carica papaya* leaf extract (CPLE) have potential activity against Dengue fever by increasing the platelet (PLT) count, white blood cells (WBC) and neutrophils (NEUT). Tea, which is prepared by using *Ocimum sanctum* boiled leaves, acts as a preventive medicament against DF. Herbal extracts of Neem *(Azadirachta indica)* and Karanj *(Pongamia glabra)* showed ovicidal activity against *Aedes aegypti*. CCRAS also advice a combination of Shunthi (Dry Ginger) powder and Guduchi (*Giloye*) powder which is effective in Dengue fever.

AROMATIC PLANTS OF HIMALAYAN REGION OF UTTARAKHAND USED IN AYURVEDIC SYSTEM OF MEDICINE

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In recent years there has been great upsurge in the study of Indian herbs. Ayurvedic medicines have stood the test of time through centuries of continued use as medicines. The present study has brought to light some interesting data on some selected plants used in traditional medicinal system of India particularly in the Himalayan region of Uttarakhand. Aromatic plants like *Artemisia japonica, Artemisia maritime, Boenninghausenia albiflora, Cedrus deodara, Centella asiatica* etc, will be screened for determining their true therapeutic and pharmacodynamics properties, ethno-medicine depending upon Ayurvedic principles. The traditional sources contain thousands of recommendations for cure and treatment of different diseases but few selective and effective drugs described here will be discussed. The plants used in the form of spices, cultivated or un-cultivated will alsobe listed during presentation.

PHYTOREMEDIATION BY HIGH ALTITUDE MEDICINAL PLANTS – SCOPE AND CHALLENGES

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Environmental pollution and its adverse effects constitute great threat to the plant and animal kingdom. Diseases like Parkinsonism, Alzheimer's disease Cardiovascular & Respiratory diseases are direct or indirect outcome of air pollution Exposure to these air pollutants in pregnancy can even result in s lower reflexes, learning deficits delayed mental development and Autism like conditions in the newborn Soil is also getting more polluted nowadays by heavy metals and pesticidal use, which will affect the quality and productivity of soil there by affecting the public health status. So considering the current scenario, control of pollution should be the first and foremost aim of the public for a healthy living, which can be accomplished through the inherent natural remedy 'Phytoremediation'. Phytoremediation is the use of living green plants for in situ risk reduction and/or removal of contaminants from contaminated soil, water, sediments, and air. By Phytoaccumulation plants take contaminants, mostly metals, metalloids and radionucleids, mainly through the roots or through foliar adsorption and accumulate them in large quantities with in their stem and leaves. This will results in various morphological and physiological changes at both cellular and molecular levels resulting in increased production of Reactive Oxygen species, enzyme deactivation, blocking of functional groups and damage of protein, lipids and nucleic acid finally affecting plant quality. Health care management system is facing a crisis in this regard because even the safety & efficacy of medicinal plants is adversely affected with this increasing pollution. The aim of this study is to assess the phytoremediation potential of selected high altitude medicinal plants and its impact on plant quality. Detailed pharmacognostic and phytochemical analysis of selected plants were done. Atomic Absorption Spectroscopy (AAS) was done for analyzing the heavy metal contamination. Phytochemical analysis showed that both the quantitative and qualitative parameters are getting affected in plants in correspondence with the heavy metal contamination. Public awareness should be done regarding the pollution controlling potential of medicinal plants, but at the same time we should be careful in ensuring the safety and efficacy of these plants while taking for medicinal use, especially from polluted areas. So the concept of Prasasthadesa for Oushadhasangrahana also needs to be emphasized if we want to achieve positive health through our medicinal plants.

A SURVEY ON THE IMPORTANT MEDICINAL PLANTS OF TIMLI FOREST OF SHIVALIK HILLS AND PHYTOCHEMICAL SCREENING ON FEW SELECTED PLANTS

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A study has been attempted in Timli forest range in the foot hills of Shivaliks in Uttarakhand with an aim to conduct a survey for the identification of local plants that can be potent ethnomedicines. Those plants extensively used by local villagers were attempted to be documented, collected and analyzed for phytochemicals in order to assess their secondary metabolites. This information on secondary metabolites is desirable to know the ethnomedicinal value of a plant. Atleast twenty medicinal plants were chosen and subjected to phytochemical analysis. Ethno-botanical surveys were conducted in Timli forest range of Shivalik hills. The plants were identified comparing with the classification systems and with the help of latest monographs and floras. The identification and nomenclature of all species was performed in accordance with the international code of botanical nomenclatures. Fresh leaves of twenty different plant species were collected and identified with their correct botanical, taxonomic identification and authentication. Twenty plants leaf samples were extracted for phytochemical analysis. Preliminary qualitative phytochemical screening was carried out using various methods. The preliminary qualitative phytochemical screening of 20 medicinal plants showed the presence or absence of bioactive compounds like anthocyanins, coumarins, emodins, fatty acids, leucoanthocyanins, steroids, saponins tannins and terpenoids. This phytochemical screening demonstrated the presence of different types of phytocompounds which could be responsible for the various medicinal properties and plant defense against predation and harmful microbes. Preliminary qualitative test is useful in the detection of bioactive principles and subsequently may lead to drug discovery and development. Phytochemical screening of medicinal plants is very important in identifying new sources of therapeutically and industrially important compounds. It is also useful in the preparation of pharmaceutical and nutraceutical products of commercial importance. Cultivation of herbal flora and its conservation can play an important role in livelihood enhancement of rural population. Ethnomedicines rich in phytochemicals is becoming a medicinal trend for the management of human ailments. Exploitation of these phytochemicals furthers by a more a refined, sophisticated and quantitative investigation is essential. About 80% world populations rely on traditional medicine for primary health care. There is a need to advance research for the development and characterization of new natural drugs, without any resurgence to these investigations.In this study, the preliminary qualitative screening will provide a basic overview on the richness of medicinal properties of the study area. Furthemore, it helps in identification of specific medicinal plants based on the presence of major phytochemicals. This will ensure in bringing out the potent ethnomedicines of this area for the wellbeing of the community in the near future.

IMPORTANCE OF CHARAKOKT BHESHAJ PAREEKSHA IN PRESENT PERSPECTIVE

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During ancient times, drugs were prepared by the physician himself to cater the need of his patients in small batches. Over the centuries, these practices were changed and resulted in large scale manufacturing and wide distribution of Ayurvedic drugs at national and international levels.This commercialization should always ensure quality of products using proper standardization parameters.The importance of drugs is known since ages. The world's oldest available written literature i.e. *Vedas* glorify the drugs by giving it the status of *Brahma*. During the process of evolution, man with his superior mind started using various herbs for the treatment of various ailments. The history of medicine began from that time which further leads to invention of various treatment modalities. Amongst all pathies, *Ayurveda* is the oldest science of life which has its roots in *Vedas*. *Dravyas* form an integral part in all eight branches of *Ayurveda*. *Acharyas* have claimed that there is nothing in this world which cannot be used as medicine. But the benefits or harm depends on the physician's skill, which drug he chooses and how he makes its use. Hence*Dravya* is a tool of *Vaidya*. It is stated as *Karana of Chikitsa. Ayurvedic* classics give importance to*Aushadha* as a part of *Trisutra Ayurveda*. Even in *Chikitsa Chatushpada, Dravya* has been given second position. Drug has specific role in the treatment of disease for achieving the objectives of *Chikitsa*. Selection of drug for *Chikitsa* depends chiefly on pathological factors *(Sampraptighatakas)*, disease itself, and cardinal features etc.

IMPORTANCE OF MEDICINAL PLANTS IN CONTEXT OF NATIONAL HEALTH AND WEALTH

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India is known for its traditional medicinal systems - Ayurveda, Siddha, and Unani. The Ayurveda concept appeared and developed between 2500 and 500 BC in India. A nation health and wealth can be maintained when each and every individual of nation can live a quality life. Ayurveda is the only science which can fulfill this. It has mainly two aims – one is to maintain the health of healthy person and other is curing the disease of ill person. For this, two types of *bheshaja* or medicinal plants have been described in Ayurveda, *Swasthasya-Urjaskar (maintaining health of a healthy person) and Artasya-Roganut (for curing diseases)* respectively. For the maintenance of health, these are further given as *Rasayan* (Rejuvenating) and *Vrishya* (Aphrodisiac) *Dravya* in *Swasthasya-Urjaskar* concept i.e. drug which are health promoting and energy producing. Medicinal plants can also be used as lactating fodder for increasing animal milk production thereby increasing wealth. Medicinal plants can successfully used as fertilizers and pesticides thereby increasing national wealth. Thus, medicinal plants are playing a crucial role in health and wealth promotion of nation.

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CHEMICAL CONSTITUENTS OF *URTICA ARDENS* LEAVES

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Urticaceae is a large family of about 45 genera and 550 species found in tropical and temperate regions, 21 genera and 120 species in India. The plants of this family are herbs, undershrubs or rarely trees, without latex; epidermal cells often cystoliths, stem fibrous, leaves alternate or opposite, simple, stipulate or not. Flowers are minute, unisexual, regular, usually cymose, sometimes crowded on enlarged receptacle. Perianth lobes 3-5, sepaloids, free or united and stamens are equal to tepals, inflexed in buds, pollens 3-5 porate, spheroidal, stenopalynous. Ovary 1-locular, 1-erect ovulate, style simple and fruit achene or drupe. Urticaardens, vern. Stinging nettle, belong to family Urticaceae is a perennial, erect, pubescent herbs or shrubs often attaining to 2.5m high; stem greenish-pale, bark fibrous, petioles, leaves, branches covered with stinging bristles. Flowers are small, pale green, clustered on spreading, axillary 4-8cm long, paniculate cymes. Male flowers with 4-perianth segments and 4 stamens. Female perianth segments 4, unequal, inner ones twice longer than outer ones. Achenes ovoid, pale-brown, hairy, enclosed by persistent perianth..The plants of genus Urtica is distributed throughout the world including Paraguay, Uruguay, Brazil, southwest of Hubei province, China, Asia, America, Europe, Iran, Greece and Turkey. The present abstract deals with isolation and characterization of 3β-hydroxy-35- (cyclohexyl-5'-propan-7'-one)-33-ethyl-34-methyl-bacteriohopane and Glucopyranosyl-O-(1-2) fructofuranoside (Sucrose) from methanolic extract of leaves of *Urticaardens*. The structures of isolated compounds was confirmed by spectroscopic methods viz. UV, IR, NMR and Mass.

IMPACT OF ALTITUDE ON SECONDARY METABOLITES, ANTIOXIDANTS AND ANTIMICROBIAL ACTIVITIES OF *TAXUS WALLICHIANA* ZUCC.: A THREATENED ANTI-CANCEROUS PLANT OF INDIAN HIMALAYAN REGION

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The present study aimed to assess the impact of altitude on the bioactive compounds, antioxidant and antimicrobial activity of *Taxus wallichiana* Zucc. Plant needles were collected from three different altitudes having different environmental conditions and investigated for phytochemicals such as phenol, flavonoid, flavanol, taxol and tannin along with antioxidant and antimicrobial activity. Results revealed that the phytochemicals and biological activities were present in all the sampled populations but their quantity varied significantly across the populations. Total phenol, flavonoid content and bioactive compounds such as gallic acid, ascorbic acid and quercetin showed significant positive correlation with altitude ($p<0.01$) and antioxidant activity (DPPH). In contrary, tannin, taxol and flavanol content of the plant have not shown any relation with altitude, but showed positive significant correlation with antibacterial activity. This work suggests that the accumulation of bioactive compounds in *T. wallichiana* needles depend on the edaphic and climatic conditions of the habitat and plant antimicrobial property is mainly due to taxol, flavanol and tannin compounds.

EFFECTS OF *ABELMOSCHUS ESCULENTUS* POD EXTRACT ON HYPERLIPIDEMIA IN HUMANS

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Current study is aimed to find the potential of *Abelmoschus esculentus* aqueous extract to reduce Serum Triglyceride, Serum Cholesterol, HDL Cholesterol, VLDL Cholesterol, CHOL/HDL Cholesterol Ratio of the Human blood. Hyperlipidemia is one of the major problems prevailing among humans today in which there is increased blood lipids content including LDL, HDL, VLDL, Cholesterol and serum triglyceride. LDL (Low Density Lipid) is one of the five major groups of lipoproteins, which transport all fat molecules around body in extracellular fluid. LDL is not considered good for body as it can cause atherosclerosis if oxidized in the wall of artery. HDL (High Density Lipid) is also a lipoprotein, which is considered as good fat as it transports fat from body within water around cells. Serum triglyceride is a type of fat in the blood. High triglyceride in the blood may be responsible for coronary artery disease especially in human females. Increased lipid content in human blood can raise the risk of many heart diseases including heart attack. To combat with hyperlipidemia using pod extract of *Abelmoschus esculentus* to reduce lipid content of blood is doing an effort.The pods of *A. esculentus* are also used for medicinal purpose due to its anti-hyperlipidemia, anti-diabetic and anti-oxidant properties. Fully automatic access Robertic biochemistry Analyzer (Response-90) by Diasys Company of Germany was used for lipid profile analysis. Blood samples were taken and the blood was centrifuged for separating blood serum from the blood sample. The blood serum samples were analyzed for lipid profile. Readings were recorded for serum triglyceride, serum cholesterol, HDL, VLDL, LDL, CHOL/HDL Cholesterol ratio for each blood sample. Initial blood samples were taken without plant extract, further blood samples were taken after giving whole plant extract of *A. esculentus.* Readings were recorded for lipid profile after 7^{th} day, 14^{th} day, 21^{st} day and 28^{th} day. From the current study it can be concluded that, oral ingestion of pod extract of *A. esculentus*has potential to reduce lipid content in human blood including serum triglyceride, serum cholesterol, HDL, VLDL, LDL and CHOL/HDL Cholesterol ratio. The pharmacological effects of *A. esculentus*can be attributed to constituents like mucilage, tannins, terpenoids, flavonoids and glycosides, which are present in all parts of the plant. Okra mucilage, okra pectin and okra fibers combat with heart diseases as it binds to cholesterol and bile acids, which carry toxins and dump it in liver.

GREEN SYNTHESIS, CHARACTERIZATION AND ANTIMICROBIAL ACTIVITY OF SILVER NANOPARTICLES USING LEAF EXTRACT OF *AJUGA PARVIFLORA* BENTH.

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In the present investigation, stable silver nanoparticles were synthesized via green approach. In this approach, silvernanoparticles were synthesized by the interaction of 3 mM silver nitrate solution with the aqueous leaf extract of *Ajugaparviflora*. Initial colour change and Surface-Plasmon-Resonance (SPR) absorbance bands between 448-456 nm gave support to the synthesis of silver nanoparticles. These nanoparticles were further characterized by XRD, EDX, TEM and FTIR techniques. XRD analysis showed that nanoparticles are crystalline in nature with face centred cubic phase. TEM measurements showed that nanoparticles are spherically shaped with their average size less than 16 nm. Important FTIR peaks at 3394.9, 1601.8, 1499.4 and 1419.9 cm-1 were predicted forhydroxyl, carbonyls, unsaturated C-Cbonds and phenolic groupsrespectively. Thus, the FTIR spectrum confirms the presence of phytochemicals which were responsible for reducing, capping and stabilizing the nanoparticles. Further, synthesized nanoparticles showed significant antibacterial activity against gramnegative *Pseudomonas aeruginosa* and *Escherichia coli* and gram positive *Staphylococcus aureus* and *Bacillus subtilis* bacterial strain.

PHYTOCHEMICAL AND NEPHROPROTECTIVE ACTIVITY OF *CICHORIUM INTYBUS* L. SEED AGAINST CISPLATIN INDUCED TOXICITY

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The aim of this study is to carry out the phytochemicals and pharmacological evaluation of *Cichoriumintybus*seeds extract to screen the therapeutic effects of the methanolic extracts of *Cichoriumintybus*L seeds against cisplatin induced nephrotoxicity. Many standardization parameters of *Cichoriumintybus* were analyzed. Standard method was adopted for the preliminary phytochemicals screening. Analysis of total phenolic and flavonoid contents, pesticides residues, aflatoxin & heavy metals were also performed. CAMAG- HPTLC system was used for fingerprinting of methanolic extract of *Cichoriumintybus*L seeds. The slides of surface preparation of leaf were prepared for quantitative microscopic parameters. The air dried powdered plant materials were subjected for determination of physicochemical standardization. Phytochemical screening was performed for Presence/absence of phyto-constituents in the plant which was helpful development of analytical profile. The antioxidant potential was evaluated by DPPH method, H2O2 scavenging method and reducing power method. The pharmacological studies include acute toxicity studies were carried out according to OECD 423 guidelines and methanolic extract of selected plants methanolic extracts were found to be nontoxic and nonlethal upto 3000mg/kg b.w. Phytochemical screening showed scavenging power (59μg/mL) at 100μg/mL concentration and 38μg/mL for Ascorbic acid. And methanolic extract of *Cichoriumintybus* showed concentration dependent scavenging activity against hydroxyl radical. The IC50 value of methanolic extract *Cichoriumintybus* was found to be 4.54μg/ml against standard ascorbic acid (IC50 2.50μg/ml) respectively. The total content 57.2 mg GAE/100 g & 5.61 mg QE/100 g phenolic compounds & flavonoids were respectively found in methanolic extract of *Cichoriumintybus.* Heavy metal residue, pesticide residue & aflatoxin residue were totally absent in *Cichoriumintybus* .The HPTLC method Toluene: Ethyl acetate: Formic acid (70:40:10 v/v) was found to be the best and gave good resolution with Rf 0.53 for quercetin acid and Rf 0.89 for quercetin. The proposed method was found to be precise, simple, specific and sensitive and can be used for quality control purposes of the plant *Cichoriumintybus* seeds. Heavy metals concentrations were found to be within standard limits. Aflatoxins and pesticides residues were absent. *Cichoriumintybus* seeds methanolic extracts (300 and 600mg/kg) revealed more nephroprotective action against Cisplatin treated acute nephrotoxicity. The outcome of this study might prove beneficial in herbal industries for identification, purification, standardization and nephroprotective activity of *Cichoriumintybus* seeds.

EVALUATION OF THE ANTIDIABETIC EFFECT OF *EPIPREMNUM AUREUM* ON STREPTOZOTOCIN INDUCED DIABETES IN RATS

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Diabetes mellitus is a complex group of metabolic disorders characterized by elevated blood glucose level due to deficient or ineffective production of insulin by β cells of pancreas In this study we examined and compared the antidiabetic effect of different extracts of *Epipremnum aureum* on blood glucose level, lipid profile, renal and hepatic function in streptozotocin (STZ) induced diabetes in rats. The animals showed significant increase in the levels of Blood glucose, Total Cholesterol, Triglycerides, SGOT, SGPT, ALP, Bilirubin, Urea, Uric acid, Creatinine and Total Protein and decrease in the HDL and antioxidant (SOD, GSH) level when compared to the normal animals. The results demonstrated that ethanol extract showed more significant results as compared to acetone and chloroform extract and standard preparation *Aloe vera*.

APPLICATION OF AN INTEGRATED APPROACH INCLUDING YAGYA THERAPY FOR THE MANAGEMENT OF EPILEPTIC SEIZURES

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Epilepsy is a chronic neurological disorder with widespread presence. As per Ayurvedic texts, Apasmara is a disease that has similar symptoms as those found in epilepsy; it is caused by the imbalance of any one or all of the three Doshas, i.e. Vata, Pitta, and Kapha. Hence, the medicinal herbs that balance the respective Doshas are used in the Ayurvedic treatment of epileptic seizures. Yagya is an ancient Indian therapeutic procedure, which nurtures nature's ecological balance, resulting in all-round well-being of an individual, as well as the entire cosmos. In the process of Yagya, coarse powder (havansamagri) made up of dry plant-medicines undergoes transformation into vapor phase, by the slow and controlled combustion process in Yagya fire. In addition, efficient oral and nasal inhalation of phytomedicines in medicinal-fumes, generated in Yagya, takes place because of pranayama, and chanting of Vedic hymns (Mantras) by the patient; these contribute to effective pulmonary administration of phytomedicines. The Mantras chanted during Yagya are intense spiritual prayers to the Almighty for the well-being of all; these contribute to the positive restructuring of the psyche of the participants. The bright light and heat of the fire experienced during Yagya have their own therapeutic advantages. Thus, Yagya Therapy (Yagyopathy) presents a multi-modal approach for the treatment of epileptic seizures. The aim of this study is to assess the efficacy of an integrated approach including Yagya Therapy in the management of epileptic seizures. Two case studies are being present here. In Case Study 1, an integrated approach including Yagya Therapy was prescribed to a patient (Male / 45years), who was suffering from epileptic seizures since past 13 years, as well as other associated ailments. The integrated approach included Yagya Therapy (using an appropriate herbal formulation - havansamagri), and some other Ayurvedic treatments like decoction of medicinal herbs, Ayurvedic medicines, dietary restrictions, etc. Before starting the integrated approach, the patient used to experience seizure episodes, at least once every 7 to 10 days; however, after starting the integrated approach, the patient did not experience any seizure episode up to his second visit, i.e. for about 54 days. He also experienced relief in other associated ailments like vibration in the entire body. In Case Study 2, Yagya Therapy was prescribed to a patient (Male / 65years) suffering from adult onset epilepsy, showing poor control with anti-epileptic drugs (AED). Before the start of Yagya Therapy, the patient had been suffering from epileptic seizures since about 3 years (about 8 to 10 seizure episodes annually) (pre-observation). After the start of Yagya Therapy, the patient took Yagya Therapy continuously for about 3.5 years, wherein only 2-3 episodes occurred during the first year, that too during sleep only, and after that no seizure episodes were experienced. All this time, the patient continued to take the allopathic medication that he was taking earlier. The integrated approach including Yagya Therapy has shown encouraging results with regards to the treatment of epileptic seizures and other associated ailments.

MEDICINAL USES OF *ALOE VERA* AND A NOVEL METHOD TO PREPARE ITS JUICE

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Many of the health benefits associated with *Aloe vera*have been attributed to the polysaccharides contained in the gel of the leaves. The thick fleshy leaves of *Aloe* plants contain not only cell wall carbohydrates such as cellulose and hemicellulose but also storage carbohydrates such as acetylated mannans. The most prominent monosaccharide is mannose-6-phosphate, and the most common polysaccharides are called glucomannans [beta-(1,4)-acetylated mannan]. Acemannan, a prominent glucomannan has also been found. The biological activities of this include promotion of wound healing, antifungal activity, hypoglycemic, anti-inflammatory, anticancer, immunomodulatory and gastro protective properties. The plant leaves contains numerous minerals, enzymes, amino acids, natural sugars and other bioactive compounds with emollient, purgative, antimicrobial, anti-inflammatory, anti-oxidant, aphrodisiac, anti-helmenthic, antifungal, antiseptic and cosmetic values for health care. This plant has potential to cure sunburns, burns and minor cuts, and even skin cancer. The external use in cosmetics primarily acts as skin healer and prevents injury of epithelial tissues, cures acne and gives a youthful glow to skin. It also acts as extremely powerful laxative. It provides nutrients such as Chromium and Magnesium. Deficiency of Chromium can result in diabetes which is on the rise. *Aloe* is a powerful detoxifier, antiseptic and tonic for the nervous system. It also has immune-boosting and anti-viral properties. Research has proven that adding *Aloe vera* to one's diet improves digestion. As a general health tonic *Aloe vera* has a large range of Vitamins - Vitamin B12, Vitamin A, Vitamin B3, Vitamin C, Vitamin E and Folic acid. Its gel contains important ingredients including 19 of the 20 amino acids needed by the human body and 7 of the 8 essential amino acids. While the known biological activities of *Aloe vera*will be briefly discussed, it is the aim of this review to further highlight a novel, effective and a cheap method for the preparation of *Aloe vera* juice.

IN SILICO AND *IN VITRO* APPROACH OF *ALLIUM SATIVUM* AND ISOLATED ALLICIN AGAINST MDR BACTERIAL STRAINS AND *MYCOBACTERIUM SMEGMATIS*

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Pathogenic microorganisms have emerged as Multi Drug Resistant (MDR) and in the past years the infectious diseases caused by MDR have increased dramatically. This study was done to investigate the antibacterial potential of *Allium sativum* and isolated allicin along with molecular docking with the proteins responsible for drug resistance. Methanol extract of *A. sativum* was prepared and the allicin was isolated by collecting the fraction using HPLC. Antibacterial activity against three MDR bacterial strains i.e. *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumonia* and two strains of *Mycobacterium smegmatis* were analyzed. Molecular docking was done for the confirmation of stable binding of allicin with the proteins involved in the metabolism of bacteria. The results showed that *A. sativum* methanol extract and isolated allicin have good antibacterial activity. MIC values of allicin were very less compared to the methanol extract of the *A. sativum* which shows that the allicin is active at concentration of 62.5 μg/ml against *P. aeruginosa* MDRKP2, *K. pneumonia* MDRPA3, *E. coli* MDEREC1, *M. smegmatis* 06, *M. smegmatis* 994. Allicin form the most stable complex with 2-trans-enoyl-acyl carrier protein reductase-inhA with the binding energy of the −4.31 Kcal/mol which is higher than the binding energy of −3.73, −3.41 and −2.74 Kcal/mol with topoisomerase IV, β- Lactamase and gyarse A respectively. These studies suggest thatmethanol extract of *A. sativum* and isolated allicin may be used as a drug against the MDR bacteria and *M. smegmatis* infections.

ESTIMATION OF TOTAL PHENOLIC, TOTAL FLAVONOID CONTENTS, *IN-VITRO* ANTIOXIDANT AND ANTIBACTERIAL POTENTIAL OF AQUEOUS EXTRACT OF *INULA CUSPIDATA* ROOTS

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Inula cuspidate belongs to family Compositae; it is an erect shrub, distributed in western Himalaya, usually found growing on steep rocky or precipitous ground. The objective of the present study includes estimation of total phenolic, total flavonoid contents and evaluation of antioxidant and antibacterial activities of aqueous extract of *I. cuspidate* roots. Total phenolic and flavonoid contents were estimated by folin–ciocalteu and aluminum chloride methods. *In-vitro* antioxidant activity was performed by four methods: DPPH (1,1-diphenyl-2-picryl hydrazyl radical) free radical scavenging assay, ferrous chelating assay, reducing power assay and nitric oxide scavenging assay.The aqueous extract was screened for antibacterial activity using macro-dilution method. The results of this study showed that aqueous extract of *I. cuspidata* roots has high total phenolic and flavonoid contents as well as potent antioxidant activity. The total phenolic and flavonoid contents were found to be 122.52 mg GAE/g and 24.15 mg QE/g respectively. IC_{50} value of aqueous extract was found to be 20.56μg/mL for DPPH, 215.52μg/mL for ferrous chelating and 452.22 μg/mL for nitric oxide scavenging assays. In reducing power assay, absorbance of aqueous extract was found to be 1.65 at 1000 μg/mLconcentration. Aqueous extract showed considerable antibacterial activity against Gram positive and Gram negative bacterial strains. Minimum inhibitory concentration (MIC) value for *Bacillus subtilus*, *Staphylococcus aureus* and *Escherichia coli* was found to be 375 μg/mL, while MIC value for *Pseudomonas aeruginosa* was found to be 750 μg/mL. The present study proves the *in-vitro* anti-oxidant and antibacterial potential of aqueous extract of *I. cuspidate* roots.

IN SILICO INHIBITION OF ERGOSTEROL SYNTHESIS IN *CANDIDA ALBICANS* BY NOVEL MODIFIED PHYTOCHEMICALS TARGETING STEROL 14A-DEMETHYLASE (CYP51) ENZYME

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Eugenol, a phytochemical present in different medicinal plants, it have been reported to possess antifungal activity. However, due to high minimum inhibitory concentrations, it is often overlooked and had never reached the next levels of drug development. With this background, we screened a series of modified eugenol-tosylate congeners to elucidate the binding mechanism of these congeners to lanosterol 14α-sterol demethylase (CYP51) enzyme in *Candida albicans*. Herein, we seek to offer molecular insights of CYP51 enzyme inhibition through all atom molecular mechanics approach and free binding energy estimations. We have selected three top most inhibitors namely ETC-5, ETC-6 and ETC-7 against CYP51 enzyme and explored their binding against the same target. It was evident from the analysis that all the inhibitors displayed stability in complex with CYP51 enzyme; however, ETC-5 exhibited enhanced stability and compactness. ETC-5 also unveiled better inward pulling effect which accounted for positive correlation motions in the active site residues. Likewise, ETC-5 revealed the most promising binding (ΔG_{bind}-36.5278 kcal/mol) as compared to other three inhibitors which disclosed relatively less favorable ΔG_{bind}. The highest binding energy of ETC-5 to CYP51 enzyme can be primarily endorsed to the upsurge in van der Waals energy by ΔE_{vdW}-46.7896 kcal/mol and Coulomb energy by ΔE_{ele}-18.4943 kcal/mol. Also hydrogen bond network is robust in ETC-5-CYP51 complex with four hydrogen bonds whilst it's less in other inhibitors. Thus, these studies can provide the development of novel antifungal drugs with multiple modes of antifungal actions, which could play a role in minimising drug resistance in fungal pathogens.

A VIEW ON RASAYANA KARMUKATVA (MODE OF ACTION) AND RELATED HERBS

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Ayurveda, a life science, gave the unique concept of balanced diet under the heading of Nitya Sevaneeya Dravya (Foods that are permissible to eat on daily basis). Promotion of proper nutrition is one of the eight elements of the Primary Health Care. Though great advances are made in the last fifty years in the knowledge of nutrition & practical application, poor section of the population continued to suffer from malnutrition in spite of increase in the food production. To bring global attention towards Ayurvedic system of medicine in concern to nutritional programme and to implement & to develop more nutritional programme in our system, a great interest has to be focused on the role of dietary factors in the promotion of health. Nitya sevaneeya Dravya's explained in Sushruta and Vagbhata Samhita, indicates the need for the Rasayana for healthy individual. The list of food ingredients those are advisable to consume daily are Shashtikashali (unpolished rice), Godhuma (wheat), Yava (barley), Mudga (green gram), Pathya , Amalaki (Indian gooseberry), Mridwika (dry grapes), Dadima (Pomegranate), Triphala, Patoli (snake gaurd), Madhu or Kshoudra (Honey), Sharkara (sugar), Sarpi (ghee), Jangalamamsa (meat of animals) , Saindhava (salt), Antarikshajala or divyodaka (pure water). The word Rasayana essentially refers to acquisition & circulation of nutrition needed to provide nourishment to the body tissues and tissue perfusion. Hence it may be presumed that a Rasayana agent acts at any of the following three levels, viz. Rasa, Agni and Srotas.

CLINICAL EVALUATION OF PARIJATA GUGGULU AND PANCHAKARMA THERAPY INTERVENTION IN FROZEN SHOULDER

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Frozen shoulder is a typical, difficult, painful and debilitating condition that can last for a considerable length of time or years influencing up to 5% of the population. Frozen shoulder is a clinical disorder of pain and seriously diminished joint movement caused by thickening and contraction of the joint capsule. The pinnacle occurrence is between middle aged and is higher in women than men. Frozen shoulder is an illustrative term used to demonstrate a clinical disorder where the patient has a restricted range of passive and active glenohumeral motion without abnormalities of the joint surface, fracture, or disengagement. It influences the glenohumeral joint, conceivably including a vague non-specific chronic inflammatory reaction, frozen shoulder is characterized by pain, stiffness and constraint of active and passive shoulder movements which adversely influence the entire upper extremity. Pain may cause pronounced sleep disturbance. Restriction of the range of motion is normally progressively marked with external rotation, but with lesser loss of abduction and internal rotation. In *Ayurved*, the sign & symptoms, etiopathogenesis resembles with *Apabahuka*. It is an ailment described by morbid *Vatadosha*localizing around the shoulder joint and thereby causing loss or dryness of *shleshakakapha*as well as constricts the *siras*at this site leads to loss of movements of the arm. *Ayurvedic* classics clarify the treatment as *Navan Nasya, Snehapana, Swedana* and *Shamanaushadhi*. It is an effort to evaluate the effect of *Parijata Guggulu* and *Panchakarma* therapy in the management of frozen shoulder. 30 patients of frozen shoulder were diagnosed based on signs and symptoms along with the radiological investigation. Treatment incorporates *Skandha Basti*with *Mahavishagarbha Taila* for 20 minutes pursued by *Patrapottali Pinda Swedan*and a *Nasya*of *MashadiTaila* in dose of 8 drops for seven days. Also the patients were advised to take two tablets (500 mg each) of *Parijata Guggulu* two times a day with luke warm water after meals for one month. There was significant improvement in overall functional status after one month of treatment with *Panchakarma* therapy. There was no need to take any analgesic medicine during the treatment. Clinical evaluations were made from the interrogation and gradation of scoring pattern. The treatment showed improvement in shoulder pain, joint stiffness and the activity of daily living (activity level & elevation in degrees), scoring for forward & lateral rotation, external and internal rotation. There were no side effects seen during the treatment as well as after the completion of treatment. The medication used in this study are very effective, safe and having *Shothara, Vedanasthapana, Nadibalya*and *Rasayan* properties. It reduces inflammation, by promoting the release of vascular and immunomodulatory factors. *Parijata Guggulu*is exceptionally simple to take, all the ingredients are readily accessible, cost effective and with no adverse effects.

SOME OBSERVATIONS ON CHEMICAL COMPOSITION AND ANTIMICROBIAL ACTIVITY OF ESSENTIAL OIL OF *OCIMUM GRATISSIMUM* L. GROWING WILDLY IN CHAMBA (TEHRI GARHWAL) UTTARAKHAND

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Ocimum gratissimum is a significant plant that is widely used in Traditional system of medicine in many countries of the world. In folk medicine, its use in upper respiratory tract infection, skin diseases, and diarrhea, headache, pneumonia, cough, fever and eye diseases is well known. This plant is also used in the treatment of epilepsy and various other mental disorders. In recent years *Ocimum gratissimum* is being investigated for its antidiabetic, antioxidant, anxiolytic, sedative, anti-inflammatory, hepatoprotective, antitumor, and gastro-protective and hypolepidemic properties. In views of the above mentioned therapeutic potential and our general interest in the chemistry of essential oils, it was thought worthwhile to collect wils variety of *Ocimum gratissimum* from Chamba (TehriGarhwal), Uttarakhand region of Garhwal Himalayas and antifungal activity of its essential oil. As there is remarkable variation in chemical composition and biological activity of essential oils due to variation in climatic and geographical conditions, the study was anticipated to have some valuable new results. Uttarakhand region is a storehouse of medicinal and aromatic plants due to favorable soil and climatic conditions. During the present study, the aerial parts of *Ocimmum gratissimum* L. were collected during the flowering season in the month of March from the outskirts of Chamba (Tehri Garhwal), Uttarakhand located at an altitude of 1600 m above sea level. Theu were hydrodistilled for four hours in Clevenger type apparatus to get colorless and pungent smelling oil. It was dried over anhydrous sodium sulphate and stored in a sealed glass vial at 5°C in a refrigerator. The yield of dried oil was 0.10 %(v/w). The oil was analysed for its chemical composition and evaluated for its antifungal activity. The analysis of the oil was performed GC-MS technique which was revealed the presence of 35 compounds constituting 96.27% of the total oil. The major components of the oil were found to be eugenol (32.86%), α-terpenolene (22.83%), *cis*-8-methylbicyclo(4,3,0)non-3-ene (9.08%), camphene (2.65%), α-phellandrene (2.12%), α-pinene (1.56%), β-bourbonene (1.46%0, β-pinenr (1.36%), carophyllene (1.32%), dodecatetraene (1.23%), 3-cyclohen-1-ol (1.15%) and *tert*-butylbenzene (1.02%). As the amount of eugenol is highest in the oil (32.86%), it can be considered as eugenol chemotype. Antifungal activity of the essential oil was investigated under *in vitro* condition against the four pathogenic fungi*viz*, *Fusarium oxysporum, Fusarium solani, Macrophomina phaseolina and Rhizoctonia solani.* The antifungal activity of the essential oil was evaluated by dissolving the oil in DMSO and making the use of poison food technique. Measurement the antifungal activity was performed at four different concentrations (2.5 %, 5%, 10% and 20%). The results of antifungal screening revealed that the essential oil of *Ocimum gratissimum* showed good antifungal activity against all the above mentioned fungal strains. It was observed that the activity increased with the increased concentration of the oil. Thus the activity was found to be maximum at a concentration of 20% and minimum at a concentration of 2.5%.

ANALGESIC EFFECT OF CANNABIS OIL IN AMVATA CASE

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Arthritis is growing problem in middle age group. RA cases are very frequent in OPD. Females are more affected and there is limited option in modern allopathic system. The NSAID'S and Corticosteroid are showing a number of adverse effects in longer duration. In this Single case study done in the OPD of UAU, the cannabis oil is recommended for local application in joints. For evaluation of pain ARA criteria is followed. In this study a very effective result is observed .The detail case study will be presented in full paper. This study shows the medicinal effect of cannabis i.e. Hemp oil in subsiding pain and inflammation this study also indicates that cannabinoid present in the hemp oil is working as an anti-inflammatory agent.

CLINICAL EFFECT OF AN AYURVEDIC REMEDY ON HEPATITIS B VIRAL INFECTION – A CASE REPORT

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Hepatitis B is a deadly disease caused by the hepatitis B virus (HBV) that infects the liver. It is a circular and partially double-stranded DNA virus of 3200 base pairs that replicate the DNA genome through reverse transcription of RNA. HBV is more dangerous than hepatitis A virus (HAV) and human immunodeficiency virus (HIV). It is transmitted by exposure to infectious blood or body secretions. This is a chronic and long-lasting disease which can cause cirrhosis and cancer of the liver. According to the WHO Hepatitis B Fact sheet N°204 (2014), over 750000 people die of hepatitis B each year in which about 300000 of these are due to liver cancer (HCC). A number of patients with positive Australian antigen and altered liver functions have been treated with the help of an Ayurvedic remedy which contains *Guduchi* (*Tinospora cordifolia* (Willd.) Miers) as one of the major ingredients. After 45-days treatment, the patients have significantly improved the liver functions. In addition, Australian antigen was not detected in the patients' blood after the treatment with the Ayurvedic drug for 2 to 6 months. The drug contains herbal preparation, no toxicity was observed in the patients. Moreover, all the herbal ingredients of this drug are grown in Uttarakhand (India) and easily available everywhere for medicinal purpose.

ANTI-DIABETIC HERBAL TABLETS FROM METHANOLIC EXTRACT OF *CLEMATIS BUCHANANIANA*

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Diabetes mellitus is one of the chronic, worldwide heterogeneous and life-threatening diseases. Its prevalence will be 5.4% by the year 2025, with the global diabetic population reaching to 300 million. The present invention relates to a novel herbal formulation made from the methanolic extract of aerial parts of *Clematis buchananiana*. *C. buchananiana* belong to family ranunculaceae is deciduous climber, branches sulcate, grayish or brownish. It is commonly called Kanguli or lagulia. It is commonly found in montane and sub-montane Himalaya, China, Bangladeswh and Nepal. In Garhwal Himalaya (Uttarakhand) it is found in Mandal, Bhyundar valley and Pandukeswar at a height of 1650-2300 meter. The results confirmed the antidiabetic activity of *C. buchananiana* plant. Particularly, it was clearly evidenced that the most potent extract in terms of reduced blood sugar level properties is the methanolic extract. The invitro and in vivo percent reduction of α-glucosidase and α-glucosidase enzymewere 75.20 % and 73.13 % in methanolic extract. Hence, results justify that, methanolic extracts of *C. buchananiana* has potent antidiabetic activity and also showed the presence of Carbohydrates/glycosides, alkaloids, flavonoids, saponins, unsaturated sterols/ triterpene and resins.

ASVIKARANAM: A NOVEL AYURVEDIC TECHNIQUE FOR PHYTOCHEMICAL EXTRACTION BY MICROBIAL MACERATION

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A sweet substance known as Soma juice prepared by the Vedic Aryans is supposed to be the first product of fermentation in India. The Rgveda (c.1500 BC) shows that fermentation technology took its first step in connection with the preparation of Soma juice in India. There is also another drink, known as Sura (wine/beer), prepared by fermentation. These two preparations have also been used in different medicinal preparations, surgical procedures and in many chemical and alchemical operations. It is believed that acetic fermentation was known to India since the early times. Fermentation products, Arista, Asava and Sura, were considered potent medicinal drugs in Vedic age. In the post Vedic period, two new preparations known as vinegar and liquor from bread were added. In the early age, Maceration and fermentation technology was used to improve the nutritional properties (digestibility and bioactivity), shelf life, and organoleptic quality characteristics of food and for extraction of the active compounds which can be used for the production of value-added food. Maceration is the winemaking process where the phenolic materials of the grape-tannins, coloring agents (anthocyanins) and flavor compounds—are leached from the fruit skins, seeds and stems into the must. These two techniques of phytochemicals extraction using microbial maceration from numerous Herbs in the Ayurveda are drawing an attention of researcher towards this traditional technique. Phytochemicals are natural bioactive compounds found in fruits and vegetables that work together with many other components in promoting good health in many ways. In addition, they can be used as nutraceuticals having beneficial health effects for the treatment of various diseases. These low-cost extraction technologies have efficiency beyond any doubt though simplicity for getting high yields, very easy to handle, low-cost, and low energy consumption. In microbial maceration, different input factors (such as time, temperature, humidity, concentration of the inoculum and other conditions) are playing important role to determine the efficiency of the process. Moreover, maintaining microbial maceration conditions is necessary for the efficient growth of the microbes to macerate and ferment different sources and enhancing the extraction efficiency. Depending on the varietal, the process of maceration can help bring out many flavors in the fermenting material that would otherwise be lacking. It can enhance the body and mouthfeel for many self-generated alcoholic product, as well as strengthen the color. Greater extraction can add to the complexity and life expectancy of the final product by developing more complex tannins that will soften over a longer period of time. With these benefits does come the risk of developing various wine faults, such as the development of acetic (or "volatile") acidity. Recent studies have witnessed an increase in the antioxidant activity, flavonoids and anthocyanin content of legumes, pulses and cereals extract because of the microbial maceration. This technique could be used to utilize pomace of grape, olive, apple & other fruit: and another food processing industry waste into a valuable byproduct.

GENETIC ANALYSIS IN BUCK WHEAT (*FAGOPYRUM ESCULENTUM* MOENCH) - A NUTRACEUTICAL CROP OF GARHWAL HIMALAYAN REGION

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Buckwheat (*Fagopyrum esculentum* Moench) is one of the most important pseudo cereal and nutraceuticalcrops of the mountain region widely cultivated in the middle and higher Himalayas during kharif season. The present investigation was conducted during *Kharif*, 2015 at Crop Improvement Research Block and Seed Testing at Department of Seed Science and Technology, V.C.S.G. Uttarakhand University of Horticulture and Forestry, Ranichauri Campus with 30 diverse genotypes of buckwheat. The thirty diverse genotypes of buckwheat including four checks *viz.,* PRB-1, Himpriya, VL-7 and Shimla-B1 was laid out in Randomized Block Design with three replication. Observations were recorded for field parameters were days to 50% flowering, days to maturity, plant height at maturity (cm), number of primary branches, number of secondary branches, number of internodes, number of leaves per plant, leaf length (cm), 100-seed weight (g) and seed yield per plant (g). The seed quality parameters were recorded for first count, standard germination, root length, shoot length, seedling length, seedling fresh weight, seedling dry weight, vigour index-I and vigour index-II. The data was utilized for estimation of mean, range, coefficient of variation, heritability, genetic advance, correlation coefficient, path coefficient and genetic divergence. The present study was under taken to elucidate analysis of variance revealed significant differences among the genotypes for all the characters. The cultivars PRB-1, IC-412762, IC-276627, RSR/SKS-71, IC-294344, Himpriya, IC-13507, IC-341661 and VL-7 exhibiting high mean performance for seed yield along with high performance for some other yield components. The genotype VL-7 was highest for maximum germination percentage, root length, seedling length, seedling dry weight, vigour index-I and vigour index-II. The genotype IC-107988 was observed maximum shoot length and IC-26599 was observed maximum seedling fresh weight. High phenotypic and genotypic coefficient of variation (PCV and GCV), heritability and genetic advance were observed for plant height, days to 50% flowering, days to maturity, number of leaves per plant, 100-seed weight and seed yield per plant. Correlation studies indicated that seed yield per plant was positively correlated with days to maturity, plant height and number of primary branches. Maximum positive direct effect on seed yield per plant was imposed by days to maturity, plant height and number of primary branches. The genetic divergence among the 30 genotypes by using Mahalanobis D^2stastistic was grouped into 6 clusters. Maximum inter-cluster genetic distance was observed between clusters I and cluster IV followed by cluster I and cluster III suggesting wide diversity among these groups. Considering cluster mean and genetic distance the crossing between genotypes of cluster I, cluster III and cluster IV would be fruitful for obtaining transgressivesergeants for developing high yielding and better quality buckwheat varieties. On the basis of salient findings of present study, it is concluded that the genotypes PRB-1, IC-412762, IC-276627, RSR/SKS-71, IC-294344, Himpriya, IC-13507, IC-341661 and VL-7 were found promising as they contained more than one desirable trait and for the seed quality parameters the genotype VL-7, IC-107988 and IC-26599, which was suitable for under laboratory condition. So these germplasm can be further utilized in crop improvement programme which is suitable for mid hills of Uttarakhand.

SCREENING AND STANDARDIZATION OF CLASSICAL AGADA PREPARATIONS

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The Classical *Agada* (Antidote) preparations which are herbo-mineral preparations prepared from very few pharmacies and folklore practitioners/ traditional practitioners used for their therapeutic usage in poisoning cases of both animate and non-animate poisoning conditions of both acute and chronic, such *Agada* preparations shall be screened for its standardizationin order to assess the quality of drugs, based on organoleptic properties, physical characteristics, physico-chemical properties,concentration of their active principles, physical and chemical standards.The present article is intended to screening and standardization of *Agada* preparations. In order to justify and evaluate the clinical efficacy of herbo-mineral preparations used for the purpose of treating poisoning such *Agada* preparations, to have a global acceptance shall have prior systematic screening and standardization methodologies. The screening and standardization of such preparations mentioned by the Government Authoritative like AYUSH, CCRAS and also WHO guidelines shall be considered to achieve aim of standardization with standard operating procedures. The aim of this study is to review standardization and screening methodologies of AYUSH drugs and standardization tests utilized for different AYUSH drugs formulations.

QUALITY CONTROL AND STANDARDIZATION OF HERBAL DRUG W.S.R TO KSHARA SUTRA

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Various countries use traditional system of medicine i.e. *Ayurveda, Unani, Siddha* and *Homeopathy*. Plants, the major sources of traditional herbal medicine are usually taken in their natural (wild) form. Here quality control for safety and efficacy of herbal drug/ plant/ medicine is on top priority. Quality control refers to a process involved in maintaining the quality and validity of a manufactured herbal drug. Standardization is an important step for the establishment of a consistent biological activity, a consistent chemical profile, or simply a quality assurance program for production and manufacturing of herbal drugs. WHO specific guidelines for the assessment of the safety, efficacy and quality of herbal medicines, as a prerequisite for global harmonization, are of utmost importance. For gaining popularity and acceptability, any treatment needs to be standardized and *Kshara sutra* is considered as medical device, so to maintain its quality level depending on different parameters it should be standardized. The aim of the present study is to briefly describe about quality control and standardization of preparation of *Ficus racemosa* latex *kshara sutra* and is completed in few steps, like selection and collection of raw drugs, pharmacognostical characteristics, extraction and analysis of latex and Qualitative Phytochemical Analysis, Fluorescence Analysis study, Fingerprinting analysis like Thin layer Chromatography and High performance liquid chromatography (HPLC). It has been found in the study that most of the biologically active phytochemicals were present in the aqueous extracts of the *Ficus racemosa* latex. Physicochemical studies reflectpresence of total, water soluble ash content, acid insoluble ash etc. Total carbohydrate content, protein, phenol and tannin content found in latex extract of *F racemosa*. TLC, the common fingerprint method for herbal analysis was done to determine the number of components in a mixture and to verify a substance's identity. HPLC analysis of the *Udumber* latex extract revealed the presence of Shikimic acid .Thus *Ficus racemosa* latex *Kshara sutra* can be used as it is good in decreasing pain, discharge, tenderness with moderate UCT.

SEASONAL VARIATIONS AND PHARMALOGICAL SCREENING OF ESSENTIAL OIL FROM *SAUSSUREA* SPECIES

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Saussurea species belongs to family Asteraceaeis medicinally important. *Saussurea* species are used as bitter, purgative, asthma, cough, and also in treatment of cholera, anthelmintic, antioxidant, antitumor, chronic skin diseases, and rheumatism. *Saussurea costus* oil used in perfumery, being rich in sesquiterpene lactones, is responsible for numerous cases of allergic contact dermatitis. The plant materials of *Saussurea costus* were collected from different altitudes of Garhwal, Uttarakhand. Air dried roots of *Saussurea costus* were subjected to hydro distillation in a Clevenger apparatus for 4-6 hours to extract oil. Analyses of all the essential oil were accomplished dissolving the samples in EtOAc with an HP 6890 Plus gas chromatography. Total polyphenolic content (TPC) of essential oils was determined using Folin-Ciocalteureagent and gallic acid was used as a standard.Radical-scavenging ability of essential oils was determined by DPPH test and inhibition of lipid peroxidation was carried out by β-carotene bleaching assay (BCB). The highest concentrations of bioactive in those samples were collected in month of December and highest antioxidant activity was found in sample collected in summer season.

BIO-DIVERSITY OF PLANT KINGDOM AND ITS INFLUENCE ON MEDICINAL PLANTS W.S.R. TO *DESHA* (REGION) AND *KALA* (SEASON)

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Biodiversity of plant resources has served not only for the primary human needs but also for health care, particularly the rural population, have been increasingly acknowledged over the last decade. The demands of the majority of the population for medicinal plants have been met by indiscriminate harvesting of spontaneous flora, including those in forests. The India subcontinent, with the history of one of the oldest civilization, harbors many traditional health care systems. Indian civilization is developed by understanding the laws through which nature governs the whole universe. The Rishis; scientist of India were always in search of those laws to give better and healthy present and future to the society. People of the society used to follow the laws which were established as the codes and conduct. *Desha* and *Kala* is also one of the entities having its own place in practice since Vedic period. Even today everyone is applying it in various contexts. *Desha* provides a rational base for locating positions of the objects with relation to oneself. Different streams of knowledge and science have accepted the *Desha* and *Kala* in different manners according their usages. *Aacharyas* have described the proper collection method of the various medicinal plants to achieve the maximum quality of the herbs as medicine. They very well aware of the relation between the plant parts and the season (*Kala*) as well as the region (*Desha*) of that plant. So this paper highlights the bio-diversity of medicinal plants with special reference to *Desha* (region) and *Kala* (season).

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ESSENTIAL OIL OF VARIABILITY OF THE *ZANTHOXYLUM ALATUM* ROXB. FROM NORTH–WESTERN HIMALAYA, INDIA

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Hydrodistillated essential oil of mature seeds of *Zanthoxylum alatum* Roxb. from nineteen populations of the North-Western Himalaya (Uttarakhand, India) were analyzed by using GC and GC/MS techniques to determine the intraspecific chemical variability. Altogether, 39 compounds were identified in the oils, and a relatively high variation in their contents was found. The oils were dominated by monoterpene hydrocarbons (17.44–68.53%) and oxygenated monoterpenes (13.53–69.12%). The main constituents of the essential oils were linalool (3.5–46.5%), limonene (0.82–41.5%), β-phellandrene (0.24–37.6%), terpinen-4-ol (0.02–21.9%), 2-undecanone (0.16–18.2%), sabinene (0.34–17%), E-methyl cinnamate (0.02–15.7%), 1,8-cineole (0.03–15.2%), myrcene (0.65–13.8%) and trans-caryophyllene (0.04–10.66%). For the determination of the chemotypes and the intraspecific chemical variability, the essential oil components were subjected to cluster analysis. The five different chemotypes characterized were Chemotype I (limonene), Chemotype II (linalool/ sabinene/ 2-undecanone), Chemotype III (linalool), Chemotype IV (limonene/ phellandrene/ linalool) and Chemotype V (phellandrene/ linalool/ sabinene).

VALIDATION OF QUALITY PARAMETERSOF LAVANGADI VATI – PILOT STUDY

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Vatikalpana is one among the important 'secondary preparation' that plays an important role in pharmaceutics of Ayurveda, owing to many advantages like easy administration, palatability, convenient form for dispensing and transportation. LavangadiVati is an Ayurvedic formulation and popularly used for the treatment of kasashwasa .Two marketed samples of lavangadivati were tested for quality control parameters and compared with the In-house prepared Lavangadi Vati. Organoleptic evaluation, extractive values, ash value, moisture content, weight variation, hardness, HPTLC etc. have been performed as planned. Routine analytical parameters of lavangadivati explained in API have been followed. The present study was designed to evaluate and compared various established parameters for the same by the marketed sample with In-house prepared lavangadivati as the SOP, methods for preparation, conditions and other aspect varies from pharmacy to pharmacy and this should be done time to time to make a check on the variation and deviations adopted from the established ones.

CULTIVATION OF HIGH ALTITUDE MEDICINAL AND AROMATIC PLANTS: PRESENT STATUS AND NEED TO TAKE IT FORWARD IN UTTARAKHAND, INDIA

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Out of the numbers of Himalayan states, Uttarakhand is blessed with such a gift, where varied climatic conditions due to variations in altitude and topography, which make this state home of wide variety of plants, particularly medicinally important herbs. Due to high commercial value of medicinally important herbs, most of them are being heavily extracted for herbal drugs, traditional uses and research purposes from their wild populations. This heavy extraction of medicinal plants has been adversely affected the very existence of a number of plants and now many of them are in verge of extinction. To consider the conservation and regular demand of raw materials of medicinally important herbs, Government of Uttarakhand declared the state Uttarakhand as a herbal state with the aim to promote the cultivation of medicinal and aromatic plants (MAPs), because the cultivation is only means for protection of natural populations as well as an option for improving livelihoods of people residing in high hilly regions of the state. Since, its declaration as herbal state, numbers of developmental projects have been run by government of Uttarakhand with the help of National Medicinal Plants Board (NMPB), Govt. of India and many other funding agencies for promotion of cultivation of MAPs in state. However, numbers of research Institutes and Universities have also been involved in development of MAPs sector in state through their research outcomes. Keeping in view the importance of cultivation of high altitude medicinal and aromatic plants and efforts made by the agencies responsible for the promotion of cultivation, a team of research staff of High Altitude Plant Physiology Research Centre (HAPPRC) surveyed remotely located districts, Uttarkashi, Tehri, Rudraprayag, Chamoli, Bageshwar and Pithoragarh of Uttarakhand under National Mission on Himalayan Studies (NMHS), Govt. of India funded project for knowing the current status of cultivation of medicinal and aromatic plants in different villages of these districts. The team constituted for survey work, observed that, approximate 536 Nali (10.72 ha.) of land has been covered under cultivation till date and mostly two species *Picrorhiza kurrooa* (Kutki) and *Saussurea costus* (Kuth) is under cultivation and traded by the villagers even after 18 years of declaration of herbal state. The observations made after survey work indicated that there is a need of concrete farm level efforts along with providing proper technical know-how and sufficient quality planting materials to farmers for increasing the present cultivation status of RET (Rare, Endangered and Threaten) species.

ASSESSMENT OF GENETIC FIDELITY AND PHYTOCHEMICAL CONTENT OF IN VITRO PROPAGATED PLANTS OF ANGELICA GLAUCAEDGEW. (FAMILY: APIACEAE): AN ENDANGERED MEDICINAL PLANT OF HIMALAYA

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The first successful, efficient and reproducible *in vitro* propagation protocol for multiple shoot induction of *Angelica glauca* has been established. Rhizomes were used as explant, and maximum shoot multiplication was observed on MS medium supplemented with 6-Benzylaminopurine 8.0 μM and Indole-3-acetic acid 0.1 μM. Roots were observed within 14 days in the MS medium enriched with 0.5 μM IAA and 0.1 μM Naphthalene acetic acid (NAA) with an average production of 4.2 roots per shoot. Rooted plantlets were successfully hardened under greenhouse conditions and subsequently established in field, with a recorded survival rate of 72 % after 45 days. The total phenolic content showed significant difference ($p<0.05$) between in vitro raised plants (5.87 mM AAE/ g DW) and control (2.36 mM AAE/ g DW). Antioxidant activity, calculated through two in vitro assays, i.e. 1,1-diphenyl-2 picrylhydrazyl (DPPH) radical scavenging and Ferric Reducing Antioxidant Power (FRAP) assays revealed higher antioxidant activity in *in vitro* grown plants in comparison to control plants. Essential oil constituent's analysis was also carried out in control and *in vitro* raised plants. Thirty-one compounds were identified in the oil samples through Gas chromatography (GC) and gas chromatography-mass spectrometry (GC–MS) analysis also identified 31 compounds in the essential oil, representing 98.1–98.7 % of total oil compositions. The major components of the essential oils were (Z)-ligustilide (51.1–51.5 %), (Z)-butylidenephthalide (31.2–31.6 %), (E)-butylidenephthalide (2.6–2.9 %) and (E)-ligustilide (2.1–1.8 %). Genetic stability of *in vitro* raised plants, evaluated using 20 Inter Simple Sequence Repeats primers, proved true to typeness of *in vitro* raised plants.

SOCIOECONOMIC BENEFITS AND CHALLENGES OF CULTIVATING ATEESH

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Aconitum heterophyllum (Ateesh) [Family: Ranunculaceae] is an indigenous medicinal plant found in alpine/sub alpine region of India. Roots are biennial, paired and have tubers. The underground stem and root as such are used in Ayurvedic medicine. *A. heterophyllum* has many therapeutic effects. It is used in various diseases like urinary infections, diarrhoea, and inflammation and as an expectorant, febrifuge, anti-helmintic, anti-diarrhoeal, anti-emetic, anti-inflammatory and as a hepatoprotective medicine. Faced with the onslaught of non-judicious exploitation of the species for the drug industry and local medical systems along with over-grazing, prolonged seed dormancy, high seedling mortality, and habitat destruction, the herb confronts extinction. Various cultivation programmes are running all over India to increase the production of the plant as well as to give farmers a good profit business with minimum use of fertilisers. The aim of this study is to find out feasibility of widespread cultivation of Ateesh. Considering the various challenges to growing Ateesh in places other than its natural habitat and Comparing cost of cultivation to its market value. Due to poor seed germination and low seedling survival, regeneration even under natural conditions is low for *Aconitum heterophyllum*. Moreover, the species, being endemic to the northwest Himalayas, grows only in localized ecological niches. The plant is restricted to a narrow geographical range with stringent ecological requirements so critical that the species neither invades newer areas nor survives at lower altitudes with comparatively higher temperatures. However, cultivation up to 2000 m altitude has been recommended in sandy (10cm deep) soils with rich organic matter. In Garhwal Himalayas, altitudes above 2000 m above mean sea level have been found to be suitable for cultivation. Sandy loam and slightly acidic soil, with pH about 6, has been found to be the best for seed germination, survival, better growth, and yield. Addition of humus or leaf litter to the soil increases survival rate and growth of seedlings at all altitudes. Production of 518 kg/hectare and 579 kg/hectare, respectively, from seedlings and tuber cuttings has been recorded after third year of cultivation under experimental conditions. Cost of cultivation is nearly Rs 84,000 for three years for 1 hectare of land. This includes cost of land preparation, irrigation facilities, low-cost polyhouse for the seedling establishment, manure, labour charges, and harvesting cost. Owing to high demand and comparatively low production, a kilogram of Ateesh tubers can fetch as much as Rs 6500 in the market. Thus, total yield from a hectare of land is approximately Rs 38 lakh which delivers a highly promising profit for farmers. The production of Ateesh can be very profitable for traditional farmers. However, restricted environmental conditions are a significant hurdle to widespread cultivation. Plant cultivation and conservation strategies are necessary. Encouragement for growing this plant in its natural habitat should be done to meet the increased demand, to prevent its substitution, and to ensure uncompromised potency of the drug.

AN APPROACH FOR CONSERVATION OF *SAUSSUREA LAPPA*

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Saussurea lappa C.B. Clarke (syn. *Saussurea costus* (Falc.) Lipsch) belonging to family Asteraceae, commonly known as Costus , is a perennial herb, globally distributed across Himalayan region at 2500-3500 m altitude. There are 300 known *Saussurea* species. *Saussurea lappa* is one of the most commercially viable species among all species of genus *Saussurea. Saussurea lappa* is a medicinally important plant. Various active compounds isolated from the plant are reported to have medicinal properties e.g. the major components are sesquiterpene lactones such as costunolide and dehydrocostus lactone. It possesses various bioactivities such as antifungal, antidiabetic, anthelmintic, antitumor, antiulcer, antimicrobial, immunostimulant, anti-inflammatory and antihepatotoxic. It is widely utilized in various indigenous system of medicine all around the world for treating variety of disorders such as tenesmus, diarrhoea, vomiting, dyspepsia, inflammation. It is also prescribed in irregular menstruation, tenesmus and abdominal pain. It is an important plant, used widely in traditional and herbal medicine, also utilized in modern medicine. Due to high demand of the plant , most of the natural populations of the species are either have been eradicated or are under destructive harvesting, therefore availability of this important plant is decreasing day by day. *Saussurea lappa* is endemic to a geographically limited part of the Himalayas and grows on moist slopes at altitudes of 2600-4000 m. Apart from the restricted distribution, the harvesting of whole plant is one of the reasons for being threatened. *Saussurea lappa* is one of the 37 Himalayan endangered medicinal plants. Because of an endemic species to the Himalaya, the distribution of this species is fairly restricted to tremendously narrow geographical, which makes it more vulnerable to extinction. Thus in order to conserve this endangered species various steps should be taken like a multi-branched approach to maintain the resource base that includes in situ and ex situ conservation and selection of better-quality genotypes followed by their multiplication should be used. Conventional methods of propagation and tissue culture techniques should be used to multiply the plant for raising commercial plantations as well as for conservation. For the species which are difficult to regenerate by conventional methods, Micropropagation can be used as a feasible alternative. Biopesticides, better-quality planting material produced through micropropagation in combination with use of bio-fertilizers and improved Agro-techniques would enhance the production of plant. Therefore, efforts should be made in order to conserve and encourage the sustainable management of *Saussurea lappa*.

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NOVEL INITIATIVE AT PROMOTING CHAMOMILE AN ANCIENT AROMATIC HERB WITH MEDICINAL PROPERTIES IN UTTARAKHAND

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This study began after discovering a large section of flowering daisies in the forest area of Duggal Villa in March 2018 and taking them to be as members of pyrethrum or probably chamomile. Having completed the first year of our study we made a preliminary study of the plant, its herbage and the aroma identification. The leaves and their arrangement, shape of the petals as well as the aroma made us draw the hypothesis that it was definitely not pyrethrum but could be chamomile. The flowers were bravely consumed by us as tea and they had an apple like aroma and sweetness. These seeds were collected from the wild and replanted on the farmland of Duggal Villa in Feb 2018 and the germination was reasonably good by April/ May 2018. As it was a little delayed we managed to get a small nursery of some plant saplings but no flowers, which we then decided to plant in Doiwala in Oct/ Nov 2018 we got a good crop by April/May 2019 which adapted to the environs of the Doon Valley. In Mussoorie also we got abundant flowers by June 2019. Another attribute of this plant that baffled us was its resilience to live in all harsh settings and return in its full glory after the winters of 2018/19. This initiated us into thinking that it is not an annual but has perennial traitsand closer to English Chamomile. We also decided to study its ability and bio pathway with its adaptation in the lower ranges of the doon valley. Hence we simultaneously moved into its transplantation in the Doiwala region of Bullawala. Chamomile is cultivated for its flowers which are used in herbal teas and for medicinal purpose. The essential oil from chamomile flowers is loaded with anti-oxidants that could play a major role in lowering the risk of several diseases including heart diseases and cancer. It can also aid sleep and digestion working as a sedative and a nervine. Thus the first ever attempt to propogate Chamomile from the forest land of Duggal Villa in India was made in Uttarakhand in March 2018 the study continues to establish its similarity with English Chamomile adapted to the regions of Dehradun District. This paper will document the first stage of our journey in study and understanding of our planting material from our wild forest land and its propagation on cultivated land. Thereafter efforts were made to prove its adaptability and use in end products for the market. As this will remain to be our reference point for suggesting improvements and furthering our research in plant breeding and tissue culture to improve the variety for better flowering and its oil content in the valley as well as the high altitude regions of Mussoorie and Dhanaulty.

VRIKSHAYURVEDA: TREASURE OF AGRICULTURAL TECNOLOGIES

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Ayurveda is the science of life for all living beings, protect the health and alleviate the disorders. Caraka Samhita and Sushruta Samhita are the original text of Ayurveda in which plant substances are use. In later work, the tradition is continued and numbers of text were created by the scholars of Ayurveda. Of them, *VRIKSHAYURVEDA* is one exclusively written on plant life, by Surpala. The meaning of *VRIKSHAYURVEDA* is "Science of plant life". It deals with about 170 species of plants health and productivity including herbs, shrubs and trees. The main aim of *VRIKSHAYURVEDA* is to ensure that conservation of plant diversity of selected species and utmost importance has been attributed to plantation equating ten sons with a single plant. It included various types of soil, plant propagation, planting methods, nourishments, disease, treatment and horticulture. At present the importance of understanding *VRIKSHAYURVEDA* has also increased because several crores are being spent every year on pesticide to control pest. A detailed study of *VRIKSHAYURVEDA* would provide with information on pest management. This paper intended to understand the traditional knowledge on biodiversity, particularly in the light of different agricultural techniques described in *VRIKSHAYURVEDA*.

CURRENT STATUS OF INDIAN MEDICINAL PLANTS - CULTIVATION, COLLECTION AND TRADE

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India's herbal sector is represented by 8610 licensed herbal units. Annual export of medicinal plants from India is valued at Rs. 1200 million. Medicinal plants not only as traditional medicines but also as a trade commodity meets the demand of the distant markets. India has a very small share (1.6%) of this ever-growing global market. Traditional medicine has served as a source of alternative medicine, new pharmaceuticals, and healthcare products. There is an urgent need to speed up the efficacy of the useful and valuable medicinal plants in order to compete with the budding global market. The annual expansion of ayurvedic market in Indian medicine is 20%. Per capita expenditure in India on medicines per annum is amongst the lowest in the world. China and India are among the two largest users of medicinal plants in the world. India uses about 7000 traditional plant species and it is estimated that there are over 7800 medicinal drug-manufacturing units in India which consume about 2000 tons of herbs annually. India's share in the world herbal market is US$1 billion and all the major herbal-based pharmaceutical companies are showing a constant growth of about 15 per cent. Herbal pharmaceutical formulations, have major use of the some botanicals such as cereals (rice, barley); spices (black pepper, nutmeg, cinnamon, bay leaves, cumin and fenugreek etc.); fruits (mango, papaya, tomato, pomegranate and pine apple); and vegetables (bittergourd, lady finger). According to a report, over 1.5 million practitioners of traditional medicinal system are using medicinal plants to prevent, promote and cure diseases and disorders. Around 25,000 effective plant-based formulations used in folk medicine are known to rural communities in India. According to Export Import Bank, the international market for medicinal plant related trade having a growth rate of 7% per annum. Medicinal plant parts that are exported and imported from India include the rhizome, fruit, leaves, root, tuber, bark, whole plant of *Acoruscalamus*, *Curcuma amada*, *Curcuma longa, Argemone mexicana*, *Piper longum*, *Cassia lanceolata*, *Glycyrrhiza glabra*, *Rauvolfia serpentine, Ricinus communis, Phyllanthus amarus, Strycnos nux-vomica, Myrica nagi, Juniperus communis, Gloriosa superba, Curcuma aromatic, Cinnamomum iners, Adhatoda vasica, Aloe vera, Garcinia indica*. 95% of the total herbal raw drugs consumed by the entire domestic herbal industry during 2014-15 included 198 medicinal plant species. 3 lakh MT of mostly wild collected herbal raw drugs pertaining to more than 700 medicinal plant species are traded through conventional herbal raw drug mandis alone which include Phyllanthusemblica, *Terminalia chebula, Terminalia bellirica, Tinospora cordifolia, Mahua longifolia, Shorea robusta, Asparagus racemosus*, etc. 1.5 lakh MT of mostly cultivated herbal raw drug entities are traded through the Krishi Upaj Mandis including Psyllium, Henna, Senna, and Ashwagandha.

MEDICINAL PLANTS OF HIGH ALTITUDE OF UTTARAKHAND: A HERBAL INDUSTRY PROSPECTIVE

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Uttarakhand state having varied agro climatic region with rich biodiversity hotspot (aprox. 8000 Medicinal plant and 6200 indigenous varieties of herbal plants. It has an area of 55483 km^2, out of which about 63 % is the forest (Forest area 34650 km^2) and about 12.50 % is cultivated land. It is endowed it an enormously rich flora including medicinal and aromatic Plants (MAPs) more than 200 unique plant. Uttarakhand state to be a mother hub for development of Ayurveda & other natural herbs based health science (AYUSH) as its earlier Vedic history. Business opportunities in Uttarakhand for Herbal pharmaceuticals are enormous due to diversified use of Herbs in pharmaceutical, Nutraceuticals, Cosmoceutical and Agro-chemical industries Herbal Pharmaceutical industry having great potential and opportunities for development in future. Mainly following Herbal Medicinal Plants & their Value Added Products well accepted in Domestic & International Market as Ayurvedic Medicines, Unani Medicines, Siddha Medicines, Homoeopathic medicines, Herbal Nutraceuticals, Herbal Cosmoceutical, Herbal Health drinks, Dietary Health Supplements, Medicinal Plants / Crude Drugs, Herbal Extracts / Concentrates, Veterinary Medicines, Health Foods, & super food etc. State Medicinal plant Board (SMPB) Selected 91 MAPs species for cultivation, conservation & sustainable use for Uttarakhand; However author add some other plants which may also be proposed to grow and cultivate in Uttarakhand, which have been in a huge demand in Ayurvedic drug manufacturing industry. Author had a critical review on conservation; sustainable use & propagation of Medicinal plant at Uttarakhand and found various issues & challenges in Uttarakhand state after detailed survey of various stakeholders of Ayush stream. These issues & challenges of Herbal cultivation need proper attention for various policy makers in favour of small Farmer of Herbs & Ayurveda industries. If we can face these challenges & issues Uttarakhand could be capital of Herbs in India. Let us joint hand together to develop our Uttarakhand as a model herbal state in India.

YARTSA GUNBU OR CATERPILLAR MUSHROOM [*OPHIOCORDYCEPS SINENSIS* (BERK.) G.H. SUNG ET AL.]: THE SOCIO-ECONOMIC DYNAMICS AND ISSUE OF ITS SUSTAINABILITY

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Any resource of immense value and of key relevance to rural livelihood as themain cash source, invariably runs the risk of being over-exploited, more so when the same remains a common property resource. The current harvest pressure on caterpillar fungus- Yartsa Gunbu (*Ophiocordyceps sinensis* (Berk.) G.H. Sung et al.) serves as a prime example. The ever-increasing demand for the commodity in the international markets and concomitantly its ever-increasing price, hovering at present at US$ 20,000 per kg, has resulted in not just its rampant exploitation, but also the degradation of the very habitat, thus endangering its future. The present study conducted across 9 broad landscapes in 110 villages and 2511 harvesters, within the Pithoragarh district, Central Himalaya, inclusive of the Rapid Vulnerability Assessment (RVA) yields the fact that the commodity being harvested remains vulnerable. The study also brings forth the salient aspects of the habitat degradation of the already sensitive alpine meadows, as well as the socio-economic changes brought forth by the harvesting of the 'green gold'. Finally, the paper ends with suggestions for evolving sound mechanisms to lessen the pressure on the species.

IMPORTANCE OF MEDICINAL PLANTS FOR EMPOWERING INDIAN SOCIO-ECONOMIC STATUS

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Herbal medicinal products are getting global importance because of their health benefits. According to WHO about 80% population of most developing countries still rely on traditional herbal medicines for their primary health care need. China has successfully promoted its own therapies and drugs with scientific evidences acceptable for the global community. It is no exaggeration to say that an 'Herbal Revolution' by India is just waiting to happen. The cultivation of medicinal crops can be grown is less risky in terms of incidence of pest attacks, diseases and price fluctuation and has potential returns. And this significance is further strengthened by the fact that these crops in degraded and marginal soils, or raised as inter crops in plantation crops like are Kutki, Atish, Ativisha, Vatsanabha etc. India has been considered a treasure house of valuable medicinal and aromatic plant species. Overall international trade in medicinal plants and their products was US$ 60 billion in 2010 and is expected to reach in US$ 5 trillion by 2050.If properly organised, the cultivation, conservation and management of medicinal plants becomes highly remunerative both in financial and economic terms for the small scale growers. The annual revenue stream from the three major Indian system of medicines, i.e. Ayurveda, Unani and siddha, is estimated at more than half a billion dollars annually, Medicinal plants account for about 70% by value of the total raw materials procured by Ayurvedic pharmacies. China and India are the two leading countries in the trade sector. During the past decade, total trade has increased from US$ 52.8 million to US$ 68.7 million, recording a growth rate if 3.56 percent per annum. The Indian farmer is presently in a very difficult situation and the majority is looking at options other than farming National Sample Survey Organization (NSSO, 59th round). The farmer is constrained by the shrinking net income flow due to the increasing cost of cultivation and uncertain prices. Largely, farmers have not diversified from traditional crops. Production costs of traditional crops are now becoming costly and the market system is poor, these factors have forced he farmer to shift towards other crops that have the potential for better returns compared to the traditional crops.

THERAPEUTIC EFFECTS, CULTIVATION STATUS AND MARKET DEMAND OFSHANKHPUSHPI (*CONVOLVULUS PROSTRATUS*)

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Medicinal plants play an important role as major sources of income of people as well as in national economy. Whole plant, different parts and their exudates are used as the primary source to isolate and synthesize therapeutically active compound and as crude material to developed medicinal formulation. To earn more profit, local inhabitants harvest huge volumes of medicinal plants indiscriminately;it causes risk on sustainability of these plants. It is common with the species obtained from the wild source. Several species of medicinal plants are listed as endangered due to indiscriminately collection or supply. This study focused on the occurrence, distribution, cultivation, harvesting and trade (market demand and consumption) of *Convolvulus prostratus.* The literature was collected from PubMed, Scopus, Google Scholar, and Web of Science. *C. prostratus* is highly valuable medicinal plantknown as Prostrate Bindweed or Shankhpushpi. It is a prostrate, spreading and perennial wild herb. All parts of the plant are known to possess therapeutic benefits and it is an important indigenous medicine, which has a long medicinal application in Ayurveda, traditional Chinese medicine and other indigenous systems. It is popularly known as brain and nervine tonic to improve memory and also used in other CNS related problems. It is an important ingredients of several herbal formulation used for this purpose. Mainly, it is collected from the wild source but now it is cultivating at the different places in India e.g. under collective initiatives of International Crops Research Institute for the Semi-Arid Tropics and Dabur India Ltd. *Convolvulus prostratus*is cultivated in Barmer district of Rajsthan. According to estimation, the trade of *Convolvulus prostratus*in Herbal Mandis in India was about 200-500 metric ton in 2014-15 while up to 2017-18 the trade was increased up to 500-1000 metric ton. However, other than this various species are used as Shankpushpi such as than *Clitoria ternatea* L., *Convolvulus arvensis* L., and *Evolvulus alsinoides* (L.) L.). The CNS related problems are increasing day by day due to change in life style. The consumption of *Convolvulus prostratus*is increasing every year; this demand may directly affect its sustainability. So, the cultivation of this herb on large scale is highly needed to protect it and this will be helpful in increasing the income of farmers.

INFLUENCE OF DIFFERENT STORAGE CONDITIONS ON QUALITY OF IMPORTANT MEDICINAL HERB BRAHMI (*BACOPA MONNIERI*)

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Bacopa monnieri (L.) Pennell, commonly known as Brahmi, belonging to family Scrophulariaceae is an important medicinal plant of the Ayurvedic system and is categorized as Medhya Rasayana, used for boosting memory. It is a small creeping, spreading, succulent herb with numerous branches and small fleshy, oblong leaves grows wild in marshy and damp places. Brahmi is a great neurotonic, immuno-modulator, adaptogen, tranquilizing and memory enhancing herb. The whole herb is used commercially for preparation of several ayurvedic formulations and also extracting the memory enhancing molecule - bacoside from the herb. Bacoside A is major bioactive compound of the herb responsible for memory enhancement. Storage conditions and storage time play very important role to maintain the quality of raw herb. However, storage conditions of important herb Brahmi has not been standardized yet. Keeping above into consideration, the present study is being carried out with the objective to standardize storage conditions and storage time of Brahmi with respect to quality of raw herb. Air dried samples of Brahmi were stored in different containers viz. glass jars, plastic boxes, plastic bags, jute bags, jute bags with polythene lining and zip pouches. The active ingredient, bacoside-A content present in the dried Brahmi herb was estimated by High Performance Thin Layer chromatography (HPTLC) at monthly intervals during the entire storage period. HPTLC method for quantitative determination of Bacoside-A content of Brahmi was developed and validated. The study revealed that there was a gradual decrease of bacoside-A content in stored Brahmi samples during the period of study. After six months of storage, the bacoside-A content was almost nil is Brahmi samples. The study suggests that the Jute bags with polythene lining are most suitable packaging material of Brahmi to get quality produce.

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POSTER PRESENTATIONS

DIVERSITY OF MEDICINAL AND AROMATIC PLANTS IN CHOPAL FOREST DIVISION OF SHIMLA FOREST CIRCLE, HIMACHAL PRADESH

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The study was carried out in Chopal forest division of Shimla forest circle, Himachal Pradesh during July, 2015 to September, 2107 to record the medicinal and aromatic plant wealth of the region. To inventorize medicinal and aromatic plants of the study area, extensive field surveys in various parts of all seven forest ranges of the division covering all agro climatic zones from sub tropical to alpine pastures were carried out. Total 213 medicinal and aromatic plant species belonging to 79 plant families were recorded and described with botanical names, common names, families, growth forms, habitat and medicinal uses. Out of total recorded species, 206 species of 74 families are angiosperm, while, five species of three families are gymnosperms. Among these, 187 species are medicinal, 15 species are used for medicinal and aromatic purposes both and 11 species are aromatic. Among different growth forms of recorded species, 115 are herbs, 47 shrubs, 40 trees, 10 climbers and 1 fungus. Family Lamiaceae was recorded as dominant family with 17 species followed by Asteraceae (15 species), Fabaceae and Rosaceae (14 species each), Solanaceae (8 species) and others. Thirty one threatened species, which fall in different category of red listed plants as per IUCN and CAMP workshop, were also recorded. The study area still harbours rich diversity of herbal wealth. There is need for further study to know the actual status of individual species of medicinal and aromatic plants especially of threatened species in Chopal Forest Division and taking remedial measures for conservation and sustainable harvesting of those species for additional income generation of local communities in perpetuity.

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SURVEY OF MEDICINAL PLANTS OF LAHAUL REGION IN DISTT. LAHAUL & SPITI (HIMACHAL PRADESH)

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The Himalayan region has been identified as a biodiversity hot spot. The Indian Himalayan Region (IHR) is well known for its diversity of medicinal plants from the Vedic period.One such area in IHR is Distt. Lahaul & Spiti in Himachal pradesh. Distt. Lahaul & Spiti consists of two formerly separate regions Lahaul and Spiti at altitude of around 4000 to 6000 meters. There are many highly valuable medicinal plantsmost of them are endangered or at the verge of extinction, for eg.*Vatsanabha, Ativisha, Chorak, Kutki, Soma* etc. Apart from these medicinal plants some highly valuable medicinal plants which are not very well mentioned are known as *Anuktadravyas* (Extra pharmacopeia drugs) like *Dactylorhiza hatagirea, Selinum vaginatum, Achillea millefolium, Hippophae rhamnoidis* etc. which are also used by the tribal people / traditional *vaidyas (Larjee)* for different purposes. Due to the high demand of herbal medication the illegal collection of these medicinal plants is very common. If the rate of harvest is high and not replaced with new plants, plants will become soon extinct. Hence, there is an urgent need to record the traditional knowledge of various ethnic communities before this culture and natural habitats are destroyed. These *Anukta* medicinal plants can also be incorporated in ayurvedic pharmacopeia. It is important to study the medicinal properties, conservation and cultivation methods of these high-altitude medicinal plants. The aim of this study is to conduct a survey of medicinal plants in Lahaul region of District Lahaul & spiti Himachal Pradesh. Permission has been obtained from the Forest Deptepartment, Government of Himachal Pradesh. Study area has been divided on the basis of Gram-Panchayat of Lahaul. Traditional *vaidyas*/Larjee located in different Gram-Panchayat. Questionnaire was prepared for the local experienced people/Larjee. Information regarding plants is gathered. Field survey was conducted on the level of Gram-Panchayat. Medicinal plants were identified and located in natural habitat. Photographs and other data regarding the habit and habitat of the plants were collected. Samples were collected for the preparation of herbarium. Plants were identified and authenticated by the experts of CSIR-IHBT Palampur H.P. New plant discoveries to Indian flora through ethnobotanical study acts as a bridge between botany and tribal knowledge regarding medicinal properties of plant. Identification and documentation of new plants play a vital role in incorporating them in Ayurvedic pharmacopeia.

ENDANGERED MEDICINAL PLANTS

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Of the estimated 30000 known medicinal plant species of world, about 8000 are found in India. In recent years, the demand for Indian medicinal plant has increased both at local and global level. Major part of exported raw material includes medicinal plant of Himalayan region. According to recent study 17 high value threatened bergenia Himalayan medicinal plants which are *Aconitum heterophyllum, Angelica glauca, Arcitum lappa, Bergenia ligulata, Bergenia stracheyi, Dioscorea deltoidea, Hedychium spicatum, Heraculum candicans, Picorhiza kurooa, Podophyllum hexandrum, Polygonatum cirrhifolium, P. verticillatum, Rheum austral, Saussurea costus, Selenium tenuifolium, Thalictrum foliosum, Valeriana jatamansi* are in threat to extinct. Due to lack of cultivation, ruthless harvesting, population of these valuable plants are diminishing day by day coupled with loss of genetic diversity, habitat degradation and facing high risk of extinction. To prevent from extinction we have to observe their population density and habitats, to record their survival under cultivation at different altitudes, to gather information their market potential. To reveal economic value of selected species, and suggests appropriate strategy for their conservation management.

FENUGREEK: THE HERB WITH MEDICINAL AND TRADITIONAL USES

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Fenugreek (*Trigonella foenum-graecum*) belonging to family *Fabaceae* occurred in south Europeand Asia, is an herb having white flowers and yellowishbrown and angular seeds. In Hindi, it is commonlyknown as methi. It is one of the common spices in Indian kitchen. Various phytochemical constituents have been reported in the seeds due to which the plant becomes rich in medicinal properties. The seed of fenugreek are being used to enhance lactation, reduces cholesterol level and regulates blood sugar level. Some fibers present in seeds are responsible for its anti-cancer activities. Due to the presence of mucilage, fenugreek has also shows antacid properties and act as a good binder for tablet preparation. Flavanoids present in seeds shows antioxidant properties. Traditionally seeds are used in the treatment of fever, gout, heartburns, eczema. Other than the medicinal use, fenugreek seeds are used as preservatives and leaves paste are used for hair growth.

AUSHADHSAMPADĀ: A CONCEPT NOTE

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Traditional knowledge is the knowledge system belonging to various communities across the globe. Such knowledge has been accumulated over the decades and has been used and passed down through generations. India, being one of the rich countries in biodiversity and traditional medicine, is prone to biopiracy. Biopiracy is an illegal act of obtaining commercial profits from indigenous communities by using their traditional knowledge. Local and indigenous communities too are entitled to share the benefits obtained out of such use. Many steps have been taken by the government of India in this regard. Convention on Biodiversity (CBD) Signed by 150 government leaders at the 1992 Rio Earth Summit came into force on 29 December 1993.NBA The National Biodiversity Authority of India was formed in 2003 to enact the 'Biological Diversity Act' of 2002 which deals with facilitative, regulatory and advisory function for Government of India on issue of conservation and sustainable use of biological resource and fair equitable sharing of benefits of use. CSIR and Ministry of AYUSH have established the Traditional Knowledge Digital Library (TKDL) for the protection of Indian Traditional Knowledge. The aim of this study is to develop an independent, non-commercial, and easy to access academic platform for the exchange of traditional knowledge regarding medicinal plant remedies for human and veterinary use by local communities of Kumaun region in Uttarakhand. Initially questionnaire based field survey will be conducted. In the later stages, participation of local communities with the help of a photographic database on the cloud and a front end mobile application will be developed. Documentation of traditional medicine and preparation of virtual herbarium and database as an accurate proof of taxonomical identity for traditionally used medicinal plants for human and veterinary use and their respective habitat and distribution. There are several options to save tradional knowledge one such example is Aushadh Sampadā'. It means 'medicinal heritage' and deals with conservation of indigenous knowledge regarding medicinal plants in Kumaun region of Uttarakhand by the generation of a photographic database on the cloud and a front end mobile application will be developed.

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DEVADARU AND ITS MEDICINAL USE

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Devadaru is a high altitude plant and is found in the north-western Himalayas at altitude of 3500-12000 feet its botanical name is cedrus deodara and belongs to family Pinaceae. Deodar Forests are widely found in snowfall Himachal Pradesh, Jammu-Kashmir, Uttarakhand, Sikkim & Arunachal Pradesh, Darjeeling region of West Bengal, South-western Tibet & Western Nepal in India. Acording to Acharya Charak it comes under stanyashodhan anuvasnopag, katu skand, group and Aacharya Sushuruta consider it in vaatsanshaman group. From its timber oil is obtained, which has a main constituent sequiterpene. Oil of devadaru having a diaphoretic property, induced the sweat, and maintain the body temperature. It is a medicinal plant and its oil and stem extract is used in various disorders, internally and externally. The word devdaru is a Sanskrit word means the wood of god. Its timber is also used in manufacturing of furniture. Its oil is used in arthritis and reducing pain and inflammation on external application. Its paste of leaves is applied in skin disorders. Its oil is used for wound healing and purification of wound. In the digestive system it is used in flatulence indigestion, and in constipation. Oil of devadaru is also used in Gonorrhoea, rheumatoid arthritis, osteoarthritis and in sciatica, by reducing pain and inflammation on external application. It is used in construction of railway sleepers, bridges, and furniture manufacturing. It is also used as an herbal medicine. Internally it is used in decoction form and powder form.

THERAPEUTIC APPLICATION OF ENDANGERED MEDICINAL PLANT SPECIES, THEIR ACTIVE CONSTITUENTS AND DERIVED PRODUCT

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Plants are very helpful for us in many ways. They provide us variety of things to fulfill our requirements. Most important they release oxygen in the atmosphere that we inhale and due to which we are alive. They also provide us food. They are primary resource of food for all living organisms. Other than this, plants are the major source medicine or secondary metabolite. As a source of medicine, plants are used in different system of medicine such as Indian (Ayurveda, Siddha, Unani and Homeopathy), Chinese medicinal system etc. Several therapeutically active constituents are isolated from the plants; they play an important role in the treatment of various diseases and disorders such as Digitoxin is used as a cardiac glycoside. The demand of medicinal plants and their derived product are increasing in the world market day by day. This increased demand cause risk on the sustainability of plants. According to International Union for Conservation of Nature (IUCN), thousands of plants are facing extinction risk due to extensive exploitation, habitat loss, deforestation and lack of conservation knowledge. This study discusses on the therapeutic application of endangered medicinal plants species

PRELIMINARY STUDY OF SOME ETHNO-MEDICINAL PLANTS IN DIMA HASAO DISTRICT, ASSAM

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Plants have been used in traditional medicine for several thousand years. The knowledge of medicinal plants has been accumulated since long based on different medicinal systems such as Ayurveda, Unani and Siddha. In India, it is reported that traditional healers use about 2500 plants. Herbal remedies are considered the oldest forms of health care known to mankind on this earth. Documenting the indigenous knowledge through ethnobotanical studies is important for the conservation and utilization of biological resources. Ethnobotanical survey has been found to be one of the reliable approaches to drug discovery. Several active compounds have been discovered from plants based on ethnobotanical information and used directly as patented drugs. Dima Hasao district is located in the southern part of Assam, India, between 24^0 582 to $25^0$472 N latitudes and 92^0 272 to $93^0$432 E longitudes at elevations ranging from 140 to 1866 m. The entire district comprises about 89 % forest cover of its total geographical area of 4,888 sq. km. The main ethnic groups in the district are Dimasas, Zeme Nagas, Mizo, Riang, Hmars, Hrangkhols, Biates, Jansens, Thadous (New-Kukis), Sakacheps (Khelmas), Vaipheis and Jaintia (Pnars) which are heavily dependent on plants for several reseasons. Ethnobotanical survey in the district was conducted during 2017–2019 to gather information regarding the uses of medicinal plants by the different tribal communities settled in the district. The study has revealed 110 plant species (61 herbs, 21 shrubs, 12 climbers and 16 trees)belonging to 95 genera and53 families that are used variously by herbalists, traditional healers and different tribal people in the district. Seeds and tender twigs were recorded as the least used plant parts. However, leaves were found most frequently used part (49%) followed by root (14%), bark (9%), whole plant (8%), latex, seeds, stemsand fruits (7%), tuber and rhizome (5%) and flowers, bulbs, young shoots and other parts (8%). The methods of preparation fall into seven categories. The plant parts are applied as paste (44%), juice extracted from the fresh plant parts (14%), decoction (12%), boiled (9%), powder made from dried plant parts (6%), Fumigate (4%) and others (11%). Paste is the main methods of preparation, either for oral or external administration. Largest number of remedies are used for skin diseases (29%) followed by stomach trouble (27%), cold, cough, asthma and respiratory disorders (17%), genital disorders (10%), rheumatism (7%), diabetes (5%), snake bite (3%) and toothache (2%). Common health ailments in the study area were skin problems such as wounds, boils, psoriasis. Common medicinal plants such as *Achyranthus aspera*, *Strebulus asper*, *Argemone maxicana*, *Nerium indicum*, *Hyptis suaveolens*, *Senna alata*, *Senna occidetalis* are used in skin diseases.

THERAPEUTICALLY IMPORTANT ACTIVE CONSTITUENTS- ISOLATED FROM MEDICINAL PLANTS OF HIGH ALTITUDE

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This article is based on the importance of therapeutically active compounds isolated from medicinal plants found at the higher altitude region. However, plants are widely used for medicinal purpose and play a key role in world health, mainly because they are readily available and cheaper than modern medicines. According to Food and Agriculture Organization about 50,000 medicinal plants are used across the world for medicinal purpose. The study is aimed to discuss therapeutically active constituents isolated from medicinal plants of higher altitude. Several therapeutically active compounds are well known; obtain from natural sources such as plants, microbes, animals, marine organisms and minerals. They are important sources of modern medicinal system e.g. alkaloid, glycoside, saponin, flavonoids and steroids etc. To compile the information and data of related subject, several research articles and books of higher altitude medicinal plants are studied. The following medicinal plant such as *Aconitum ferox, Acorus calamus, Argemone maxicana, Canabis sativa, Bacopa monneri, Coptis teeta, Hedychium spicatum, Juglans regia, Rhodendoron arboretum, Rubia cordifolia, Taxus wallichiana* and *Zanthoxylum oxyphyllum* etc. are reported from the higher altitude. The active constituents of these plants are well known for health benefits in traditional medicinal system of world including Ayurveda and modern medicine. The active constituents of these medicinal plants are also important source for pharmaceutical industry to develop medicine. According to the data, the demand of these medicinal plants is increasing every year. Several species of higher altitude region have been categorized as endangered species according to their IUCN status. Therefore, there is the need to conserve these medicinal plant species.

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MIRACULOUS PROPERTIES OF HERBS AND SPICES AND THEIR ROLE IN HUMAN HEALTH AND DISEASES

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Herbs and spices have a long history of both culinary and medicinal use. Ayurvedic traditional medicine evolved more than 5000years ago and uses herbs and spices for health, including turmeric, basil, mace, cinnamon and ginger. Many components present in herbs and spices which fight oxidants and free radicals that can damage cell membranes, DNA and proteins. Many herbs and spices, like turmeric and cumin, are potent anti-inflammatory agents. Cinnamon helps us for weight loss, by increasing the metabolic rate. It is a good for fat burns. Spices and herbs are reversed for their potential health attributes. They are reported to have positive effects in the treatment of numerous diseases, especially chronic ones such as cancer, diabetes and cardiovascular diseases. Herbs and spices elaborate secondary metabolites obtained form part of the plants are useful for chemical defence. They inhance food taste good but may not be delicious themselves and many of them posses remarkable pharmacological and medicinal properties.'' Food is an army'' Moreno say compounds from herbs and spices as well as the other food you are eating work together to provide health benefits.

TRADITIONAL MEDICINAL PLANTS OF UTTARAKHAND HIMALAYA

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Other than primary metabolite (Carbohydrate, proteins, fat, lipids, vitamin and enzyme), plants are the major source of secondary metabolite or therapeutically active constituents such as alkaloids, glycosides, tannins, saponins, terpenoids and steroid etc. About 422000 flowering plants are reported from the world. On the basis of the literature, more than 50000 species of plants are used for medicinal purposes, worldwide. In Indian traditional medicine system, more than 43% of the total flowering plants are reported to be of medicinal importance. According to a report, about 1500 species of medicinal plants are found in Uttarakhand State. In India, the use of medicinal plant species for health benefit has been documented long back in ancient literature. The Uttarakhand State is well known to for different tribes such Jaunsari tribe, Tharu tribe, Raji tribe, Buksa tribe and Bhotiyas; they all are used medicinal plant for the health benefits. In this study, the health benefits of medicinal plant of the State are discussed on the basis of information collected from the different Tribes. This information will help to develop scientific validation and documentation of medicinal plant species.

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LITERARY STUDY ON "ATIS" WITH CONTEXT OF HIGHLY THREATENED HERB SPECIES AMONG HIGH ALTITUDE MEDICINAL PLANTS

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Ayurveda is the science of life and the entire globe is in need of lifestyle modification through holistic approach. The Ayurveda herbs play a vital role in maintenance of health and curing of diseases. The entire globe is thus looking at India with assurance of gaining the best quality herbs which can stand testimony to the basic principles of Dravyaguna Vidnyan and Kayachikitsa given in classical texts of Ayurveda. Himalayas have always been regarded as the ideal place of Ayurveda; let it be for Ayurveda studies or cultivation of herbs. The great Indian epic of Ramayana mentions the story of Hanuman travelling all the way from Shrilanka to Himalayas in search of Sanjivani. He failed to identify the Sanjivani and thus he lifted up the entire mountain of Dronagiri. The story demonstrates the underlying sociological scenario of huge demand of unique Himalayan high altitude herbs along with failure of identification. Such unique herbs can only be acquired from Himalayan region with specificity of geology and environment. Thus these unique herbs need to be identified, documented and conserved. We identified some of the highly endangered herb species cultivated at high altitudes and conducted literary research on the same to highlight necessity of their cultivation. Atis, Kutaki, Chorak and Revandchini are some of these endangered species found at altitudes of 2,000 to 3,300 meters of height. Chirayata is found at height of 1,800 to 3,300 meters altitude; whereas Kakoli is found at height of 1,200 to 2,400 meters altitude. The aim of this study is to study ''Atis'' with context of highly threatened herb species among high altitude medicinal plants. The Literary research was conducted on Atis from perspective of highly threatened herb species among high altitude medicinal plants from books, journals and newspapers. ''Atis'' is highly essential herb with context of highly threatened herb species among high altitude medicinal plants. There needs to be a special focus on cultivation, collection, transportation of Atis.

LITERARY STUDY ON "KUTKI" WITH CONTEXT OF HIGHLY THREATENED HERB SPECIES AMONG HIGH ALTITUDE MEDICINAL PLANTS

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Ayurveda is the science of life and the entire globe is in need of lifestyle modification through holistic approach. The Ayurveda herbs play a vital role in maintenance of health and curing of diseases. The entire globe is thus looking at India with assurance of gaining the best quality herbs which can stand testimony to the basic principles of Dravyaguna Vidnyan and Kayachikitsa given in classical texts of Ayurveda. Himalayas have always been regarded as the ideal place of Ayurveda; let it be for Ayurveda studies or cultivation of herbs. The great Indian epic of Ramayana mentions the story of Hanuman travelling all the way from Shrilanka to Himalayas in search of Sanjivani. He failed to identify the Sanjivani and thus he lifted up the entire mountain of Dronagiri. The story demonstrates the underlying sociological scenario of huge demand of unique Himalayan high altitude herbs along with failure of identification. Such unique herbs can only be acquired from Himalayan region with specificity of geology and environment. Thus these unique herbs need to be identified, documented and conserved. We identified some of the highly endangered herb species cultivated at high altitudes and conducted literary research on the same to highlight necessity of their cultivation. Atis, Kutaki, Chorak and Revandchini are some of these endangered species found at altitudes of 2,000 to 3,300 meters of height. Chirayata is found at height of 1,800 to 3,300 meters altitude; whereas Kakoli is found at height of 1,200 to 2,400 meters altitude. The aim of this study is to study ''Kutki'' with context of highly threatened herb species among high altitude medicinal plants. The Literary research was conducted on Kutki from perspective of highly threatened herb species among high altitude medicinal plants from books, journals and newspapers. ''Kutki'' is highly essential herb with context of highly threatened herb species among high altitude medicinal plants. There needs to be a special focus on cultivation, collection, transportation of Kutki.

LITERARY STUDY ON *TRAYAMANA* WITH CONTEXT OF HIGHLY THREATENED HERB SPECIES AMONG HIGH ALTITUDE MEDICINAL PLANTS

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Ayurveda is the science of life and the entire globe is in need of lifestyle modification through holistic approach. The Ayurveda herbs play a vital role in maintenance of health and curing of diseases. The entire globe is thus looking at India with assurance of gaining the best quality herbs which can stand testimony to the basic principles of Dravyaguna Vidnyan and Kayachikitsa given in classical texts of Ayurveda. Himalayas have always been regarded as the ideal place of Ayurveda; let it be for Ayurveda studies or cultivation of herbs. The great Indian epic of Ramayana mentions the story of Hanuman travelling all the way from Shrilanka to Himalayas in search of Sanjivani. He failed to identify the Sanjivani and thus he lifted up the entire mountain of Dronagiri. The story demonstrates the underlying sociological scenario of huge demand of unique Himalayan high altitude herbs along with failure of identification. Such unique herbs can only be acquired from Himalayan region with specificity of geology and environment. Thus these unique herbs need to be identified, documented and conserved. We identified some of the highly endangered herb species cultivated at high altitudes and conducted literary research on the same to highlight necessity of their cultivation. Atis, Kutaki, Chorak and Revandchini are some of these endangered species found at altitudes of 2,000 to 3,300 meters of height. Chirayata is found at height of 1,800 to 3,300 meters altitude; whereas Kakoli is found at height of 1,200 to 2,400 meters altitude. The aim of this study is to study ‘‘Trayamana’’ with context of highly threatened herb species among high altitude medicinal plants. The Literary research was conducted on Trayamana from perspective of highly threatened herb species among high altitude medicinal plants from books, journals and newspapers. **‘‘**Trayamana’’ is highly essential herb with context of highly threatened herb species among high altitude medicinal plants. There needs to be a special focus on cultivation, collection, transportation of Trayamana.

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LITERARY STUDY ON VATSANABHA WITH CONTEXT OF HIGHLY THREATENED HERB SPECIES AMONG HIGH ALTITUDE MEDICINAL PLANTS

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LITERARY STUDY ON "PUSHKARMOOL" WITH CONTEXT OF HIGHLY THREATENED HERB SPECIES AMONG HIGH ALTITUDE MEDICINAL PLANTS

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Ayurveda is the science of life and the entire globe is in need of lifestyle modification through holistic approach. The Ayurveda herbs play a vital role in maintenance of health and curing of diseases. The entire globe is thus looking at India with assurance of gaining the best quality herbs which can stand testimony to the basic principles of Dravyaguna Vidnyan and Kayachikitsa given in classical texts of Ayurveda. Himalayas have always been regarded as the ideal place of Ayurveda; let it be for Ayurveda studies or cultivation of herbs. The great Indian epic of Ramayana mentions the story of Hanuman travelling all the way from Shrilanka to Himalayas in search of Sanjivani. He failed to identify the Sanjivani and thus he lifted up the entire mountain of Dronagiri. The story demonstrates the underlying sociological scenario of huge demand of unique Himalayan high altitude herbs along with failure of identification. Such unique herbs can only be acquired from Himalayan region with specificity of geology and environment. Thus these unique herbs need to be identified, documented and conserved. We identified some of the highly endangered herb species cultivated at high altitudes and conducted literary research on the same to highlight necessity of their cultivation. Atis, Kutaki, Chorak and Revandchini are some of these endangered species found at altitudes of 2,000 to 3,300 meters of height. Chirayata is found at height of 1,800 to 3,300 meters altitude; whereas Kakoli is found at height of 1,200 to 2,400 meters altitude. The aim of this study is to study "Pushkarmool" with context of highly threatened herb species among high altitude medicinal plants. The Literary research was conducted on Pushkarmool from perspective of highly threatened herb species among high altitude medicinal plants from books, journals and newspapers. "Pushkarmool" is highly essential herb with context of highly threatened herb species among high altitude medicinal plants. There needs to be a special focus on cultivation, collection, transportation of Pushkarmool.

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LITERARY STUDY ON KAKOLI WITH CONTEXT OF HIGHLY THREATENED HERB SPECIES AMONG HIGH ALTITUDE MEDICINAL PLANTS

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Ayurveda is the science of life and the entire globe is in need of lifestyle modification through holistic approach. The Ayurveda herbs play a vital role in maintenance of health and curing of diseases. The entire globe is thus looking at India with assurance of gaining the best quality herbs which can stand testimony to the basic principles of Dravyaguna Vidnyan and Kayachikitsa given in classical texts of Ayurveda. Himalayas have always been regarded as the ideal place of Ayurveda; let it be for Ayurveda studies or cultivation of herbs. The great Indian epic of Ramayana mentions the story of Hanuman travelling all the way from Shrilanka to Himalayas in search of Sanjivani. He failed to identify the Sanjivani and thus he lifted up the entire mountain of Dronagiri. The story demonstrates the underlying sociological scenario of huge demand of unique Himalayan high altitude herbs along with failure of identification. Such unique herbs can only be acquired from Himalayan region with specificity of geology and environment. Thus these unique herbs need to be identified, documented and conserved. We identified some of the highly endangered herb species cultivated at high altitudes and conducted literary research on the same to highlight necessity of their cultivation. Atis, Kutaki, Chorak and Revandchini are some of these endangered species found at altitudes of 2,000 to 3,300 meters of height. Chirayata is found at height of 1,800 to 3,300 meters altitude; whereas Kakoli is found at height of 1,200 to 2,400 meters altitude. The aim of this study is to study ‘‘Kakoli’’ with context of highly threatened herb species among high altitude medicinal plants. The Literary research was conducted on Kakoli from perspective of highly threatened herb species among high altitude medicinal plants from books, journals and newspapers. ‘‘Kakoli’’ is highly essential herb with context of highly threatened herb species among high altitude medicinal plants. There needs to be a special focus on cultivation, collection, transportation of Kakoli.

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LITERARY STUDY ON "JATAMANSI" WITH CONTEXT OF HIGHLY THREATENED HERB SPECIES AMONG HIGH ALTITUDE MEDICINAL PLANTS

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LITERARY STUDY ON "KALA JEERA" WITH CONTEXT OF HIGHLY THREATENED HERB SPECIES AMONG HIGH ALTITUDE MEDICINAL PLANTS

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Ayurveda is the science of life and the entire globe is in need of lifestyle modification through holistic approach. The Ayurveda herbs play a vital role in maintenance of health and curing of diseases. The entire globe is thus looking at India with assurance of gaining the best quality herbs which can stand testimony to the basic principles of Dravyaguna Vidnyan and Kayachikitsa given in classical texts of Ayurveda. Himalayas have always been regarded as the ideal place of Ayurveda; let it be for Ayurveda studies or cultivation of herbs. The great Indian epic of Ramayana mentions the story of Hanuman travelling all the way from Shrilanka to Himalayas in search of Sanjivani. He failed to identify the Sanjivani and thus he lifted up the entire mountain of Dronagiri. The story demonstrates the underlying sociological scenario of huge demand of unique Himalayan high altitude herbs along with failure of identification. Such unique herbs can only be acquired from Himalayan region with specificity of geology and environment. Thus these unique herbs need to be identified, documented and conserved. We identified some of the highly endangered herb species cultivated at high altitudes and conducted literary research on the same to highlight necessity of their cultivation. Atis, Kutaki, Chorak and Revandchini are some of these endangered species found at altitudes of 2,000 to 3,300 meters of height. Chirayata is found at height of 1,800 to 3,300 meters altitude; whereas Kakoli is found at height of 1,200 to 2,400 meters altitude. The aim of this study is to study ''Kala Jeera'' with context of highly threatened herb species among high altitude medicinal plants. The Literary research was conducted on Kala Jeera from perspective of highly threatened herb species among high altitude medicinal plants from books, journals and newspapers. ''Kala Jeera'' is highly essential herb with context of highly threatened herb species among high altitude medicinal plants. There needs to be a special focus on cultivation, collection, transportation of Kala Jeera.

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LITERARY STUDY ON "JEEVAK" WITH CONTEXT OF HIGHLY THREATENED HERB SPECIES AMONG HIGH ALTITUDE MEDICINAL PLANTS

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LITERARY STUDY ON "RVANDACHINI" WITH CONTEXT OF HIGHLY THREATENED HERB SPECIES AMONG HIGH ALTITUDE MEDICINAL PLANTS

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LITERARY STUDY ON "KIRATATIKTA" WITH CONTEXT OF HIGHLY THREATENED HERB SPECIES AMONG HIGH ALTITUDE MEDICINAL PLANTS

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LITERARY STUDY ON "CHORAK" WITH CONTEXT OF HIGHLY THREATENED HERB SPECIES AMONG HIGH ALTITUDE MEDICINAL PLANTS

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The aim of this study is to study ''Chorak'' with context of highly threatened herb species among high altitude medicinal plants. The Literary research was conducted on Chorak from perspective of highly threatened herb species among high altitude medicinal plants from books, journals and newspapers. ''Chorak'' is highly essential herb with context of highly threatened herb species among high altitude medicinal plants. There needs to be a special focus on cultivation, collection, transportation of Chorak.

MEDICINAL PLANTS DIVERSITY USED BY BHOTIYA TRIBAL COMMUNITY OF GANGOTRI NATIONAL PARK OF UTTARKASHI DISTRICT

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The Bhotiya are an ethno-linguistic group of people living in the Bagori, Harshil and Beerpur of Uttarkashi district of Himalayan region that divides India from Tibet. They are closely related to the Tibetans and their name Bhotiya, derives from the word Bod, which is the Classical Tibetan name for Tibet. Those living in Uttarakhand are generally referred to as Bhotiya, although they are sometimes also referred to as Bhutia. Bhutia more commonly means the related people of Sikkim. Bhotiya Tribal community have excellent knowledge of medicinal plant occurred at high Himalayan mountain of Uttarkashi district. Earlier day they used each and every plant medicinally but day by day this knowledge is going down and to be need explore.Tribal families of this region migrate towards the higher latitudes of Himalayan region like Bagori, Harsil during summer while in winter season (Dewali to Holi) they migrate towards lower Himalayan regions and community keep all the medicinal plants used as medicine. Study area falls under the Uttarkashi district. The present study was based on intensive and extensive field made during December 2016 to April 2017 periodic field visits were made once in study area to collect detailed information about the diversity and utilization of medicinal plants. So medicinal plant were surveyed by us which are directly used by Bhotiya and local community of the area. But regular use and illegal poaching may become serious problem for these medicinal plants near future. The allopathic system of medicine though expanded with a high growth rate has caused a lot of side effects and people are again returning to medicine extracted from vegetation. India and China is the repository of world's best system of natural herbs and medicine. The Garhwal region was the place of Rishi Charak for making research on herbs and he composed Charak Samhita. The market for the herbs is now going upward with the craze for AYURVEDA and traditional curing system. Demand for the cosmetics based on herbs and plant extracts is increasing with unprecedented rate. Now, it is up to the planners of the region to ride the crest of this opportunity and take benefit from production of Medicinal and Aromatic Plants

CHEMICAL COMPOSITION, ANTIOXIDANT AND ANTIFEEDANT ACTIVITIES OF THE ESSENTIAL OIL OF AERIAL PART OF *PLECTRANTHUS BARBATUS* ANDREWS

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Plectranthus barbatus (Coleus forskohlii) an important medicinal plant of family Lamiaceae has been used in traditional ayurvedic medicine for many years. The aim of present study was to evaluate the chemical composition, antioxidant and antifeedant activities of the essential oil of the aerial parts of *Plectranthus barbatus*. The chemical composition was analyzed by gas chromatography- mass spectrometry (GC-MS). The antioxidant capacity was evaluated in term of radical scavenging (DPPH, hydroxyl, nitric oxide and superoxide), reducing power and metal chelating activity. The antifeedant activity was examined on third instar larvae of *Spilosoma oblique* (Bihar hairy caterpillar) by using leaf disc method in no choice situation. The GC- MS analysis of essential oil of the aerial parts of *Plectranthus barbatus* led to identification of bornyl acetate (19.02%), n-decanal (14.45%), β-bisabolene, (4.68%), sesquisabinene (4.06%) as major components along with other minor components. The antioxidant activity assessment of the essential oil via DPPH radical scavenging, hydroxyl radical scavenging, nitric oxide radical scavenging, superoxide radical scavenging, reducing power and metal chelating activity reveals the potential antioxidant property with respective values IC_{50}= 23.18±0.05 µg/mL, IC_{50}= 16.55 ±0.35 µg/mL, IC_{50}= 20.46±0.05 µg/mL, IC_{50}= 17.07±0.02 µg/mL, RP_{50}=19.64±0.05µg/mL and IC_{50}= 13.29±0.06 µg/mL. The antifeedant capacity of the essential oil monitored through leaf disc method in no choice situation was found in a dose dependent manner (maximum at 500 ppm of concentration). The study indicated the significant finding of antioxidative potential in the essential oil of *Plectranthus barbatus* and this property might be useful in the preparation of drug formulations, health tonics, and cosmetics. Essential oil also showed potent insect antifeeding action against third instar larvae of *Spilosoma obliqua* which might be helpful for reducing the use of chemical pesticide in near future.

ENDOPHYTIC BACTERIAL STRAINS MODULATED SYNTHESIS OF LYCOPENE AND BIOACTIVE COMPOUNDS IN *SOLANUM LYCOPERSICUM* L. FRUITS

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Tomato (*Solanum lycopersicum* L.) is a natural medicine, can make people healthier and decrease the risk of conditions such as cancer, osteoporosis and cardiovascular disease. Lycopene is a plant nutrient with antioxidant properties and reduce the risk of cancer. Aim of the present work to estimation of lycopene and bioactive compounds in the tomato plant fruits inoculated with endophytic bacterial strains (MS-1, MS-2, MS-3, MS-4, MS-5). Two varieties (local and hybrid) of tomato (*Solanum lycopersicum* L.) have been used in this study.Endophytic bacteria, isolated from these two varieties.The bacterial strains were inoculated to the seeds and seedlings of tomato, and allowed to grow into the earthen pots. The fruits of bacterized plants and un-inoculated control of both the varieties were taken for the lycopene and bioactive compound analysis using HPLC, GCMS and UV-Vis spectrophotometer. The visual observation of the fruits showed deep red color due to the presence of high lycopene content in *Pseudomonas aeruginosa* (MS-5), *Methylophilus flavus* (MS-4) and *Rhizobium pusense* (MS-1) inoculated plant fruits in both the varieties. The results derived from the chromatogram of peak area as obtained in HPLC analysis of lycopene revealed that *Rhizobium pusense* (MS-1), *Methylophilus flavus* (MS-4) and *Pseudomonas aeruginosa* (MS-5) inoculation as microbial inoculants enhanced the lycopene content in both the varieties. The GCMS analysis of the endophytic bacteria inoculated plant fruits indicated 11 major carotenoids peaks observed in total ion current chromatogram revealed the presence of lycoxanthin and rhodoxanthin in all except *Bacillus cereus* (MS-3) inoculated local variety plant fruits. Astaxanthin and rhodoxanthin acetate in most, rhodopin, lycophyll and hematoporphyrin in more than half while rubyxanthin and α- carotene were present only *Rhizobium pusense* (MS-1) treated plant fruits. The antioxidant activity of treated plant fruits were measured in the terms of IC_{50} values percent of free radical scavenging activity of DPPH compared to ascorbic acid. *M. flavus* (MS-4) inoculated hybrid plant fruits showed strong free radical scavenging activity while *B. cereus* (MS-3) showed minimum activity. The antioxidant activity of endophytic bacteria treated tomato plants of local variety concluded that *Bacillus cereus* (MS-3) and *P.aeruginosa* (MS-5) inoculated plant fruits showed maximum and minimum free radical scavenging activity, respectively, compared to control. *Methyliophilus flavus* (MS-4) and *P. aeruginosa* (MS-5) inoculation resulted in enhanced level of total phenol content in both the varieties. The response of *M. flavus* (MS-4) was much better when compare with other treatments.Flavonoid content in the endophytic bacterial inoculated plant fruits measured in the terms of quercetin concentration revealed that *R. pusense* (MS-1), *B. cereus* (MS-3), *P. aeruginosa* (MS-5) enhanced the flavonoid content in their respective inoculated tomatoes in both the varieties. From this study, it can be inferred that endophytic bacteria play a pivotal role in the pharmaceutical activities of *Solanum lycopersicum* L fruits. Findings of the work conclude excellent biological activities of the endophytic bacteria associated with *S. lycopersicum* L.and postulate medicinal potential of lycopene and other bioactive compounds.

NOTHOAPIOLE AND α-ASARONE-RICH ESSENTIAL OILS FROM *PLEUROSPERMUM ANGELICOIDES*BENTH. - A HIGH ALTITUDE MEDICINAL AND AROMATIC PLANT FROM WESTERN HIMALAYA OF UTTARAKHAND

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Pleurospermum angelicoides Benthis a herb found at high altitude in the Himalayan tract of Uttrakhand.It is distributed in the Himalaya Mountains 3300-4800 m above the sea level, Yunnan province, China, southern Chibetto, and Nepal. It is a Chinese folk medicine used as an antipyretic and diaphoretic agent in local areas of Yunnan province, China and as treatments of typhoid and dysentery by the name of "Chipi" in Himalayan regions.Previously a phenylpropanoid, l-propenyl 2,3,4-trimethoxybenzene, angelicoidenol a bicyclic monoterpene[5] and two isocumarins from seeds of *Pleurospermum angelicoides* were reported. To investigate essential oil compositions of leaf, seed and root of *Pleurospermum angelicoides* and isolation structure determination of isolated compounds. The fresh leaves, stems and seeds of *Pleurospermum angelicoides* were collected from Milam glacier (Uttarakhand) at an altitude of 3400 m in the month of August at mature stage. The identification was done from Botanical Survey of India, Dehradun. The voucher specimens (No.CHEM/DST/03) have been deposited in the Phytochemistry reserach laboratory of the Chemistry Department, Kumaun University, Nainital. The fresh plant material (1.0 kg stems, 1.0 kg roots, and 500gm seeds) were subjected to steam distillation separation using a copper electric still, fitted with spiral glass condensers. The distillates were saturated with NaCl and extracted with n-hexane and dichloromethane. The organic phase was dried over anhydrous sodium sulphate and the solvents were distilled off in a rotary vacuum evaporator at 30^0 C and the percentage oil content was calculated on the basis of fresh weight of plant materials. The oil yields were 0.40% and 0.35% in leaves and rhizomes respectively (v/w). The oils were analyzed by using a Nucon 5765 gas chromatograph (Rtx-5 column, 30 m × 0.32 mm, FID), split ratio 1: 48, N_2 flow of 4 kg/cm^2 and on Thermo Quest Trace GC 2000 interfaced with MAT Polaris Q Ion Trap Mass spectrometer fitted with a Rtx-5 (Restek Corp.) fused silica capillary column (30 m x 0.25 mm; 0.25 μm film coating). The column temperature was programmed 60^0 C -210^0 C at 3^0C/min using He as carrier gas at 1.0 mL/min. The injector temperature was 210^0 C, injection size 0.1μL prepared in hexane, split ratio 1:40. MS were taken at 70 eV with a mass range of 40-450 amu. The GC and GC/MS analysis of leaf, fruit and root oil of *P. angelicoides* represented 99.03%, 98.26% and 97.74% of the total constituents identified in leaf, seed and root oil respectively. Both of leaf and fruit oils were dominated by limonene and α-asarone (48.42% 14.76% and 23.19%, 20.67%) respectively. The major constituents of leaf oil were limonene (48.42%), α-asarone (23.19%), γ-terpinene (11.02%), β-asarone (4.79%), perilla aldehyde (3.26%), (*E*)-β-ocimene (2.58%) while the fruit oil was dominated by α-pinene (22.28%), α-asarone (20.76%), perilla aldehyde (16.76%), limonene (14.76%), bornyl acetate (7.53%), *p*-anis aldehyde (4.47%), where as the root oil has totally different composition. The single major compound from root (83.43%) was isolated and identified by comparison of its IR, MS, ^{1}H NMR and ^{13}C NMR data as 5-Allyl-4,6,7-trimethoxy-benzo[1,3] dioxide, with it α-muurolene (4.41%) and some other compounds are present in trace amount. This is concluded that the plant which is collected from high altitude of Uttarakhand, contains number of useful compound having very important biological activities and one of major compounds is isolated is useful in preparing of medicines.

ANTIMICROBIAL ACTIVITY OF COW URINE AND ITS ROLE AS BIOENHANCER WITH *AZADIRACHTA INDICA* (NEEM)

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Developing countries have been using the traditional system of medicine from centuries for treating various ailments and diseases. Indian system of medicines, especially Ayurveda, has been using cow urine for betterment of physical and mental health of mankind since thousands of years, and it is taken as holy drink by many Indian rituals. Ancient texts and Indian literature recommended the use of gomutra for variety of diseases like gastric troubles, wounds, injuries, skin disorders, diabetes etc. In recent, cow urine is used as a therapeutic agent in form of panchgavya, a blend of five compounds obtained from the cow, namely dung, urine, milk, ghee & curd. The aim of this study is to evaluate antimicrobial activity of Cow urine and its role as bioenhancer with *Azadirachta indica* (Neem). Fresh, distilled Cow urine samples were used, the extracted & distilled sample of plant leaves were mixed with cow urine & kept in sunlight for 5 days for photoactivation & then filtered through sterile Whattman filter paper. The filtered photoactivated form was again redistilled & evaluated for antimicrobial potential by Kirby-Bauer assay method. Distilled cow urine was mixed with medicinal plant extract for photoactivation. After redistillation and evaporation the yield of crude sample obtained was 65 ml. Photoactivation is necessary to remove the active particles of medicinal plants in a natural temperature & sunlight, it also kills the microbes present in the cow urine to avoid contamination. After result analysis, we found that a good antimicrobial activity represented by the photoactivated cow urine sample with medicinal plant, the combination shows maximum zone of inhibition and the cow urine acting as bioenhancer viz., On comparing the data of medicinal plant extract with cow urine distillate, we found that the *Azadirachta indica* (Neem) plant extract distilled exhibited higher antibacterial as well as antifungal activity, the maximum zone of inhibition is observed with *S. aureus* (9 mm in diameter) and *Penicillium sp.* (12 mm in diameter) respectively. So here cow urine act as a good bioenhancer which enhances the activity of *Azadirachta indica* (Neem), represent a very high sensitivity against many strains of bacteria and fungi when photoactivated with cow urine. The maximum antibacterial activity was found against *S. aureus*, whereas maximum antifungal activity was against *Mucor sp.*, *Aspergillus sp.,* and *Penicillium sp.* Present study is related to the role of cow urine (gomutra) as a bioenhancer. Cow urine distillate is an activity enhancer & availability facilitator for bioactive molecules. The distillate helps in absorption of active molecules across the cell membrane of microorganism. The medicinal plants are rich in secondary metabolites (which are potential sources of drugs) & essential oils of therapeutic importance. So present research emphasize the combination effect of cow urine & medicinal plant viz. *Azadirachta indica* (Neem) on various microbes in reference to their antimicrobial activity as well as the effect of cow urine as a bioenhancer.

EVALUATION OF ANTIOXIDANT ACTIVITY OF *BADRI* COW URINE

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Cow urine occupies a holy place in Indian rituals and ayurveda due to its effluent application against various diseases since Vedic period. Cow-derived products such as urine, milk, curd, ghee and dung collectively known as Panchgavya, and is also well known for their therapeutic applications. *Badri* cow is the indigenous cattle breed of Uttarakhand state. This is the first cattle breed of the state to get certified y National Bureau of Animal Genetic (NBGAR).Certain conventional drugs, therapies and imbalance dietary sources are mainly responsible for the generation of free radicals in body that may lead to some serious manifestations like cancer and diabetes. Therefore, need to explore new antioxidant compounds to combat the health concerns. The aim of this study is to evaluate the free radical scavenging activity of *Badri* cow urine. Collection of cow urine- *Badri* cow urine was collected from Cattle Breed Centre, Nariyalgaon, Champawat (Uttarakhand). Cow urine was then filtered by Whatman No.1 filter paper to get rid of precipitated material. Determination of antioxidant activity- The total phenolic content in collected Badri cow urine sample was detected by Folin-Ciocalteau method. Free radical radical scavenging activity was assessed by (1,1-diphenyl-2-picryl hydrazyl) DPPH method. Superoxide radical scavenging activity was determined by nitroblue tetrazolium NBT reduction method Total phenolic content of cow urine was 5.09±0.005 mg GAE/g. The DPPH and NBT assay showed dose-dependent scavenging activity of cow urine and the IC_{50} was calculated as 52.51±0.35 mg/ml and 81.29±0.06 mg/ml respectively. It may conclude that cow urine has ability to neutralize the free radicals in dose dependent manner. Therefore, it may be used as a versatile therapeutic agent.

ANTI-INFLAMMATORY AND ANTI-MICROBIAL ACTIVITIES OF ENDOPHYTIC FUNGI ISOLATED FROM HIGH ALTITUDE MEDICINAL PLANTS

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Endophytes are specific group of micro-organisms which colonize plants internally without apparent adverse effects. Endophytic fungi are potent source of novel organic compounds with pharmaceutically important biological activities and a high level of biodiversity. An array of natural products has been characterized from endophytes, which include anti-cancer, antioxidant, antifungal, antibacterial, antiviral, anti-insecticidal and immunosuppressant activity. The aim of this study is to isolate and screen the potential endophytic fungal isolates from high altitude medicinal plants for antibacterial, antioxidants and L-asparaginase mediated anti-inflammatory activities. Isolation of endophytic fungi from medicinal plants as described previously by Strobel et al. 2004. The spent broth after mass fermentation was analysed for antibacterial activity against pathogenic microbes using KB disc diffusion assay and Agar well diffusion assay. The antioxidant potential of the fungal extracts was analysed by estimating total phenolic content and DPPH radical scavenging activity. The in-vitro anti-inflammatory activity of fungal extracts was evaluated through inhibition of albumin denaturation. A total of 79 different fungal endophytes were isolated from different plant parts of various medicinal plants viz. *Rauwolfia serpentina, Pinus sabiniana*, *R. arboreum* and *C. verum* to create a potent repository. Among the repository, potent antibacterial activity was observed in isolates from *Rauwolfia serpentina* and *C. verum*. All the isolates exhibited free radical scavenging activity but 4 cultures namely LG#OTSBOK, #7RALB, #10RASTB, #13CCBKN showed maximum antioxidant activity and maximum phenolic content was estimated in extracts of 4 fungal isolates i.e. #1RASTB, #9CZLFAB, #17BBSSTB and #13CCBKN.Further, cultures namely #17BSSTB, #9CZLFAB, #LG2 and #13CCBKN showed highest anti-inflammatory potential by inhibiting albumin denaturation. The isolated endophytic fungal isolates were screened for the production of L-asparaginase enzyme. In the L-asparaginase screening assay #11 RASTB, #17 RASTB, #18RALFB, #10RASTB, #9CZLFN and #18CTLFN were found to be potent L-asparaginase producer. One-way ANOVA analysis and Tukey's post hoc analysis revealed maximum L-asparaginase production in #9 RASTB with a zone size of 20.3 mm. Molecular identification of potent anti bacterial endophytic fungal isolate #10RSLBRT was ascertained as belonging to *Fusarium incaranatum-equiseti* complex. Recent advances have shown an increase of pharmaceutical intervention in harvesting potent bioactive compounds of therapeutic potential from medicinal plants. This has resulted in over exploitation of medicinal plants rendering an increase in endangered species. Isolation of endophytic fungi harboring similar chemical diversity as that of host medicinal plant can prove as an alternative repository of potent bioactive compounds. The present study has shown the anti bacterial, antioxidant and anti-inflammatory potential of fungal endophytes isolated from high altitude medicinal plants. Potent endophytic fungal isolates were recovered with multiple bioactivities including L-asparaginase production and anti-inflammatory action.The present study has shown an alternate route of harnessing novel compounds of natural origin with potent medicinal values.

PHEROMONE TRAP - AN EFFECTIVE METHOD IN THE CONTROL OF *TRILOPHIDIA ANNULATA* ATTACK ON *ASWAGANDHA* (*WITHANIA SOMNIFERA*)

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Several medicinal plants are used to treat the different ailments of human being. Drug also prepared from the Phyto constituent which is extracted from the plants. Healthy plants must be in need to prepare quality medicines. Plants are qualitatively and quantitively vulnerable when they are affected with disease and pest during its development. Because of these factors medicinal plants are inadequately supplying to the health sector; impact of this leads to low quality products. Plant protection thus plays a great role to prevent or reduce the damage and produce healthy material. Several pests comprising of species of insects, mites, plant pathogens and nematodes damage these plants in all agro-ecosystems where small, medium and large-scale cultivation is practiced. *Aswagandha* (*Withania somnifera* L*)* is an important medicinal plant which is commercially cultivated in this country. Conservation and protection of such herb is a formidable task as several biotic factors affect their physiology and photochemical profile along with yield. The insect pests continuously infect throughout the year considered as major infestation. Trilophidia is a genus of grasshoppers in the family Acrididae. Withania somnifera is an evergreen shrub reaching height up to 110 cm. It has been recommended in the treatment of aphrodisiac, liver tonic, antinflamatory agent, astringent and more recently to treat bronchitis, asthma, ulcers, emaciation, insomnia and senile dementia. It is a major ingredient in different ayurvedic formulations. In order to cop up with the demand it is mandatory to cultivate this plant as crop. There is several pest management methods are indicated in the principle and practice of cultivation of Withania somnifera L. Pheromone trap is newly introduced method in which pheromones are used to lure insects. Using other pest control measures on Withania somnifera can alter the quality of the drug which is needed in the preparation of medicine. By the use of this mechanical trapping we can make sure that it doesn't alter the normal physiology of the Withania somnifera L.

ARTEMISIA ROXBURGHIANA WALL. EX BESSERVOLATILES: A LESS EXPLORE HIGH ALTITUDE MEDICINAL/ AROMATIC PLANT

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Artemisia roxburghiana wall. Ex. Besseris an erect perennial, highly fragrant herb belonging to the family Asteraceae. It is commonly known as Roxburgh's wormwood. It is growing wild on dry open slopes and wasteland in Himalayan region at altitudes between 1000–4300 m a.s.l. and distributed in western Himalayas (Jammu & Kashmir, Himachal Pradesh and Uttarakhand) between altitudes 2000-3500 m a.s.l. The whole plant is used in ethno-medicine in India to treat eye diseases, wounds, cuts, and external parasites in animals. An extract of the whole plant is used to treat fever, skin allergies, malaria and intestinal worms. In Indian folk medicine, this species of Artemisia has been successfully utilized to cure eczema, pimples and sores. *A. roxburghiana* has significant amount of essential oil/volatile ascompared to other species of Artemisia and very less explored on bioactivity part of its volatile oil. Therefore, the present research aims to study the isolation and characterization of *A. roxburghiana* essential oil, physicochemical profiling and its antimicrobial activity. The aerial part of the *A. roxburghiana* was collected from an altitudeof 2060 m, yielded 1.020±0.2% yellowish brown colored essential oil. GC/MS analysis of essential oil revealed the presence of 57 chemical constituents out of which 49 compounds were identifiedwhich constitute 88.94% area and rest 11.06% remain unidentified. γ-Curcumene (17.25%) was the major compound in *A. roxburghiana*essential oil. Physicochemical profiling was carried out and antimicrobial activity of essential oil against human pathogens viz. *Staphylococcus aureus, Escherichia coli* and *Saccharomyces cerevisiae* was evaluated.

EFFECT OF *JATYADI GHRIT* ON CHRONIC ULCER MANAGEMENT: A CASE STUDY

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The aim of this paper is to study and discuss the effect of *jatyadi ghrita* on chronic ulcer. This case study shows enthusiastic results of *jatyadi ghrit* on chronic ulcer over the dorsum of the left foot since last six months in a 98 years old lady. The wound developed due to accidental penetration of a wooden piece. Wound healing has been described throughout the history of *Ayurveda*. Our ancient *Acharyas* knew that proper wound debridement is the fundamental step in wound healing process. The chronic ulcer (*dushta vrana)* becomes even more complicated and difficult to manage if body's normal biological response to fight wounds becomes impaired. Natural ingredients present in *Jatyadi ghrit* are *jati* (*Jasminum officinale*), *nimb* (*Azadiracta indica*), *haridra* (*Curcuma longa*), *daruharidra* (*Berberis aristata*), *patol* (*Trichiosanthes dioca*), *sariva* (*Hemidesmus indicus*), *manjistha* (*Rubia cordifolia*), *yastimadhu* (*Glycyrrhiza glabra*), *kutaki* (*Picrorhiza kurroa*), *karanj* (*Pongamia pinnata*) and *usheer* (*Vetivera zizanioides*). Apart from these natural contents cow's ghee and blue vitriol are also included. *Jatyadi ghrit* (described by *Acharya Sharangdhara* in *Sarangdhara Samhita, madhyam khanda* 9/58-60) is used in ulcer present over the vital parts, wound suppuration, deep seated wound, non-healing ulcers, boils, insect bites etc. The contents of *jatyadi ghrit* have anti-inflammatory, antioxidant, analgesic, anti-ulcer, anti-microbial, immune-modulator and haemostatic properties. The natural ingredients present in the *jatyadi ghrit* initiate regeneration of the destroyed tissue, removal of damaged structures and thus speed up the healing of the ulcer to restore the normalcy. This study will definitely give a hope to new researchers to work more on herbal formulations with their miraculous results.

ALTITUDINAL VARIATION IN STEROIDAL SAPONIN CONCENTRATION AND ANTIOXIDANT POTENTIAL OF *PARIS POLYPHYLLA*, AN ENDANGERED MEDICINAL PLANT OF INDIAN HIMALAYAN REGION

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Paris polyphylla is an important medicinal herb of the Indian Himalayan Region shares its position with endanagered species. A study was carried out to investigate the altitudinal variation in secondary metabolite concentration of *Paris polyphylla*. Rhizomes were collected from five populations of Kumaun Himalaya across the altitudinal gradients. The major chemical constituents of the species is Steroidal saponin and maximum concentration (44.18 mg/g DW) was found to be present in Katheliya (Bageshwar) population, altitude 3235m asl, followed by lesser concentration with decrease in altitude. Among various steroidal saponins namely Polyphyllin I, II, VII, Polyphylin II was present in highest concentration in all population and all three constituents showed a positive correlation between concentration and altitude of growing sites. Additionaly Antioxidant potential of rhizomes of *Paris polyphylla* was also evaluated by DPPH and FRAP assay. Result exhibited a positive correlation between Total Flavonoid, Tannin, Phenol concentration and altitude. Maximum DPPH scavenging activity was showed by population Dwarpani (Bageshwar) altitude 2700m asl and highest ferric reducing ability of plasma was observed in population Katheliya (Bageshwar) altitude 3235m asl.

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EXTRACTION, STRUCTURAL ELUCIDATION AND PHYTOCHEMICAL CHARACTERS OF SAPONINS AND ITS USES

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Saponins are the plant steroids having two different structural subunits an aglycon and a saccharide unit. The structural variability in saponins is seendue to the variations in the aglycon or saccharine subunits. For complete structural estimation of saponins identification of aglycon unit as well as determination of sugar sequence is done. Typically for extraction of Saponins the clean fresh plant material is subjected to exhaustive methanolic extractions and thereafter the crude methanolic extract is further extracted with petroleum ether, % aqueous methanol, n- butanol and water. The bulk of the saponins are found in normal butanol fraction. For structural estimations a complete hydrolysis of the saponins is carried out to know the aglycon subunit as well as the sequencing of sugar units. Multidimensional NMR has been quite useful in structural determination of Saponins. Uses of DEPT or APT analysis give fruitful clues regarding aglycon subunit and sugar sequencing. The saponins exhibit antimicrobial properties, guarding our body against fungal, bacterial and viral infections. At the same time they improve immune system by stimulating the production of T-cells. Saponins act as antioxidants. The saponins are generally found in Soyabeans and Peas. The saponins form foam when mixed with water. They show antiinflamatory and immune-boosting properties as well as antibacterial effects. Their name derived from a latin word 'Sapo' which means soap. The saponins are chemical compounds that occure in wide range of herbs, seeds and vegitable. In medicine they are used in vaccine formulations to regulate immune function. Due to their antibacterial and foaming properties, these compounds are added to shampoos, soaps, house cleaners etc. The saponins help in reducingcholesterol levels, kill disease causing bacteria and inhibit tumor growth.

ANALYSIS OF MEDICINALLY IMPORTANT PHYTOCOMPOUNDS FROM *ADINA CORDIFOLIA* BARK- AN IMPORTANT MEDICINAL PLANT OF RUBIACEAE FAMILY

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Adina cordifolia Benth & Hook, commonly known as Haldu is deciduous tree whichhas antiulcer potential activity, antifertility activity, anti- inflammatory and anti-nociceptive activity. The present study was aimed to evaluate the bioactive phytochemical constituents of *Adina cordifolia* bark, with this broad objectives the total phenolic contents (TPC), total flavonoid contents (TFC), total antioxidant potential, DPPH scavenging activity, FRAP assay and GC-MS analysis of bark extracts were carried out. For the identification of medicinally important compounds in *Adina cordifolia,* bark extracts were prepared using cold extraction method in different solvents of varying polarities *viz.,* chloroform, ethyl acetate, acetone and methanol. Total phenolic content of plant extracts was analysed using Folin-ciocalteu reagent, total flavonoid content was estimated by using aluminium chloride and total antioxidant activity was estimated by formation of a green phosphate Mo(V) complex at acid pH. Gas Chromatography Mass Spectroscopy was performed to identify phytocompounds present in plant extracts using National Institute of Standards and Technology (NIST) library. The highest total phenolic content found in ethyl acetate and flavonoid was found in acetone extract of *Adina cordifolia* bark. Total antioxidant activity was highest in methanol extract while DPPH radical scavenging avtivity was highest in acetone extract. All the extracts from bark were different in their qualitative and quantitative make-up of major and minor constituents. The dominating constituents in the bark extracts of *A cordifolia* were umbelliferone, o-trimethylsilyl (0.60-5.74%), 7-hydroxycoumarin (32.67-79.62%), n-hexadecanoic acid (0.75-5.78%), methyl commate d (0.68-3.31%), ergost-5-en-3.beta.-ol (1.41-4.03%),γ-sitosterol (5.33-14.43%) and α-amyrin (2.46-8.73%) in different solvents. The study concludes that *Adina cordifolia* have many biologically important compounds, so it can be recommended as a plant of pharmaceutical importance.

PHYTOCHEMICAL ANALYSIS AND BIOLOGICAL ACTIVITIES OF *ARDISIA SOLANACEA* ROXB. COLLECTED FROM FOOT HILLS OF UTTARAKHAND

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The aim of present study was to analyze the chemical composition and to evaluate biological activities of the ethyl acetate leaf, stem and root extract of *A. solanacae* Roxb. Extracts were obtained from different parts of the plant using Soxhlet method in ethyl acetate. The extracts so obtained were chemically analysed qualitatively and quantitatively. Qualitative analysis of ethyl acetate leaf, stem and root extract of *A. solanacea* showed the abundance of alkaloids, carbohydrates, resins, diterpenes, triterpenes, fats and oils. While quantitative analyses of extracts were done by the combination of GC and GC/MS. The major compounds present in the leaf extract (ASLE) were aristolone. The major compounds of stem extract (ASSE) were 4,6,6-trimethyl-2-(3-methylbuta-1,3-dienyl)-3-oxatricyclo octane (16.19%). While the α-amyrenone (13.30%) was the major compounds of root extract (ASRE).ASLE showed higher phenolic, flavonoid and orthodihydric phenol content 323.99±0.04 mg/g GAE, 17.00±0.012 mg/g CNE and 36.09±0.02 mg/g CLE respectively. The *in vitro* antioxidant activity was performed in terms of DPPH radical scavenging, reducing power and metal chelating effect. ASLE showed highest radical scavenging potential; ASLE possessed highest reducing power and also exhibited maximum metal chelating effect in comparison to standard antioxidants. The negative correlation of total phenols with IC_{50} values of DPPH radical scavenging (-0.986), metal chelating activity (-0.685) and reducing power activity (-0.999) was obtained. ASRE showed a strong *in vitro* anti-inflammatory effect relative to the diclofenac sodium. The antifeedant activity of various ethyl acetate extracts of *A. solanacea* was done against Bihari Hairy Caterpillar (*Spilosoma oblique*) insect and the results showed ASRE to possessed highest % antifeeding activity. ASRE was evaluated for its insecticidal activity against *Spilosoma oblique* insect using leaf dip bioassay method and showed significant mortality rate.

IMMUNOMODULATORY ACTIVITY OF *CAMELLIA SINENSIS* IN EXPERIMENTAL ANIMALS

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Immune system plays a significant role to fight against foreign bodies. Medicinal plants are the abundant source of bioactive substances which are obliging to enhance the immune system of our body. In Ayurveda, traditional medicinal plants create attention to build up body defence mechanism against various threaten diseases.*Camellia* species is well known to treat various diseases. The aim of this study is to evaluate immunomodulatory activity of *Camellia sinensis* in experimental animals. Immunomodulatory activity was carried out by neutrophil adhesion test, heamagglutination test and delayed-type hypersensitivity. The present study was aimed to investigate the immunomodulatory activity of methanolicextract of *Camellia sinensis*in wistar albino rats. Cellular immunity was assessed by neutrophil adhesion test and delayed type hypersensitivity reaction while humoral immune response was analysed by haemagglutination titre assay. The significant increase in both cellular and humoral immune response was observed in animals treated with *C. sinensis*. Among the different doses, 200 mg of *C. sinensis* was more effective in both humoral and cellular immunity.These findings showed that *C. sinensis* is more potential in increasing both humoral and cellular immunity in wistar albino rats. The immunostimulatory effect produced by *Camellia* species helps in the stimulation of both cellular and humoral immune system and also increases the total leucocytes counts. This study provesthe use of tea beverages shall be that helpful to the immunosuppressed people by enhancing the immune system.

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BOTANICAL DESCRIPTION, PHYTO-CHEMISTRY, MEDICINAL USES AND PHARMACOLOGY OF AN AYURVEDIC MEDICINAL PLANT- KAMPILLAKA (*MALLOTUS PHILIPPENSIS*)

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Ayurveda is the traditional Hindu system of medicine which is based on the idea of balance in bodily systems and uses diet, herbal treatment, and yogic breathing.Ayurveda believes five basic elements Pancamahabhutas (space,air, fire,water and earth) manifest in the human body as three basic humours known as tridosas (Vata, Pitta and Kapha). Several species of medicinal plants are reported to use in Ayurveda to treat and cure diseases and disorders. Our present study was aimed to discuss on botanical, description, phyto-chemistry, medicinal uses and pharmacology of an Ayurvedic medicinal plant- Kampillaka (*Mallotus philippensis*). In the present study, the relevant literature collected from various offline and online sources including Scopus, Web of Science and PubMed, was thoroughly reviewed for botanical description, phyto-chemistry and Pharmacology of *Mallotus philippensis. Mallotus philippensis* (Lam.) Mull.- Arg., belonging to family Euphorbiaceae is commonly known as Kamala dye tree and red kamala. It is up to 10-12 meters in height and is widely distributed throughout tropical India along with the Himalaya from Kashmir east wards up to 5000 ft. *Rottlera tinctoria* is synonym of this drug. An attempt has been made to highlight this Himalayan plant in field of traditional medicine. Traditionally this plant used in the treatment of skin problems, bronchitis, antifungal, tape worm, eye-disease, cancer, diabetes, diarrhea, jaundice, malaria, urinogenital infection. Various part of plant contain majority of phyto-constituents like terpenoids, phenols, diterpenoids, steroids, flavonoids, cardenolides, coumarins, isocoumarins, and many more especially phenols that is, bergenin, mallotophilippinens, rottlerin, and isorottlerin are also present. This plant has already been reported for its Inflammatory, immuno-regulatory, anti-bacterial, anti-fungal, anti-allergic, anti-proliferative, anti-oxidant and anti-radical action. The Kampilaka is an important Ayurvedic plant; it is used to several diseases & disorder and balance dosas. Different part of the plant contain therapeutically active constituent and reported to show various pharmacological action.

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CHEMICAL AND BIOLOGICAL STUDY OF ESSENTIAL OIL OF *ZANTHOXYLUM ARMATUM*

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Zanthoxylum armatum (Family: Rutaceae) is commonly known as Timur. It is an aromatic, deciduous, a branched, scandent, or erect shrub or a small tree, 6 m tall or more, with dense foliage. Species found in the hot valleys of the Himalayas from Jammu to Bhutan up to an altitude of 2400 m and in Eastern Ghats in Orissa and Andhra Pradesh in India, Nepal and Pakistan. The plant is adapted to subtropical climate of lower warm valleys of Himalayas with sufficient rainfall. Timur is known as an important magical plant as its plant parts like leaves, stem, bark, fruits, seeds and roots possess medicinal properties and are used in indigenous medicine preparation against various diseases. In traditional health care system, it is valuable because of its stomachic, carminative and anthelmintic properties. The plant has been commonly used in medicine for the treatment of fever, skin sensitivity, chest infection, dental problems, and digestive problems and in scabies. Traditionally the timur bark is utilised as dye yielding resource. Due to unique aroma and flavour, the timur leaves are potential source of spices. In view of the immense medicinal importance of the species, the present study aims to study the chemical composition of *Zanthoxylum armatum* and its anti-fungal activity against forest pathogens. The major chemical constituents of Timur identified through GC-MS analysis are β-linalool (33.22%), Myrtenol (5.37%), D-limonene (5.21%), Caryophyllene (3.25%), Phytol (3%), α-humulene (1.02%). which has both traditional as well as medicinal importance. *Z. armatum* essential oil has been evaluated for its antifungal activity against *Fusarium oxysporum, Rhizoctonia solani* and *Alternaria.* The results will be discussed during the presentation.

TOTAL PHENOLIC, FLAVANOID CONTENT AND ANTI-OXIDANT ACTIVITY OF ETHANOLIC EXTRACT OF *PRIMULA DENTICULATA* FLOWERS

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P. denticulata belongs to the family Primulaceae and it contains triterpene glycosides denticin and denticulatin and flavanoid. The aim of the study was to investigate total phenolic content in plant extracts by folin-ciocalteu's method, total flavonoid content by Aluminium chloride method and invitro antioxidant studies by DPPH free radical scavenging assay, reducing power assay and ferrous chelating activity. In total phenolic content, phenolic constituents undergoes a redox reaction with the mixture of phosphotungstate and phosphomolybdate present in the folin-ciocalteau reagent and give blue color solution which shows maximum absorption at 765 nm. In total flavanoid content, the intensity of the yellowish green color of the chelate formed by the flavonoids when treated with $AlCl_3$ in presence of acetate buffer was spectrophotometrically determined at 415 nm. In presence of anti-oxidant DPPH free radical reduces to DPPH-H, due to the hydrogen donation by antioxidant. This leads to the color change of DPPH solution from violet to yellow. The potency of antioxidant was determined by measuring absorbance of DPPH solution at 517nm, lower the absorbance more potent is an antioxidant. Reducing power assay measures the reducing ability of an antioxidant. In this method an antioxidant donates its electron to Fe^{3+} ion of potassium ferric cyanide and reduces it to ferrous (Fe^{2+}) ion. The ferrous ion generated in the reaction forms complex with ferric chloride which gives Prussian blue color and shows maximum absorbance at 700 nm. In ferrous chelating method, the antioxidants forms chelate with Fe^{2+}ion, this decreases the formation of blue colour Fe2+-ferrozine complex in the reaction. The decrease in the color intensity is estimated by measuring the absorbance at 562 nm. The total phenolic and flavanoid content of ethanolic extract of flowers of *P. denticulata* was 83.204 mg GAE/ g and 38.197 mg QE/g respectively. In DPPH free radical scavenging assay, the percentage inhibition of ethanolic extract and ascorbic acid has been noted as 72.49% and 80.22% at a concentration 500µg/ml and 10µg/ml respectively. In ferrous chelating activity, the percentage inhibition and IC_{50} value of ethanolic extract was 67.27% and 706.51 µg/ml respectively. In reducing power assay, absorbance of ethanolic extract 0.813at concentration 500µg/mlhowever it is less as compared to standard ascorbic acid 1.12 at concentration 100 µg/ml. In conclusion, the ethanolic extract of *P. denticulata* flower extract showed significant anti-oxidant activity.

PHARMACOGNOSTICAL AND PHYTOCHEMICAL ANALYSIS OF *CARICA PAPAYA* LEAVES

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Objective of the present study is to carry out the physicochemical and phytochemicals standardization of *Carica papaya* leaves to establish the standard pharmacognostical parameters of this valuable medicinal plant. Many standardization parameters of *Carica papaya leaves* are analyzed. Standard method is adopted for the preliminary phytochemicals screening. Analysis of pesticides residues, aflatoxin & heavy metals are also performed. The sections of leaves are prepared for quantitative microscopic parameters. The air dried powdered plant material is subjected for determination of physicochemical standardizations like ash value, Extractive value and fluorescence nature of the powder drug using light of short and long wavelength of 254nm and 366nm respectively. Phytochemical screening is performed for the identification of phytoconstituents in the plant which is helpful in the development of analytical profile. The morphological and microscopic examinations of drug are revealed the presence of endosperm cell which are polygonal in shape and contain alerone grains and oil droplet, cell of testa, yellow colouring matter and starch grains. Preliminary phytochemical screening showed the presence of carbohydrates, phenolic compounds, flavonoids, alkaloids, proteins, saponins and lipids in the drug extract and flourescence nature of drug is confirmed by fluorescence analysis in different solvent. Concentrations of heavy metals, ash value and extractive value are determined and found within acceptable Pharmacopoeial limits. Pesticides residues and aflatoxins are also determined but not detected in the tested samples. The physicochemical and phytochemical standards which are outcome of this research may be utilized as substantial data for identification and standardization of *Carica papaya* leaves.

PANCHAKARMA THERAPY FOR ALLERGIC RHINITIS: A CASE STUDY

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Allergic Rhinitis is characterized by symptoms like nasal congestion, sneezing, rhinorrhea, nose itching, etc., and has a major impact on the patient's quality of life and productivity. Conventional therapeutic interventions include allergen avoidance, oral antihistamines, intranasal corticosteroids, etc. However, there are several shortcomings such as occurrence of side-effects, patients not responding adequately to treatment, etc. Thus, there is a definite need to look for other therapeutic procedures for the effective management of this disease. As per the classical texts of Ayurveda, Vataja Pratishyaya is the disease that has symptoms similar to those associated with Allergic Rhinitis. Encouraging results have been shown by the Nasya procedure of Panchakarma therapy in managing the symptoms of this disease. To assess the efficacy of Panchakarma therapy in the management of symptoms of Allergic Rhinitis. A case study is being presented here, wherein a 36 year old male patient, suffering from symptoms of Allergic Rhinitis, came to the Out Patient Section of the Department of Ayurveda and Holistic Health (DAHH) at Dev Sanskriti Vishwavidyalaya, Haridwar. Panchakarma therapy was administered for 13 days to this patient. According to Ayurveda, this disease is associated with the imbalance of Kapha and Vata doshas. Hence, Kapha and Vata pacifying therapeutic procedures and herbal medicines, that also provide nourishing effect to the respiratory system, were used; these included Deepan Pachan Drug, Abhyangam (Sarvanga), Abhyangam (Ekanga), Vashpa Sweda (Sarvanga), Nadi Sweda, mild Koshtha Shuddhi, Anuvasana Basti, Asthapana Basti, Nasya, Shirodhara, and Kwatha of Vata and Kapha pacifying herbs. Later, patient took raw Haridra (Curcuma longa) for self-management of disease at home. The patient experienced significant reduction in sneezing episodes, from about 150 per day to about 20 per day; relief in heaviness in the head region; and, complete relief in itching in nose and throat. Overall, the patient reported a good experience. In a followup taken after about one and a half years, the patient reported complete relief in sneezing episodes and heaviness in the throat, as well as non-recurrence of the earlier condition. Panchakarma therapy showed encouraging results with regards to the management of the symptoms associated with Allergic Rhinitis and associated ailments, in a short duration of time.

A COMPARATIVE ANTIDIABETIC ACTIVITY OF DIFFERENT EXTRACTS OF *COCCINIA INDICA* ROOT

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Coccinia indica is indigenous plant of Central Africa, India and Asia. It is cultivated abundantly in India (Assam. Bihar, Orissa, Maharashtra, Andhra Pradesh, Tamil Nadu) as a vegetable and its wild form is also found in many parts of India. This plant has been widely used in traditional Indian medicinal system (Ayurvedic, Unani, and Siddha) for their anti-inflammatory, antipyretic and analgesic anti-microbial and antidiabetic activity.*C. indica* reveals that it contains carbohydrates, glycosides, fix oils and fats, proteins and amino acids, saponins, tannins, phytosterol, alkaloids, phenolic compounds, flavonoids, gum and mucilage. A comparative antidiabetic activity of different extract *i.e*. pet ether chloroform, methanol and water of and *Coccinia indica* root were performed in STZ induced diabetic rats. The blood glucose level was estimated with glucometer One Touch Basic Plus® (Lifescan Inc. California, USA) using the strips (glucose oxidase method). Values are expressed as mean ± standard error of the mean. Diabetes was induced in Albino Wistar rats (200-250gms) by single intraperitoneal injection of streptozotocin (50 mg/kg) in freshly prepared in citrate buffer (pH 4.5). Diabetes was confirmed by checking the blood glucose levels after 48 h of streptozotocin injection. Animals showing blood glucose level above 250 mg/dl were selected for the antidiabetic study. Diabetic animals were randomly assigned from group II to IV. Group I served as normal control.. Group II served as diabetic control. Groups I and II received vehicle during the experiments, group III received the reference standard drug glibenclamide (3 mg/kg), groups IV and received the aqueous extract, Group V received and Group VI received chloroform and methanolic extract of *C.indica* roots respectively. Blood glucose level was measured after 14 days of extracts administration**.** After 14 days of antidiabetic study Different extracts of *Coccinia indica* showed antidiabetic activity for different extend But Methanolic extract of *C. indica* root showed significant reduction in blood glucose level as compared to aqueous and chloroform extract.

EFFECTIVENESS OF AYURVEDA TREATMENT IN URDHWAGA AMLAPITTA: A CLINICAL EVALUATION

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Dyspepsia (Amlapitta) is the commonest ailment found in present time. Now a day due to unawareness about prakriti (psychosomatic costitution) people are practicing inappropriate diat style and living habits which leads disturbances in digestive system. As per Ayurveda due to this pitta gets vitiated with kafadosha which leads excessive secretion of vidagdha Pitta causing symptoms like burning sensation. If this pitta takes an upward course in patient, then it is called as Urdhwaga Amlapitta. This study was conducted with objective to assess effectiveness of personalized Ayurveda treatment for Urdhwaga Amlapitta (un-investigated dyspepsia). This was a one-arm exploratory open-label clinical trial. Thirty patients of Urdhwaga Amlapitta were selected as per eligibility criteria. They were given different herbo-mineral preparation in different ratios as per individualized approach of Ayurveda. These drugs were given for period of 28 days and patients were followed weekly in OPD for assessment of their symptom severity scores. Tiktamlodgar (Acid eructation) and Gurukoshthatva (gas bloating) was most commonly occurring symptom in 93 % (n=28) of participants. Seventy percent (n=21) of participants were having Avipak (indigestion) followed by 50 % (n=15) with Gurukoshthatva (Gas bloating) and 40 % (n=12) with Tiktamlodgar (Acid eructation). The patient was symptomatically relieved by all the symptoms of Urdhwaga Amlapitta by 3rd visit (21st day) and difference in score was statistically significant. All participants were willing to take Ayurveda medicine. Combination of Ayurveda drugs with individualized approach as per Ayurveda text, given to patient of Urdhwaga Amlapitta can symptomatically cure patients within 28 days. These drugs were found to be well-tolerated, safe and acceptable.

REVIEW ON PHYTOCHEMICAL, INSECTICIDAL, ANTIMICROBIAL AND CYTOTOXICITY OF THE CRUDE METHANOLIC EXTRACT FROM *AJUGA PARVIFLORA* BENTH.

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Ajuga parviflora Benth belongs to genus *Ajuga* and family *Labiatae* (also called *Lamiaceae*) is an annual or short lived perennial herb that gro ws in temperate region, widely distributed in Europe, Asia and Africa. *Ajuga* species has great medicinal importance thus used for the treatment of rheumatism, gout, asthma, diabetes, malaria, ulcers and have antibacterial, antitumor, antifeedant and vulnerary properties. The aim of our study was to evaluate the phytogenic chemical compounds and assess different activities from methanolic extract and essential oil of *A. Parviflora* Benth. In the present study, the phytochemical constituents of essential oil were isolated by steam distillation and screened by GC and GC -MS analysis of *A. Parviflora* Benth. Methanolic extract of medicinal herb *A. parviflora* Benth. was also evaluated for phytochemical screening . An antimicrobial activity against various strains of bacteria and fungi, insecticidal activities against red flour beetle (Tribolium castaneum), wheat weevil (Sitophilis granaries) and their larvae has also been reported. For brine shrimp lethality bioassay (cytotoxicity) at different concentrations viz. 10, 100 and 1000 ug/ml of the methanolic extract has been reported to be used. The volatile constituents of *Ajuga parviflora* Benth were isolated by hydro distillation and analyzed by GC and GC-MS which revealed the presence of β - caryophyllene (22.4%), γ -muurolene (12.7%), γ - terpinene (6.3%), caryophyllene oxide (6.2%), α-humulene (5.8%), δcadinene (4.3%), α - amorphene (3.8%) and β-selinen (2.5%). Methanolic extract of medicinal herb reported the presence of aromatic compounds, carbohydrates, glycosides, tannins, a lkaloids, polyphenols, quinines, dions, aminophenols, steroids/sterols, flavonoids a nd terpenoids. For brine shrimp lethality the percent mortality and LD_{50} value was calculated through probit analysis after 24 hrs. The LD_{50} value of extract was 321.42μg/ml while that of standard drug cyclophosphamide was 16.09μg/ml. It can be concluded that this study will guide researchers for the isolation of new compounds from *A. parviflora* and it will have efficiency against ailments of infections and diseases.

EVALUATION OF TRACE ELEMENT CONTENTS IN *RUMEX HASTATUS* D. DON ROOTS

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Medicinal plants are being used in oriental medicine for the treatment of various ailments ranging from the common cold to cancer. *Rumex hastatus* D. Don locally known as Kilmori is an important medicinal plant of family Polygonaceae. The leaves and aerial part of *R.hastatus* are sour in test and used for making sauce, the leaf extract applied on cuts and wounds to check bleeding and also used to relieve from suffering of nettle sting. Aerial part of *R.hastatus* is widely used in the preparation of crude Ayurvedic drugs. In order to evaluate the quality and efficacy of *R.hastatus* plant material, focusing on pharmacologically relevant groups of compounds and inorganic elements is therefore required. Much work has been done on quantification of anthraquinones, naphthalene-1,8-diols, flavonoids, stilbenoids and other organic constituents of *R.hastatus*, but determination of trace metals remain undiscovered. Therefore, present study was designed to estimate the essential trace elements and electrolytes in aerial part of *R.hastatus* occurring at different altitudes. The matured roots (100 g) of *R.hastatus*were collected from three different sites viz. Adibadri (1,750 m), Nagnath- Pokhari (1870 m) and Ghat (2,550 m), covering the entire altitudinal range of this species. Multi-element working standard solutions (10, 100, 150, 200 ppb) were prepared by appropriate dilution of the stock ICP multi-element standard (Merck) 10 ppm. All analyses were performed on ICP-MS (Perkin Elmer NexION 300X) using both Standard and Kinetic Energy Discrimination (KED) modes. The concentration of total 16 elements (Li, Na, Mg, Al, K, Ca, Cr, Mn, Fe, Ni, Cu, Zn, Mo, Ag, Sn and Pb) were determined. The overall concentration of K was found to be the highest, whereas the level of Li was lowest. The highest concentrations of Na, Mg, Al, K, Ca, Fe, Zn, Ag and Pb were found to be 9.66±0.28, 4.89±0.25, 3.59±0.10, 10.00±0.10, 10.00±0.20, 9.54±0.20, 4.47±0.40, 1.22±0.001 and 6.18±0.81 ppb respectively. This is the first investigation regarding the mineral composition ofAerial part of *R.hastatus*. The microwave digestion method has considerable advantages, which includes good precision and accuracy, reduced contamination, speed and safety. The use of concentrated nitric acid and sulfuric acid (4:1) mixtures allowed the complete digestion of samples. Mean intake of Li, Na, Mg, Al, K, Ca, Cr, Mn, Fe, Ni, Cu, Zn, Mo, Ag, Sn and Pb falls within the recommended range. The concentrations of Li, Cr, Mn, Ni, Mo and Sn were quite low in all samples, whereas Mg, Al, Cu, Zn, Ag and Pb were present in moderate concentrations, but Na, K, Ca and Fe were in very high concentrations in all the samples.The mineral contents were well within the permissible range for human consumption, therefore, recommended for medicinal uses.

CROSSLINKING OF GUAR GUM FOR PHARMACEUTICAL APPLICATIONS

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Guar gum is a dietary fibre obtained from the endosperm of the Indian cluster bean *(Cyamopsis tetragonolobus)* and orally used for cure of constipation, diarrhoea, irritable bowel syndrome (IBS), high cholesterol, and high blood pressure. It is advocated for use in lowering serum cholesterol and low density lipoprotein (LDL)-cholesterol levels without producing any significant effect on high density lipoprotein (HDL)-cholesterol or triglyceride levels. The numerous health benefits of guar gum are due to the presence of naturally occurring biopolymer, galactomannan with mannose: galactose ratio of 2:1. It possesses long chain of β (1-4) mannose backbone to which α (1-6) galactopyranosyl unit is attached. Guar gum and its derivatives are widely used in food and pharmaceuticals. In our laboratory, guar gum was crosslinked with different crosslinking reagents such as epichlorohydrin, sodium trimetaphosphate, glutaraldehyde and glyoxal. The crosslinking with sodium trimetaphosphate and glutaraldehyde are widely used in pharmaceuticals for drug delivery. The crosslinked reaction products were characterized by spectroscopic methods, TGA, viscosity, sedimentation weight and volume, swelling power, solubility and degree of cross-linking. The cross-linking of the biopolymer increased the sedimentation volume at higher conc. of cross-linking reagent. The modified products can be used for drug delivery, viscosifier, emulsifier and related pharmaceutical applications.

UNDERSTANDING PHARMACOKINETICS OF RUKSHA AND LAGHU QUALITIES WHILE USING AS HERBAL CONTRACEPTIVES

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Rapid increase in population is a serious problem throughout the world. Nowadays birth control become necessity in India because many socio-economic conditions of people have been adversely affected by increasing crimes, illiteracy, diseases, improper food and shelter. As women play a pivotal role in the family, she is also responsible for the wellbeing of the family so, women's healthcare need to be safe and effective. Modern contraceptives / synthetic anti-fertility agents have various side effects like weight gain, nausea, headache, carcinoma of cervix, carcinoma of breast etc. So it is necessary to use biologically active substance as fertility regulating agents. In *Bhavprakasha* and *Yogratnakara,* there are some herbal contraceptive were described. *Pippali (Piper longum), Vidanga (Embelia ribes), Japakusum (Hibiscus rosa-sinensis)* are considered as potent contraceptives. These drugs act as uterine constrictor in order to act as contraceptives. They mainly possess *Laghu and Ruksha Guna* and *katu vipaka* which increase *Vata dosha* that helps in *Garbhashaya sankocha* causing expulsion of un-implanted fertilized ovum. Several studies on the above mentioned herbs were reported that they contain some active ingredients like saponins, steroids, etc. which are responsible for the antifertility effect like anti-ovulation, anti-implantation and shown minimal side effects in comparison to the chemically synthesized contraceptive which usually contain various combinations of hormones. Here we have concluded that some of the herbs possessing *ruksha* and *laghu* qualities can be used as contraceptives. These herbal contraceptives can provide an opportunity for affordable, potential and efficient replacement with having lesser side effects, particularly to the women living in the rural areas.

CARBOXYMETHYL GUARAN: A POTENTIAL DIETARY FIBER

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Ayurvedic literature vividly describes usage of various plants for food and pharmaceutical applications. Consequently, guar legumes are used traditionally in Indian cuisine since ages due to assorted health benefits due to the presence of seed galactomannans. The later is composed of linear chain of (1-4)-β-D-mannopyranosyl units with α-D-galactopyranosyl units as side chain having (1-6) linkages, in a ratio of 1.5 to 2 resulting in varied end use applications. The hydrolysed form of gum is a promising source of dietary fibre. Further, native and derivatised gum is used in treatment of diverse ailments viz. haemorrhoids, constipation, diabetes etc. Carboxymethyl guar gum is one of the most versatile derivatives demanded in food, feed and pharmaceuticals for diverse applications. The properties of the modified gum are dependent on the degree of substitution (DS). In our laboratory, carboxymethylation of guar gum was carried out by varying different reaction parameters viz.amount of mono-chloroacetic acid (MCA), conc. of NaOH, reaction temperature, reaction time and gum: liquor ratio. The optimized conditions for carboxymethylation of powdered GG (DS =0.5830) comprised of 0.125 mol of NaOH; 0.05 mol of MCA; reaction medium: 80% aqueous methanol; liquor: gum ratio (v/w) of 15:1 at 75^0C for 75 min using 0.029 mol of guar (as AGU). The products were characterized by spectroscopic techniques viz. FT-IR, 1D (^{1}H, ^{13}C and DEPT-135) and 2D (HSQC, HMBC and COSY) NMR. Rheological studies demonstrated non-Newtonian pseudo-plastic behaviour of carboxymethyl guar gum.

SHIKIMIC ACID: A PRECIOUS BIOACTIVE MOLECULE FROM *ILLICIUM GRIFFITHI*

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Illicium griffithii is one of the highly traded aromatic and medicinal plants occurring in high altitudes, subtropical and temperate forests in North-East India which grows in selected patches to a few locations. It is used as traditional medicine to cure abdominal pain, cough, food poisoning, vomiting, toothache etc. Fruits are also a potential source of Shikimic acid for the production of oseltamivir (Tamiflu), an antiviral drug against avian influenza or bird flu. Shikimic acid is one of the potent globally acknowledged pharmaceutical intermediate and sole building blocks for antiviral drug oseltamivir (Tamiflu). Most of the current supply of shikimic acid is being sourced from Chinese star anise (*Illicium verum)*. India, despite being one of the major mega diversity in world, imports shikimic acid to meet its requirements. With increasing demand of shikimic acid for diverse pharmaceutical applications, researchers across the world are continuously screening different species for the isolation of shikimic acid. In the present study, shikimic acid was quantified by HPLC from the extracts of *Illicium griffithii*fruits collected from different geographical locations of North-Eastern region of Meghalaya.The extraction of *Illicium griffithii* fruits and subsequent HPLC analysis revealed that shikimic acid was found to be in highest amounts in patch 2 (14.43%) followed by patch 1 (10.22%), patch 12 (5.05%) and patch 13 (3.06%). The clones with higher percentage of shikimic acid are being propagated by the partner institution at NEHU.

PHYTOCHEMICAL AND PHARMACOLOGICAL EVALUATION OF *PAEONIA EMODI* FROM GARHWAL HIMALAYA

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This study was designed to examine for the first time the antimicrobial, antioxidant activities and phytochemical screening of different fractions (petroleum ether, ethyl acetate, methanolic and water) of leaves part of *Paeonia emodi*. *P. emodi* (*Ranunculaceae*) family commonly known as Chandra in Uttarakhand.It is a shrubby perennial with large deeply cut leaves and large white flowers with numerous orange-yellow stamens. Its tuber or rhizomes are rich in starch, sucrose, malic acid, oxalic acid, tartaric acid and benzoic acid content. The plant is a CNS depressant, hypothermic, diuretic, anti-inflammatory and useful in gout. Vaids in Joshimath (Uttarakhand) use it as an antispasmodic. *P. emodi* is used as traditionally in different disease such as high blood pressure, congestive heart failure, palpitation, asthma, convulsions, epilepsy, paralysis, schizophrenia, bronchitis, cough, abdominal colic, ascites, hepatitis, jaundice, renal colic, calculous, dysmenorrhea, uterine disorders, leprosy, erysipelas and other skin diseases. It is rich in triterpenes, monoterpene glucosides and phenols. The extraction process involved fractionation with various solvents with using AOAC method and standard techniques. Antioxidant activities of methanolic extract were examined using DPPH methods. The level of starch, sucrose and malic acid *Paeonia emodi* leaves were found to be 9.5%, 5.4% and 0.47% respectively. The methanol extracts in particular from the leaves showed the highest activity compared with other plants. The antimicrobial activities were tested by the disc-diffusion method. Phytochemical screening of methanolic extracts (leaves) lead to identification of tannins, flavonoids, polyphenols, sterols, polyterpenes and alkaloids. The present study was attempted for the first time to investigate the antimicrobial activity, antioxidant activity, thin layer chromatography and phytochemical screening of *Paeonia emodi*to search for newer, safer and more potent drug.

ESTIMATION OF TOTAL FLAVANOIDS CONTENTS IN URTICA DIOTICA ROOT EXTRACT

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The flavanoid are polyphenolic compounds, usually occur in plants as glycosides form. Flavanoids are usually having one or more phenolic hydroxyl group combined with sugar residue. Flavanoids compound are regarded as 15 carbon skeleton. These occur in almost all parts of plant. *Urtica diotica* is a perennial herb commonly known as stinging nettle, belonging to the family *Urtieaceae*. Phytochemical evalution of plant revealed the presence of many chemical compounds like steroids, saponins, flavanoids, tannin, proteins, and amino acids. *Urtica diotica* is widely used by traditional medicinal practitioners for curing various diseases such as nephritis, haematuria, jaundice and arithritis. *Urtica diotica* has been reported to have various pharmacological activities like antibacterial, antibiotic, antioxidant, analgesic, anti-inflammatory, antiviral and anticancer. The plant also used as food, fibre, paint, manure and cosmetics industries. So, the current task has been designed to estimate total flavanoids in chloroform and ethyl acetate extract of *Urtica diotica* plant by alumminium chloride colorimetric test. This test is used to quantify the amount of flavonoid. This study will provide referential information for correct identification and help in checking adultration in market sample used in preparation of herbal medicines.

HERBAL FORMULATION OF GARHWAL HIMALAYAN MEDICINAL PLANT *VALERIANA JATAMANSI*

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This study was aimed to evaluate the possible phytochemical activity and to develop new herbal formulation with potential pharmacological activity from readily accessed natural products. *Valeriana jatamansi* (family *Valerianaceae*) commonly known as Sumaya in Garhwal Uttarakhand. *V. jatamansi* is used as stomach pain, nervous disorder, skin disease, snake poison, muscle pain, epilepsy and insanity. It is medicinally used for different disease as like antispasmodic, antitumor, antineoplastic, antianxiety, antiobesity and hysteria. The materials included fresh and dry roots and leaves *of V. jatamansi* were collected from Khirshu district Pauri, Uttarakhand during November–December 2018. These plants were authenticated from Taxonomy Laboratory, Department of Botany, HNB Garhwal (A Central University) Srinagar. The roots and leaves were first shade dried for a week. Then the crushed roots and leaves were ground into coarse powder with the help of a mechanical grinder and soxhlet extracted with petroleum ether, chloroform, methanolic and water using the soxhlet apparatus. Each extract was evaporated to dryness under reduce pressure using a rotary evaporator. The extracts thus obtained were stored in air tight container at 4°C until further analysis. The phytochemical screening of plant showed the presence of carbohydrates, saponins, glycosides, flavonoids, phenols, resin and tannins. However, alkaloids were absent.

IN VITRO ANTIMICROBIAL ACTIVITY AND PHYTOCHEMICAL SCREENING OF *RUBUS LACIOCARPUS* LEAVES

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The aim of this work is to investigate *In vitro* antimicrobial activity and phytochemical screening of *Rubus laciocarpus* leaves. It is commonly known as black Hinsarin Uttarakhand and belongs to Rosaceae family. It is used as astringent, diuretic, anti-diarrheal and anti-dysenteric properties. The fruit of *R. laciocarpus* is contains protein, crude fat, vitamin C, minerals and dietary fibers etc. This is used in the treatment of digestive disorder, astringent, supplementary food, and cardiac disorder and blood disorders. The materials included fresh and dry leaves *of R. laciocarpus* were collected from Rambada district Rudraprayag, Uttarakhand during June-August 2017. These plants were authenticated from Taxonomy Laboratory, Department of Botany, HNB Garhwal (A Central University) Srinagar. The leaves were first shade dried for a week. Then the crushed leaves were ground into coarse powder with the help of a mechanical grinder and soxhlet extracted with petroleum ether, chloroform, methanolic and water using the soxhlet apparatus. Each extract was evaporated to dryness under reduce pressure using a rotary evaporator. The extracts thus obtained were stored in air tight container at 4°C until further analysis. The antimicrobial activities were tested by the disc-diffusion method. The extraction process involved fractionation with various solvents with using AOAC method. Phytochemical screening of methanolic extracts (leaves) lead to identification of tannins, flavonoids, polyphenols, sterols, polyterpenes and alkaloids.

A COMPARATIVE STUDY OF BHRINGRAJ OIL AND MURCHIT SEASAME OIL ON DANDRUFF

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Dandruff is one of the most common hair problem characterized by excessive scaling of scalp tissue. Market is flooded with antidandruff products and people are fed-up by these chemicals and its side-effect so everyone is looking for something natural and safe treatment option for a healthy scalp. The aim of this paper is to study the effect of bhringraj oil on dandruff in comparison with seasame (murshit teel oil) and to evaluate the difference chemically. In this study 60 subjects suffering from 'darunak' were recruited. Two groups were made - Group 'A' was given murchit teel oil and Group 'B' was given bhringraj oil. Murchit teel oil was prepared with reference of Bhaishajya Ratnawali, Bhringraj oil was prepared with reference of 'Bhaishajya Ratanawali' Both groups were advised to apply 10 to 15 drops of given oil over the scalp area & massage at bed time daily for 45 days. They were prohibited from using any type of hair oil & shampoo. They were advised to wash their hair with luke warm water alternate day. After evaluating the observation, we can say that 'bhringraj oil' is more effective than sesame oil on 'darunak'. Bhringraj is swed janan, rakta prasadak & keshya. It activates swed granthi and increase blood circulation of that place. So it is the most important ingredient in curing darunak. Aamrabeej majja is kafaghna & krimighna, so it is helpful in curing dandruff. Also it is pitta shamak, so it helps in daah. Neelotpal is kafhaghn, varnya, twak doshahar, which helps to cure dandruff. So we can conclude that ingredients of bhringraj oil plays important role in curing 'darunak'. Bhringraj oil is more effective in 'darunak' than murchit sesame oil.

TO STUDY PHYTOCHEMISTRY AND PHARMACOLOGY OF MEDICINAL PLANTS

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The aim of this study is to identify the commonly used plants in Ayurveda, to study the Ayurvedic pharmacology of the selected plants, to categorize selected plant drugs according to their Ayurvedic pharmacological properties and to elicit the importance of Ayurvedic pharmacology for scientific growth and upliftment of Ayurveda. The intended research involves highlighting the major plant drugs used in Ayurveda with their respective pharmacological properties. This involves studying in detail the available literature of the selected plants to understand their Ras, Guna, Virya, Vipaka and Prabhava karma. Also categorizing the plants into similar Rasa, Guna, Virya and Vipaka in order to understand there karma over the Dosha's thereby explaining the working principle (Karmukta). Finally, interpreting the role of Ayurvedic pharmacology in the control of diseases by Ayurvedic principles of Dosha Samta. The present study will depict the role of Ayurvedic pharmacology in the effective and scientific management of diseases through Ayurvedic principles. It will also help to highlight the prime importance of basic principles of Ayurveda as well as the long ignored Ayurvedic pharmacology principles. The limitations of phytochemistry of active principle in the Ayurveda should be well understood by the Ayurvedic scholars. Hence this paper is oriented to give reorientation to the pharmacological research pattern in Ayurveda. In the event of scientific prowess and evidence base medicine, we the Ayurvedic scholars of present time are somewhere disregarding the Ayurvedic pharmacology. If the Ayurvedic principles are left out in Ayurveda then it will eventually change into herbal science. Thereby the present paper is a small step to reinstate the significance of Ayurvedic pharmacology.

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CLINICAL EFFICACY OF *PALASHBEEJADIYOGA* AND *KAMPILLAKADILEPA* IN THE MANAGEMENT OF *MANDAL KUSHTHA* W.S.R. TO *DUSHIVISHA*.

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Mandal Kushtha (psoriasis) is one of the common chronic disorders facing the human beings. Other pathie's are helpless to cure it, except *Ayurveda*, especially with *Shodhana* therapy; All *Acharyas* have given emphasis on repeated *Shodhana* but schedule of *Shodhana* therapy is itself a very time consuming and hectic for patients living in today's competitive and busy life. To overcome this problem we have managed *Shamana* procedures which are not very time consuming and patient can take it easily. In this schedule we have introduced *Palashbeejadi Yoga* as oral preparation in a dose of 2g two times in a day after meal and *Kampillakadilepa* with Ghee as topical application in sufficient quantity two times in a day. Thistrial had run for one month and follow up of one monthaftertreatment. So in this trial, efforts were made to develop easily applicable, safe, simple and cost effective management for *Mandala Kushtha* (Psoriasis). Patients have been given life style suggestion to prevent recurrence of disease. The aim of this study is to evaluate clinical efficacy of *Palashbeejadi Yoga* and *Kampillakadi Lepa* in the management of *Mandala Kushtha*. Literary references were collected from *Ayurvedic* classics, commentaries, modern literature other recently published books and research journals. *Palashbeejadi Yoga* and *Kampillakadi Lepa* which were prepared in the pharmacy of N.I.A. Jaipur.All the patients fulfilling the criteria of diagnosis and inclusion were randomly selected. Total 30 diagnosed patients of *Mandal Kushtha* were selected, randomly from *Agadtantra* OPD and IPD of NIA Jaipur. Written informed consent was taken on prescribed Performa before the inclusion of patient in trial. They are briefed about merits and demerits of research plan before taking consent. The duration of trial was one month. Two types of trial drug were selected mentioned in *Sidha Bhaishajya Manimala.* Above drugs were taken in prescribed proper proportion as mention in text and formulated in the NIA pharmacy Jaipur. The first trial drug was *Palashbeejadi Yoga* (Si.B.M.,4gu. *Kushtharogachikitsa*/3-4). The dose of 2 g was given twice a day after meal through oral route. The second trial drug was *Kampillakadi Lepa* and used externally with ghee twice a day for one month. The therapeutic effect of the treatment was assessed in based on both sign & symptoms and laboratory investigations. 2 patients showed marked relief (06.67%), 22 patients showed moderate improvement (73.33%), 5 patients showed mild relief (16.67%) and 1 patients showed no relief (03.33%). Drugs showed good effect by reducing the sign and symptoms of *mandala kushtha*.

α-L-ARABINOPYRANOSYL (1-3)-β-D-GLUCOPYRANOSYL (1-3)-β-HYDROXY-OLEANE-12-ENE-28-METHYL ACETATE FROM THE SEEDS OF *TRICHOSANTHIS TRICUSPIDATA*

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The plant *Trichosanthesis tricuspidata* is a climbing plant belongs to the family cucurbitaceae. α-L-arabinopyranosyl (1-3)-β-D-glucopyranosyl (1-3)-β-hydroxy-oleane-12-ene-28-methyl Acetate has been isolated from the seeds of *Trichosanthis tricuspidata* first time together with two known compounds β-sitosterol and quercitene. The structure of the compound was characterised by means of chemical and spectral methods including advanced 2D NMR studies.

ALTITUDINAL AND SEASONAL VARIATION IN MORPHOLOGICAL FEATURES IN *ACONITUM HETEROPHYLLUM* WALL. EX ROYLE, AN ENDANGERED MEDICINAL PLANT OF INDIAN HIMALAYAN REGION

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Aconitum heterophyllum Wall. ex Royle (Ranunculaceae) is an important medicinal plant of the Indian Himalayan region which is placed under Endangered category by IUCN. This important medicinal plant is known to be heavily extracted from the wild in Uttarakhand owing to its aggravated demand from pharmaceutical industry. The present study was carried out to explore the suitable region which can be developed as a cultivation site in Uttarakhand so that pressure on wild population may be reduced in order to conserve this valuable species in their natural habitat. A total of five populations from different geographical and altitudinal zones (chakrata, 2890 m; Uttarkashi, 3281 m; Chamoli, 3556 m; Pithoragrah, 3832 m and Bageshwar, 3841 m) were studied for morphological features in three different seasons. Populations were selected based on literature and local information whereas seasons were chosen on the basis of life cycles in the study area, i.e. August: vegetative growth period whereas September and October for reproductive period (Young flowers and matured flowers with seeds respectively). The population study was carried out using stratified random sampling method (1m x 1 m). Ten individuals were selected randomly for recording morphological characters i.e. Plant height, stem diameter, tuber length, tuber diameter and leaf area). A considerable variation is found regarding morphological features of *Aconitum heterophyllum* among different altitude and time period. The morphological features in general correlated negatively with altitude. Maximum plant height (27.6$\pm$3.2) was observed in populations from lower altitude (Chakrata region, 2890 m asl) whereas, the minimum value (22.3$\pm$3.5) was recorded from the relatively higher altitude (Bageshwar, 3841 m asl). The maximum leaf area (2.92$\pm$0.3 cm^2 /plant) was recorded comparatively from lower altitudes (Chakrata region, 2890 m asl) in the month of September which is vegetative growth period of the plant, whereas, minimum leaf area (0.92$\pm$0.1 cm^2 /plant) was recorded in the month of August at higher altitudes (Bageshwar, 3841 m asl). Some trend has been reported for the stem diameter, maximum dia (5.8$\pm$1.2) was recorded from lower altitude (Chakrata region, 2890 m asl). However, data on tuber length and diameter indicated that tuber size did not correlate with plant height (Table 1). Indeed, plants with the shortest height had long tubers. The results of morphological features also showed that species performs better (in terms of vegetative growth) at lower altitude. Similar kind of results has been reported in another important medicinal plant *Aconitum violaceum*. The study explores the cultivation prospects of *Aconitum heterophyllum* in Uttarakhand. Present study reveals that all the study sites can be selected for the cultivation of *Aconitum heterophyllum,* however, time of harvest has to be precociously chosen. If the bioactive content is to be extracted from the vegetative parts, then it has to be harvested in the vegetative growth period which is August-September in this case and if tubers are the source of bioactive compound then it should be harvested during the late flowering period i.e end of September- mid October. Since, tubers of higher altitudes are robust compare to lower altitudes thus, Bageshwar and Pithoragarh can be selected for extraction of bioactive compound from tubers and in lower altitudes from vegetative plant parts.

THE PHILOSOPHICAL ANALYSIS OF THE CONCEPT *VEERYA*

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The fundamental principles of *Ayurveda* are based on philosophical and scientific observation of nature according to the law of *Yatha Bramande Tatha Pinde* (uniformity of nature) as *Charaka* has also quoted the same view in the concept of *LokaPurushaSamya*. (Ch.Sha.5/3) The physical and chemical laws have been applied to solve the mystery between man and nature. As the universe is controlled by the Sun, the Moon and the Air so the living body is regulated by the elements of *Vata*, *Pitta* and *Kapha*.(Su.Su.21/8) According to *Ayurveda* and Indian philosophy the whole universe and its belongings are constituted of the *Panchamahabhootas* (five basic elements) including the human being too. This similarity between the inward and outward nature of man is of great significance in health science. All the drugs and dietetic substance are *Panchabhautika* in nature and when they used, influence the chemical composition of human cells accordingly because of having similar nature. The *Veerya* (potency) of drugs has great significance in *Ayurveda* because the action of drug is defined by the same. There are different opinions about its characters and action among the scholars. One opinion says that *Veerya* is a quality in the form of energy by which drugs act, so the character of *Veerya* will be different in drugs having different modes of action. Another opinion says that al- though *Veerya* is energy, but it is purely technical and must be taken scientifically with quite accuracy. Some scholars consider *Veerya* as eight prominent qualities i.e. *Guru-Laghu*, *Shita-Ushna*, *Snigdha-Ruksha*, Manda and *Tikshna*, but the other scholars consider only two types *Veerya* namely *Sheeta* and *Ushna*. This dual view of potency of drugs is much more prevalent and requires a deeper analysis. The dualistic view of the potency of drugs has its deeper origin in Indian philosophy.

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STUDY ON THE ANALYTICAL QUALITY CONTROL PROTOCOLS FOR THE STANDARDIZATION OF POLYHERBAL FORMULATION *SAPTAVIMSATIKA GUGGULU*

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Plants are natural resources for a wide range on biochemical products and are used medicinally in various countries. They are the foundation of many potent and effective drugs. However the usage and dose of lots of traditional medicines which are in random and unspecified are a big challenge for acceptance as a medicine until not get standardized. The most important ayurvedic drug, i.e., Saptavimsatika Guggulu has selected from ayurvedic famous books named Ayurvedic Pharmacopoeia of India ayurvedic monographs for phytochemical and physicochemical study. These ayurvedic drugs are mainly and commonly used in the treatment of heart, skin, and stomach-related disease. The quality test for the finished product were performed in which total ash, acid insoluble ash, water soluble extract, alcohol soluble extract, moisture content etc were estimated. The tablets or *vati* of the study drug were analysed for hardness, uniformity of weight, friability and disintegration time (DT) in which hardness (Kg/cm2) 1.42±0.080, uniformity of weight % 4.267±0.163, friability% 0.566±0.232, and disintegration time (min) 9.35±0.229 were estimated. HPTLC analysis of *Saptavimsatika Guggulu* using toluene: ethyl acetate: formic acid (7:3:1) as mobile phase showed 14 peaks for all three batches. The coinciding max Rf values were 0.10, 0.18, 0.33, 0.42 and 0.80. Hence, the standard parameters were developed for current formulation. So, in the current study, the analytical standard of *Saptavimsatika Guggulu* was developed which will be ready reference for the next researcher.

ADULTRATION AND SUBSTITUTION IN AYURVEDA PRACTICES

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Ayurveda is an Indian traditional system of medicine. In present era, world is looking towards herbal Medicine because of acceptability and safety. Medicinal plants constitute an effective source of Ayurvedic properties. In India, about 80% of the rural population depends on herbal medicines in primary health care level .the concept of substitiution prevailed ages back and in ayurveda *"Sandigdha Dravaya"* is a term used for that type of medicinal plants which are mentioned in Ayurvedic classics *Bhavaprakasha* and *Yogaratanakar.* Adulterants and substitutes are the common practices in herbal raw material trade. Adulteration is a debasement of an article. The motives for intentional adulteration are normally commercial. Substitution is a replacement of equivalent drugs in place of original drugs. The principles to select substitute drugs are based on similar *Rasa, Guna, Virya, Vipaka* and mainly the *Karma*. At present the adulteration and Substitution of the herbal drugs is the burning problem in herbal industry and in Ayurvedic practices.Resulted growing high altitude region many endangered and rare costly original medicinal species such as these are *Vatsnabh kutki, riddhi, pushkarmool, vridhi, kakoli, shirkakoli, jeevak, meda, mahameda* etc.completely endangered and incorrect identification of their intentinally or unintentionally, Finally they become effectively adulterer and substituted in condition. Thus, it is prime necessity to compare the drugs with a whole aspect, which goes in hand with a holistic approach of Ayurveda ''Treat the man as whole-Take the drug as a whole.''

QUALITY CONTROL AND STANDARDIZATION OF HERBAL PRODUCTS

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The term herbal drug denotes plants or plant part which is converted into Phytopharmaceuticals which meaning of simple process involving harvesting, Drying and Storage .There is need to increasing Awareness and general Acceptability of the use of Herbal Drugs. 80% population of World depends on Herbal medicine and products. Thus more chances in market or pharmacy, Manufactures abuse and Adulteration of products. Standardization is an Important step in Development and Production of Herbal medicine .The quality of raw material plays an important role on successful Manufacture Additionally the plant materials are susceptible to adulterations contaminations and Deterioration . The quantitative determination of markers play a big role on clinical properties of herbal drug and it is closely linked to the standardization of herbal medicines .Crude extracts manufactured directly from herbal materials show qualitative and quantitative data in accordance to the quality of the respective starting raw materials. Chemical standardization is a most important step in reproducibility of efficacy and safety. The industrial manufacture and the quality control of herbal products in spite of the complex mixture of phytochemicals the analytical task has been simplified by modern instrument .This review seeks to enlighten stakeholders in herbal medicine on need to establish quality parameter for collection handing processing and production of herbal medicine as well as employ such as parameters in ensuring the safety of global herbal market.

STANDARDIZATION OF *GREWIA OPTIVA* ACCORDING TO WHO GUIDELINE AND AYURVEDIC PHARMACOPOEIA

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Grewia optiva is commonly known as Bihul and Rainbow Shower tree. It is native of Pakistan but also cultivated in Himalayas above 700 m. It is used to treat microbial infection, diarrhea, fever, inflammation, arthritis and facilitates child birth. An attempt has been made to highlight this Himalayan plant in field of traditional medicine. The present study was for establishment of quality standards for the leaf of this drug. Investigations like organoleptic characters, microscopically examination (transverse section and powder characteristics), physico-chemical evaluations (ash values, extractive values, loss on drying, foreign organic matter, swelling index, foaming index, crude fiber content), Preliminary phytochemical tests, TLC finger print and fluorescence analysis for the identification of constituents and quantitative estimations were performed. The standardization parameters are found within the limit. Phytochemical and chromatographic investigation reveals the presence of phyto-constituents like Terpenoids, Alkaloids, Tannins, Flavonoids, Steroids, Glycosides and Coumarins. Results obtained from study are helpful in generation of plant profile, differentiating different species and identifying adulterants, evaluation of plant leaf for its pharmacological potentials, isolation of phyto-constituents and their characterization.

QUANTITATIVE ESTIMATION OF *ADINA CORDIFOLIA* ROXB.PHYTOCONSTITUENTS

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Adina cordifolia Roxb. (*Rubiaceae*) commonly known as Haldu is found throughout India, they are found in evergreen forests, especially in the eastern ghat, Karnataka and Kerala. It is native of India, Srilanka, China and Vietnam. It has been used for different ailments in the traditional system of medicine such as paste of bark applied on skin for the treatment of eczema, scabies and decoction of bark is given to pregnant women to prevent miscarriage, as tonic in anaemia and after fevers. The root bark of *Adina cordifolia* Roxb.used for the treatment of dysentery and urinary problems such as burning sensation of urine in different part of India. Ursolic acid and quercitin are present in leaves of *Adina cordifolia* because of which it is effective against jaundice, conjunctivitis, cholera, cold and cough and applied over swollen portion to remove pain and swelling. The juice of the plant is applied extremely to kill worms in sores. The extensive literature survey of *Adina cordifolia* Roxb.; it is observed that no chemical constituents isolated from plant parts of *Adina cordifolia* Roxb; only phytochemical screening has been performed in leaf extracts. Therefore, present study involves identification of phytoconstituents (Leaves, Stem bark, *etc*) and their quantitative estimations. Soxhlet extraction method was used for preparation of different extracts (except hydroalcoholic, for which maceration is used), according to polarity level chloroform, ethanol, hydro-alcoholic and water. Preliminary phytochemical tests and chromatographic profile were performed followed by quantitation of phytoconstituents. Phyto-constituents are such as alkaloids, carbohydrates, glycosides, tannins, flavonoids, fixed oil, volatile oil, saponins are present in the extracts of *Adina cordifolia* Roxb. Findings will help in setting diagnostic indexes for the plant and will also help in isolation of phytoconstituents (Which can further be used as standards).

STANDARDIZATION OF *BINDU PRAMANA* W.S.R. TO *SARASWATA GHRITA* AND *GO-GHRITA*

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Standardization is a fundamental starting point for any improvement effort. The definition of standardization from *Webster's Dictionary* reads, "to standardize means to cause or be in agreement against a commonly used authority or acceptable quality; or conforming to an established norm." Dose is a very important factor in any of the treatment procedures to get optimum efficacy of the therapy. According to M. Monier Williams, Matra is the full measure of anything or Measure of any kind of quantity, size, duration, number, degree etc. In the five karmas of *Shodhana*; Nasya is the major karma, and consider best for Urdhavajatrugata vikara and Bindu is the unit to measure the dose of Nasya. Change in the dose may affect the therapeutic results. In routine, one Bindu is considered as one drop (~0.05ml) that seems meagre as compared to the actual volume. The aim of this study is to standardize the dose of one *Bindu* for *saraswata ghrita* and *Go-ghrita* in 30 healthy volunteers. 30 Healthy volunteers aged between 25 to 35 years, of different physique viz. *Atisthula* with *Atidirgha*, *Atisthula* with *Atihrishwa*, *Atikrisha* with *Atidirgha*, *Atikrisha* with *Atihrishwa* and average physique. *Saraswata ghrita* and *Go-ghrita* were analysed in this experiment and compared with droppers available in market. Statistical analysis: Results were tabulated and analysed for different formulations. Study shows variation in quantity of Bindu in different formulations and with different physique. Analysis of the results showed that Bindu is not equivalent to drop. Routinely practised dose measured by dropper is much less compared to classical Bindu and different for different formulations.

ADULTERATION IN HERBAL MEDICINE: NEED OF CONCERN

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In the field of medicine, one of the burning problems is the practice of Adulteration which creates doubts and disbelief in the curative capability of traditional medicinal systems. Adulteration is a practice of substituting original crude drug partially or whole with other similar looking substances but the latter is either devoid of or inferior in chemical and therapeutic properties. The aim of this study is to find out the reasons, types, methods and effect of Adulteration in Herbal medicine along with Tests available for Genuinity of drugs. Published researches available at online databases like PubMed, Springer, Web of Science etc., were screened to collect information. On reviewing the available literature, it has been found that the incorrect identification of many rare, endangered plants along with deforestation and extinction of various species caused an adverse impact on the availablility and supply of these drugs. Beside this, Lack of knowledge about authentic source and plants, mushroom growth of pharmaceutics resulted in adulteration. This adulteration practice would not only reduce the efficacy of the drugs but also affect the trust of the people in the traditional healthcare systems and may also cause some complications. So, there is a need of hour to check on this adulteration practice. It may be assessed by different methods like morphological or organoleptic tests, microscopic evaluation, chemical evaluation, physical evaluation, chromatography, spectrophotometry etc. It is high time to have a control over both intentional & unintentional Adulteration. World Health Organization (WHO), in its publication on quality standards for medicinal plant materials, recommends rejecting any batch of raw material, which has more than 5% of any other plant part of the same plant (E.g. stem in leaf drugs), even though they derived from the authentic plant . The collectors and traders have to be educated about the danger and unethical nature of adulteration. Legal sanctions based on proven studies on the ill effects of adulteration have to enforce to check the practice. Studies on adulteration practices will have to be taken up along with identification of the drugs. Conservation measures of their natural habitat & ex-situ medicinal plant cultivation may have to be taken up in large scale.

EVALUATION OF PRELIMINARY PHYTOCHEMICAL AND PHYSICOCHEMICAL STUDY FOR QUALITY ASSURANCE OF MADANAPHALA (*RANDIA DUMETORUM* LAM.)

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In Indian system of medicine, *Randia dumetorum* of family *Rubiaceae* is an important medicinal plant popularly known as emetic nut. Literary survey reveals that the fruit is aphrodisiac, emetic, purgative and antipyretic as well as having Anti-bacterial activity. As there is no detailed standardization study of the fruit of this plant, therefore the presented study attempts to review the study done for evaluation of phytochemical and physicochemical study for Quality assurance of *Madanaphala* (*Randia dumetorum* lam.). The aim of this study is to review the study for validation and standardization of quality and safety of *madanaphala*. All data was reviewed from classical texts and research articles.Some parameters were also evaluated in AIIA sophisticated analytical lab. On reviewing the literature available, it has been found that the important phytochemicals, phytosterols, alkaloids and tanins were present in the methnolic extract at fewer amounts. In HPTLC, the recovery value of oleanic acid was found to be about 99.38% to 100.79% as mention in the research article, which shows the reliability and suitability of the method. Differences in quality control parameters between newly collected *madanaphala* with the old one were also evaluated which will be presented at the time of presentation. The plant has been attributed with a number of activities in classics. The multidimensional activities of *Randia dumetorum* lam. has been revalidated in recent times on several studies.

TO PROMOTE CULTIVATION OF MEDICINAL PLANTS FOR GLOBALIZATION OF AYURVEDA

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Ayurveda is a traditional system of medicine. It is regarded as a safest medicinal system. In *Ayurveda Acharya Charak* has mentioned *Chatushpaad* in the *Nirdesha Chatushak* of *Sutrasthan* Chapter – Ninth. *Chatushpaad* consist of four objectives *Bhishak* (Doctor), *Dravya* (medicine), *Upasthata* (nursing staff), *Rogi* (Patient). Herbal plants are important because without medicine, treatment is quite impossible. Due to popularity of ASU (*Ayurveda*, *Siddha*, *Unani*) drug has increased drastically in the recent years. Now a day the increased demand of ASU drugs has encouraged the cultivation of medicinal plants. By cultivating the meditational plant the chance of adulteration and malpractice decrease and it will help to improve market demand and socio-economic status. A medicinal plant is plant that is used with the intention of maintaining health, to be administered for a specific condition, or both whether in modern medicine or traditional medicine. Medicinal plants have long been utilized in traditional medicine and worldwide ethno-medicine. The food and agriculture Organization estimated that over 50,000 medicinal plants are used across the world. The cultivation of medicinal plant requires lots of care and management as compare to that of other plants. Depending upon the quality of material required, the process as well as duration of cultivation may vary. The cultivation of medicinal or aromatic plant is only possible when one have appropriate knowledge regarding the plant habitat and climate requirements. Himalaya is recognized for best quality of herbs by *Acharya Charak.* A large no of important herbs like *Vatsnabh*, *Atees*, *Kutki*, *Jatamansi*, *Kooth*, *Puskarmool* etc grows here and are under the threat of extinction. Cultivation is the only hope to keep *Ayurveda* alive and to improve livelihood of local people.

MEDICINAL PLANT BIODIVERSITY OF UTTARKASHI DISTRICT AND THEIR CONSERVATION FOR DISEASE PROTECTION

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Himalaya covers 18% geographical area of the India, which extends over 12 states and broadly categorized in to Northern, North-Eastern and Central Himalaya. Of the total population of the country 6% people are inhabited in this region. The rich biological diversity of the Himalayan region is managed and utilized by these native communities in a variety of ways. Study area falls under the Uttarkashi district. The present study was based on intensive and extensive field made during December 2015 to April 2016 periodic field visits were made once in study area to collect detailed information about the diversity and utilization of medicinal plants. So medicinal plant were surveyed by us which are directly used by Bhotiya and local community of the area. But regular use and illegal poaching may become serious problem for these medicinal plants in near future. The allopathic system of medicine though expanded with a high growth rate has caused a lot of side effects and people are again returning to medicine extracted from vegetation. India and China is the repository of world's best system of natural herbs and medicine. The Garhwal region was the place of Rishi Charak for making research on herbs and he composed Charak Samhita. The market for the herbs is now going upward with the craze for Ayurveda and traditional curing system. Demand for the cosmetics based on herbs and plant extracts is increasing with unprecedented rate. Now, it is up to the planners of the region to ride the crest of this opportunity and take benefit from production of Medicinal and Aromatic Plants.

IMPACT OF ORGANIC MANURE ON PHYTOCHEMICALCONSTITUENTS OF *ARTEMISIA ANNUA* CV.SIM AROGYA

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Medicinal plants are Nature's gift to help pursue a disease free healthy life, and thus can play an important role in preserving health. *Artemisia annua* is currently the only commercial source of the artemisinin. Studies on elicitation response of phytochemical constituents such as phenols, tannins, flavonoids, alkaloids, amino acids, terpenes etc., in the leaves of *Artemisia annua* cv. SIM AROGYA (medicinal plant) grown in different type of organic manures - Vermicompost and Poultry Manure was undertaken. The experiments were conducted at the experimental field of MRDC, GBPUA&T, Pantnagar using Randomised Block Design. There is a remarkable influence of organic manures on soil characteristic and morphological characteristics of plants such as number of branches, shoot length, stem diameter and phytochemical constituents. Further qualitative and quantitative analysis of phytochemical constituents and the resultant antioxidant capacity of the secondary metabolites in the plant extract are carried out. The powdered aerial parts were extracted with n- hexane and aqua- ethanol. The n- hexane gave the highest yield, followed by aqua -ethanol. Organic manures (vermicompost and poultry manure) are also affect the presence of phytochemical constituents. All the parameters are compared to chemical fertilizer and control.

ROLE OF GROWTH HORMONES IN UNPREDICTABLE REPRODUCTIVE BEHAVIOUR OF *CEDRUS DEODARA*

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The diplohalontic life cycle of conifers with *Cedrus deodara*, as no exception alternates between reproductive phase and vegetative phase and results in good seed year once in every three to four years interval. The uncertainty of reproduction is not predictable and can be attributed to change in the hormonal levels in the trees at the time of reproduction. Auxins and gibberellins play a major role in flowering of day light plants like conifers, hence an attempt to understand the role of growth hormones leading to the unpredictable behaviour of *Cedrus deodara* was made, for which over 900 trees were marked at three different sites, *viz*. Cheog forest, HFRI campus in Himanchal Pradesh and Chakrata forest in Uttarakhand. And their reproductive behaviour was observed since the time of pollination to cone production. Samples from plants with different reproductive behaviour like, male, female, monoecious and vegetative were collected for extraction and estimation of growth hormones and find out the relationship between the levels of different hormones and cone production, if any. A correlation between growth hormones and the changing reproductive behavior of the trees was affirmed.

SAVE PLANTS (*NARDOSTACHYS JATAMANSI*) - SAVE LIFE

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A large number of herbal plants are found in himalyan areas. *Nardostachys jatamansi* DC.is one among them. *Jatamansi* is an endangered, unique and beneficial herbal agent belonging to family valerianaceae. It is valued in the Indian, chinease, Tibetan, Nepalese, Bhutanese, and Japanese system of medicine.It is a reputed ayurvedic herb and used in various multiple formulations. *Acharya charak* mentioned *jatamansi* in *sanghyastapana mahakashaya* . It is used in treatment of insomnia and CNS disorder. Nardostachys jatamansi has been reported to have many satisfying activities like antifungal, antimicrobial, antioxidant, hepatoprotective and cardio protective properties. But reports also suggest that the species has become endangered due to over-exploitation of rhizome for its medicinal value. In view of this, urgent need was felt to propagate and multiply species via planned and protected cultivation. The demand of such drug increases day by day and this demand can only be met through cultivation. Cultivation will not only meet the demand of market and help in improving socio-economic status, but also help in conservation of spices in natural habitat. Being a person it's our moral duty to protect the plants from its disappearing so that our next generation can also be able to use and feel them.

CULTIVATION OF MEDICINAL PLANT: A FOUNDATION OF HEALTHY FUTURE

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Since ancient time, plant has been used to cure disease and maintain good health. *Ayurveda* is a symbol of natural medicine based on plants. There are lot many diseases which could be completely cured by plants and its products. Medicinal plants are considered very safe because there is almost no or minimal side effects in field of treatment. At present, awareness aboutherbal product is increasing day by day. Due to over consumption and less cultivation of medicinal plants worldwide, it is affecting the socio-economic status. Earlier forests were the resource of these plants but in modern era which is affected by enforceability to cut the forests so, the only option for yielding raw material is to cultivate medicinal plants and secure medicines from adulterations. Now days, plants are also used in beauty products, cleaning products, natural dye etc. Cultivation of medicinal plant is affected by some factors like soil, atmospheric humidity, light, rainfall etc. Cultivating medicinal plants in abundant would provide a healthy future to our generation. This article is related with importance of medicinal plants, their cultivation, need of cultivation and its value for future.

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CULTIVATION OF MEDICINAL PLANTS

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The Himalayas have a great wealth of medicinal plants .The Central Himalayan region covers Uttrakhand. Uttarakhand is a store house of medicinal plants. Our state observed an increase in the area under cultivation of medicinal plants. A lot of farmers' engaged in cultivation increased day by day. Proffitable cultivation of medicinal plants will be beneficial for the farmers of the society. Cultivation of medicinal plants provides livelihood and health security to a large segment of Indian population. A number of important drugs to cure cancer, diabetes& heart ailments are presently made from molecules obtained from Medicinal plants. Such as Vatsnabha (*Aconitum ferox*), Kutki (*Picrohiza kurrooa*), Nirgundi (*Vitex negundo*) etc. therefore, Medicinal plants have been known to be an important potential source of therapeutics or curative aids. The use of medicinal plants has attained a commanding role in health system all over the world.

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CULTIVATION OF MEDICINAL AND AROMATIC PLANTS IN INDIA

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India exhibits a wide range in topography and climate, which has a bearing on its vegetation and floristic composition. This subcontinent is one of the World's 12 leading Biodiversity Centres, encompassing 16 different agro-climatic zones, 10 vegetation zones, 25 biotic provinces and about 426 habitats of specific species. More than 80 percent of medicinal and aromatic plants (MAP) are collected from Indian forest land. However, many of these, due to over-exploitation have become rare (Rheum emodi, Aconitum deinorrhizum), threatened (Rauvolfiaserpentina, Berberisartistata), or endangered ones (*Sassurea lappa, Dioscorea deltoidea*). Problems arising out of rapid genetic loss of medicinal plants forced the need for international co-operation and co-ordination to undertake programmes for conservation of medicinal plants to ensure that adequate quantities are available for future generations. Cultivation of medicinal and aromatic species gives scope to improve the quality of the drugs. Merits of commercial cultivation of MAP is the outcome of implementation of number of critical factors like locate-selection; good genetically stable planting materials; good agrotechnological practices; nutrient input; harvesting management and implementation of suitable post harvesting techniques to preserve the end product till smart and effective marketing arrangements are made. There is a growing demand today for plant-based medicines, health products, pharmaceuticals, food supplements, cosmetics etc. in the international market.

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NATURAL AND CULTIVATION STATUS OF MEDICINAL PLANTS OF KOTDWAR BHABAR RANGE

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Garhwal Himalaya is a veritable emporium of medicinal plants. Present study sites are situated in Shiwalik Hills of Garhwal Himalaya (29°25'N- 31°25'N latitude and 77°45'E- 80°02'E longitude) covering around 200km long stretch with an altitudinal range between 300-1500m. This stretch is a hub of medicinal plants traditionally used by tribals and local inhabitants. The study sites are bounded by Yamuna in the West and Ramganga in the East and separated from the north by middle Himalaya and from south by Tarai plains. The dominant medicinal plant species in the study area are *Shorea robusta, Terminalia chebula, T. tomentosa, T. belerica, Pinus roxburghii, Acer oblongum, Aegle marmelos, Acacia catechu, Albizia lebbbek, Acacia nilotica, Adina cardifolia, Abelmoschus moschatus, Abutilon indicum, Acacia fernanciana, Anisomeles indica, Asclepias curassavica, Asparagus adscendens Acyranthesaspera, Ageratum conyzoides, Argemone maxicana* L., *Artimisia nilagirica, Abrusprecatorius, Asparagus racemosus, Bauhinia vahlii, Basella rubra Cymbopogon citrates, Cymbopogon martini, Cynodon dactylon, Cyperus rotundus, Adhatoda vasica* etc. Majority of the medicinal plants in the study area are propagated by seeds while least number of plants was propagated by tubers. Agro-technology of 23 commercially important medicinal plants was observed. The observational study revealed that medicinal plants could be cultivated in a range of soil types. Most of the species exhibited positive growth pattern by using farm yard manure/cow dung/organic manure. However, with the sufficient irrigation facility, by applying NPK, the productivity could also be increased. The maximum yield reported in fresh leaves of Aloe vera (500 qn/ha). Fresh roots of *Asparagus racemosus* were reported to be the 90 qn/ha. Yield obtained through rhizome ranged 40 qn/ha (*Acorus calamus*) to 80 qn/ha (*Costus speciosus*). Dry bulbs of *Chlorophytum borivilianum* were reported to be approximately10qn/ha. Seeds obtained from *Macuna puriensis* were 30qn/ha. Value of dry roots may range from 6 qn/ha (*Withania somnifera*) to 24 qn/ha (*Rauvolfia serpentina)* while the dry stem of *Tinospora cordifolia* gave 12 qn/ha yield. Economic analysis based on gross/profit ratio of selected medicinal plants depicted *Asparagus racemosus* and *Rauvolfia serpentina* were highly profitable

ARBUSCULAR MYCORRHIZATION INDUCES MORPHO-METRIC AND PLASTOCHRON INTERVAL INDICES IN *AQUILARIA MALACCENSIS*LAMK.: AN ECONOMICALLY IMPORTANT TREE SPECIES

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A biotization experiment was performed for quality stock production on *Aquilariamalaccensis* Lamk.which is a very slow growing economically important forest tree species in North-east India. One month old seedlings were inoculated in a designed experiment with single and combined endomycorrhizal treatments. All inoculated seedlings showed significant biomass production than control seedlings. The Biovolume index (B_i) was high in all inoculated plant seedlings than non-inoculated control seedlings but EM_2 (*Acaulospora* species) treatment had high B_i (78.17±0.024) than rest of the inoculation treatments. The Quality index (Q_i) value was also high (1.22±0.024) in *Acaulospora* sp. (EM_2) treatment followed by *Glomus* species + *Acaulospora* species (EM_1+EM_2) treatment (1.10±0.031) and *Glomus* species (EM_1) (0.83±0.014) treatment. Control seedlings had low value (0.14±0.021) of Q_i than rest of treatments. The plastochron interval index (P_i) of *A. malaccensis* after 60 days of inoculation was low in EM_1+EM_2 treatment as the time interval for initiation of 2nd leaf was 1 day than rest of the treatments in which the time interval was 4 days for initiation of the 2nd leaf primordia. Substantially, the leaf primordia appearance in EM_1+EM_2 treatment was impetuous than rest of the treatments. In control treatment where the 8th leaf primordia appeared on 36th day and after then there was no appearance of leaf primordia. Therefore, the EM_2 treatment was best single/alone treatment of mycorrhizal inoculation followed by EM_1+EM_2 synergistic treatment for quality stock productionof *A. malaccensis* seedlings.

ENDANGERED MEDICINAL PLANTS: STATUS, CAUSE AND STRATEGIES FOR CONSERVATION.

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India has a rich base of medicinal plants, enriched with about 8,000 different species. According to the Government of India, traditional medicines are the sole means of health care for about 65 percent of the population. Approximately 80% of the people in the world's developing countries rely on traditional medicine for their primary health care, and about 85% of traditional medicine involves the use of plant extracts. According to World Health Organization, The demand for medicinal plant based raw materials is growing at the rate of 15 to 25% annually and it will likely to increase more than US $5 trillion in 2050. World Health Organization has listed over 21000 plant species used around the world formedicinal purpose. The medicinal plants are basic raw material for the production of Ayurveda, unani, phytopharmaceuticals and neutraceuticals etc. Consequently, many of the important medicinal plant species have been threatened and some of them are on the verge of extinction due to ruinous harvesting, over-harvesting practices and urbanization. The red data book lists 427 Indian Medicinal plant entries on endangered species, of which 28 are considered extinct, 124 endangered, 81 rare and 34 insufficiently known. The present study reviews causes for depletion of medicinal plant flora along with global trends, developments and strategies for conservation and sustainable use of medicinal plants. Systematic literature searches in the Web of Science, PubMed, ScienceDirect, Biomed, Springer, Medline using search terms e.g. ''medicinal plant'', ''sustainable use'', and ''conservation'' has been done. The bulk demand of the raw material leads to the over exploitation of medicinal flora to meet the requirement of the pharmaceutical and allied industries. A total of 560 plant species of India have been included in the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened species. On a global basis, the IUCN has estimated that about 12.5% of the world's vascular plants, totalling about 34 000 species are under varying degrees of threat. Conservation of endangered medicinal plants is the need of time. Therefore, Legislation, In situ conservation, Ex situ conservation, Good agricultural and collection practices (GACP), encouragement for microenterprise development by indigenous and rural communities, protection of traditional resources and intellectual property rights, biotechnical approaches like micropropagation, plant tissue culture and synthetic seed technology based approaches should be applied along with sustainable use of medicinal plants.

ANALYTICAL STUDY OF OBSTACLES FOR HERBAL CULTIVATION AT HIGH ALTITUDE VILLAGES OF UTTARKHAND

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Ayurved is in great demand across the globe and so are the Ayurveda herbs necessary for manufacturing classical Ayurveda formulations. Still the cultivation of Ayurveda herbs is not seen vividly across rural parts of the country. The rural villages of Uttarakhand specifically; which are considered as gateway for Himalayas; are also far from professional approach in cultivation of herbs which are ideal for high altitudes. As per the reports; Bageshvar, Pithoragrh, Chamoli, Uttarkashi and Rudraprayag are leading districts for adopting herbal cultivation as source of livelihood and almost ten thousand people are getting benefitted for the same. Various government as well as non-government organizations such as National Medicinal Plants Board, Herbal Research and Development Institute, Uttaranchal Youth and Rural Development Centre, Dunagiri Foundation are contributing widely to the task of awareness, training and support of high altitude herbal cultivation. The objectives of this study are to explore, understand, analyze and highlight the causative factors demotivating rural farmers from cultivation of high altitude herbs. The study includes literary research through books, online publications and newspaper articles; along with unstructured interview of agriculturists and socialists in Uttarakhand. The further scope of the study is to conduct a large scale observational study across different districts of Uttarakhand state; pinpointing of pain issues thus may help us explore the possible solutions and implications necessary to promote and support high altitude herbs cultivation which is of utmost necessity for sustainability of herbs and for quality Ayurveda formulations leading to assured outcomes mentioned in classical texts of Ayurveda. The most important reason thus found during the study is associated with the lack of awareness in regard with demand, identification, cultivation, collection, packing, distribution and transport of the herbal plant. People need to understand what is in demand from local as well as national and global markets. The identification of herbs irrespective of terminology in Sanskrit, Latin, English or Local languages is necessary to be standardized. The cultivation of different types of herbs differs with forms of the herbs and parts being used for medicinal preparations. The same needs to be understood and shared with regional farmers in terms of planning and designing under agriculture management. The next part is to understand the specific part used for medicinal preparations and thus to follow the collection procedures accordingly. For ex: - A plant is not necessary to be destroyed when only bark is used for medicinal preparations. The waiting period for such plants to grow is long; but once it is full-grown; the collection of medicinal parts can be done more often from the same plant without necessity of new cultivation. Once the medicinal parts of the herbs are collected; most important procedure is to understand packaging and transport procedures to avoid loss of medicinal properties. Also packaging is necessary to be done to keep herbs unadulterated. The wild fires, wild animals, immigration of villages to urban cities, distribution of farming lands adds up to the obstacles of for Herbal Cultivation at the high altitude villages of Uttarkhand.

EXPLORATION OF ALLELOPATHIC POTENTIAL OF SELECTED MEDICINAL PLANTS CULTIVATING AT FARMERS FIELDS IN HIGH ALTITUDE REGION OF GARHWAL HIMALAYA, UTTARAKHAND, INDIA

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Allelopathy is the competitive ability of plants by which they can inhibit the growth of other plant species. This ability is conferred to the plants by a group of various chemical compounds (allelochemicals) released by donor plant and affects the neighboring species. These compounds have been shown to be secreted by the plant leaves, stem and roots, accumulate in soil and inhibit weed growth specifically. Many compounds including phenolics, flavonoids and organic acids have been shown to be putative allelochemicals in root exudates of many plant species. Allelochemical toxicity inhibits photosynthesis, respiration, ion uptake, it also cause cell damage by free radical formation and causes reduction in antioxidant activities which leads to membrane alterations and water imbalance leading to drastic consequences. The phytotoxic effects of substances released by leaching, root exudation and residue decomposition of certain plants on germination and seedling growth of the associated plants have been quite understood in several studies. However, none of the study has been reported on allelopathic behaviour of medicinal and aromatic plants grown along with weed species in high altitude region of Uttarakhand. Allelopathic medicinal plant species in combination with sustainable cultural management can help in suppression of weeds naturally and may help in more production of secondary metabolites. The developed trait can also help in create the plant species resistant to weeds which will completely harmless to the environment. Keeping in view, the present study is proposed to determine and understand the allelopathic behaviour of selected medicinal plant species viz., *Picrorhiza kurrooa* (Kutki), *Saussurea costus* (Kuth) and *Aconitum Spp.* (Atis & Mitha) grown with different weeds at farmers fields in high altitude region of Garhwal Himalaya, Uttarakhand.

CONSERVATION OF THE MEDICINAL PLANTS IN POSSIBLE WAYS

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Worldwide between 50,000 and 80,000 flowering plants are used medicinally. Of these 15,000 may face extinction due to overharvesting and habitat loss. One sixth of the Indian plants have the medicinal values which are in the verge of extinction. More than 80% of South Asia's 1.4 billion people have no access to modern healthcare; they rely instead on traditional medicine using native species for the healing of the ailments. All the branches of the traditional medicine including Ayurveda, Unani, Siddha and Tibetan medicine are using nearly about 50,000 herbal formulations in India. In ayurvedic industry and also in the contemporary trade 960 medicinal aromatic plants are being used and in those 178 species of the plants are consumed in volumes more than 100 metric tons per year and these contribute about 80% of the industrial demand of all the botanicals in the country. Therefore there is serious need for medicines leads to uncontrolled and over cultivation of plant parts leading to rare, endangered, critical and extinct state. It is estimated that more than 1200 plants that are exclusively found in India suffer from various degrees of threats. Conservation of the medicinal plants is necessary by taking the proper measures so that rare medicinal plants which are on the verge of extinction can be protected. Many plants have the medicinal values but are yet to be investigated for the purpose of the serious ailments like cancer and AIDS. Taxol from the Himalayan yew, Madagascar Periwrinkle are found be having the anticancer properties. But these are overexploited from the wild and became the endangered species to separate the active constituents. Decreasing forest area, due to irregular rainfall, encroachments of the forest lands, soil erosion because of felling of trees, monoculture of the particular species like Eucalyptus and Acacia like sps leading to the decline of medicinal plant wealth. Threats to the conservation are habitat destruction, bio-prospecting and over harvesting of the medicinal plants. Awareness in the public for the conservation of medicinal plants is to be given by the local traditional practitioners of the medicine to control illegal gathering of medicinal plants. Conservation of the medicinal plants can be achieved by the combined efforts of the Agronomists which can develop improvised techniques for cultivation of medicinal plants, conservation campaigns, plant breeders to breed the better strains of medicinal plants for cultivation, plant genetic resource specialists to preserve and maintain the gene banks of the rare and extinct species, seed biologists and Traditional health practitioners. Guidelines of WHO for the conservation and practicing Good Agricultural and Cultivation practices helps in this regard. In-situ conservation of the species in the natural habitat and ex-situ conservation through cultivation of the medicinal plants in the Botanical gardens and in the parks of the local areas the city. Pollution can also be controlled by the medicinal plants which can help to clean the air. So there is a need for the conservation of the medicinal plants to save from the potential loss of live-saving cures for disease such cancer or AIDS, but also the loss of possible proteins or vitamin rich foods.

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EMERGING TRENDS IN MEDICINAL PLANT CULTIVATION

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In Ayurveda herbs of particular geographical region, season, time and method of collect herbs have great values in Ayurvedic Pharmaceutics. Herbs grown in the Himalaya have great medicinal value than grown in other regions because of more stressful conditions. These Stressful conditions increase the medicinal value manifold in the herbal plant grows in the Himalayan region. Stressful conditions like defense against competitors, pathogens, or predators; is responsible for the generation of phytochemicals. The demand for raw herbs drastically escalated in the last two decades due to change in environmental changes. Recently, there have been rapid changes that may challenge the traditional way of agriculture, collection, preservation & pre-processing of herbs to reduce the production cost, increase production and to meet the demand of the market. Soilless farming techniques such as hydroponics, aquaponics, and aeroponics; Vertical Farming, Organic farming, and tissue culture are used to improve and increase crop production. Aeroponics, Hydroponics techniques are successfully used to alter the ratio of different phytochemicals within the same species. This technique if fused with some traditional medicine like Go-Mutra (Cow's urine), Go-Rasa (Cow dung extract), Haridra (*Curcuma longa*), and also different types of decoctions might be gives supersizing result. Nitrogen is very important and needed for plant growth. Nitrogen is also a part of the chlorophyll molecule, which gives plants their green color and is involved in creating food for the plant through photosynthesis. Nitrogen is also a part of the chlorophyll molecule, which gives plants their green color and is involved in creating food for the plant through photosynthesis. Ammonia nitrogen-containing compound of the urine. Similarly, Nitrogen, Phosphorous, and potassium are found in dung are also micro essential elements for the proper growth of a plant. Thus, Gomutra and Gorasa spray on the roots can be used to increase the alkaloids in the herbs. Dupana (fumigation), can minimize the pathogenic infection and pest. Several studies reveal that Mantroucharana (chanting of Mantras) produce good waves that potentiate the growth of the plant. 93 % of wild medicinal plants used for making medicines are endangered. In the updated red list of June 2015, IUCN added 44 Indian medicinal plants on the list. Tissue culture helps in exact copies of large scale and quick production of endangers plant species from very small tissue. Also, this technique reduces the chance of transmitting diseases, pests, and pathogens. So this valuable technique for the conservation of dangerous plant species. It is very difficult to grow in their limited usual habitat without adopting vertical farming practices. Thus, this is the need of the hour to merge the classical and traditional knowledge of Indian Agriculture practice with modern plant cultivation help in saving the rare and endangered species like *Coleus barbatus, Aconitum chasmanthum, Gentiana kuro, Lilium polyphyllum*, *Sausserea costus, Chlorophytum borivilianum,* etc.

PHARMACOLOGICAL DIMENSION AND TRADITIONAL EMPLOYMENT OF *DATURA STRAMONIUM* L.

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Datura stramonium, the most common species within *Solanaceae* family. *D. Stramonium* has been used for mystic and religious purposes. In the end of August stems with leaves and flowering tops are collected and dried as soon as possible at 45 °C to 50 °C. The leaves should be gathered when the plant is in full bloom and carefully dried. They are generally harvested in late summer. *D. Stramonium* in asthma treatment and possible effects on prenatal development was studied. Exposure of the foetus to *D. Stramonium* when a mother use it for asthma, will cause a continuous release of acetylcholine, resulting in the desensitization of nicotinic receptors, this could ultimately result in permanent damage to the foetus. Therefore we conclude that this African herbal remedy should be used with caution during pregnancy. In cancer, an integrated approach is needed to manage cancer using the growing body of knowledge gained through scientific developments. Thousands of herbal and traditional compounds are being screened worldwide to validate their use as anti cancerous drugs. *D. Stromonium* in therapeutic dose of 0.05 – 0.10 g was used to cure cancer. Likely unsafe produce vomiting, hypertension, loss of consciousness may lead to coma but may interact with anti – cholinergic drugs. Present studies indicated that *Datura stramonium* having various medicinal and pharmacological properties. Phytochemical of the plant are alkaloids, atropine, scopolamine, tannin, saponine, glycosides, phenol, sterols, lignins, fats, carbohydrates and proteins. Alkaloids, tannins, carbohydrates and proteins are used in medicines due to its analgesic and antiasthmatic activities. Atropine used in treatment of Parkinson's disease, peptic ulcers, diarrhea and bronchial asthma. Traditionally leaves past and extracts are externally used for injuries, wounds, bleeding and pain. Juice of flower petals is used in ear pain and seeds are used as purgative in cough, fever and asthma.

IN VITRO PROPAGATION AND SEASONAL VARIATION IN PHYTOCHEMICAL CONTENT IN ROOTS AND LEAVES OF *NARDOSTACHYS JATAMANSI*

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Nardostachys jatamansi DC, a member of family Valerianaceae, is an endangered herb of perennial nature commonly referred to as Indian spikenard. It is spotted at an altitude of 3000-5000 m in alpine Himalayas ranging from Punjab to Sikkim and Bhutan as an erect and hairy 10–60 cm long herb. This herb is well known for its medicinal and aromatic properties. The roots and rhizomes of *N. jatamansi* DC. have been used to treat epilepsy, hysteria, syncope and mental weakness. It also exhibits antioxidant, antimicrobial, hypotensive, cardio protective, antidepressant, anti-inflammatory activities and is used in the treatment of neural diseases. Characteristic medicinal importance of *N. jatamansi* plant has been the cause of its exploitation, making the species critically endangered. Therefore, effective conservation, management and replenishment of the species is highly important. Since the plant is slow growing in nature, its rapid regeneration in natural habitat in not possible. Tissue culture of *N. jatamansi,* therefore, offers a model system to mass multiply the herb in order to minimize overexploitation of plant from its natural habitat and ensuring its conservation there. A protocol was developed for *in vitro* shoot multiplication from rhizome explant of *N. jatamansi* collected from Chamoli district of Uttarakhand and maintained in lab at 20°C temperature. The rhizome sequentially sterilized with 5% (v/v) Tween20 (5 min), 0.1% Bavistin (5 min), 0.1% (w/v) $HgCl_2$ (1 min) and 70% ethanol (1 min) showed shooting after 5 days of implantation on WPM medium supplemented with 1 mg/L of TDZ and 0.5 mg/L GA_3. In another part of study, seasonal variation in phytochemical content in different extracts prepared from leaf and root parts of *N. jatamansi* was also evaluated. Highest phenolic and tannin contents (63.76 ± 0.03 and 204.67±1 mg GAE g-1extract respectively) in methanolic root extract and flavonoids (48.5±0.5 mg quercetin g-1extract) in ethyl acetate root extract were recorded in plant collected in rainy season (June-July 2018), whereas these contents were lowest in Aqueous leaf extracts of winter season (Jan-Feb 2018). Since significant amount of phytochemical content was detected in roots and leaves of *N. jatamansi* which further confirms its potential role for controlling oxidative stress generated during pathogenic conditions.

IN VITRO PRODUCTION OF SECONDARY METABOLITES AND ASSESSMENT OF ANTIOXIDANT AND ANTIMICROBIAL ACTIVITY IN *PAEONIA EMODI*: AN APPROACH TOWARDS CONSERVATION AND SUSTAINABLE UTILIZATION

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Conservation and sustainable use of Himalayan medicinal plants is priority agenda keeping in view the declining availability in their natural habitat. Among others, *Paeoniaemodi*, one of the important medicinal plants greatly recognized for its therapeutic potential is not an exception. The species is recently consider for its antidiabetic potential and hence require to develop approaches for its conservation and utilization. Among different conservation approaches, production of secondary metabolites through in vitro callus culture can help in production of required content and promote conservation. Callus was developed through leafexplants in MS medium supplemented with different concentrations of PGRs (auxin and cytokinin). *In vitro* callus was extractedin 4 different solvents, i.e., methanol, ethanol, acetone and ethyl acetate, separately and extraction was used to measure phenolic compounds including emodin, paeoniflorin, antioxidants and antimicrobials. Results reveal that the maximum callus biomass (1.54±0.08 g) was obtained in 4thweek after inoculation in auxin and cytokinin combination. Higher content of phytochemicals and antioxidant activity was observed in methanol extract. Free radical scavenging activity were measured by three different assay ABTS, DPPH, and FRAP was positively correlated ($p<0.05$) with total phenol, flavanol, flavonoid and tannin content. *In vitro* regenerated callus also showed good antibacterial and antifungal activity in ethylacetate extract. The results indicate that 4thweek (28 days) to 5th week (35 days) old callus grown on Murashige and Skoog medium with supplementation of NAA and TDZ had higher concentration of emodin, paeoniflorin and antioxidant activity. The results of this study have commercial application as it fulfill the demand of raw active content through large scale production and help reduce pressure in natural habitat of the species, if upscaled properly.

IN VITRO PROPAGATION OF *RHODIOLA IMBRICATA* (EDGEW.): A HIGH VALUE RARE MEDICINAL HERB

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Rhodiola imbricata (Crassulaceae) is a perennial, rare, high altitude medicinal herbgrows in rocky slopes, wet places & higher passes at elevations 4,300 m above sea level in the trans-Himalayan region of Ladakh.Plant is well known for its valuable medicinal properties like adaptogen, stress buster, anti-anoxic, anti-cold and anti-fatigue due to presence of diverse secondary metabolites, mainly phenolic glycosides. Salidroside and rosavins are the most important bioactive component of *Rhodiola sp.* due to their potential applications in pharmaceutical and nutraceutical industries. A procedure for *in vitro* propagation of *Rhodiolaimbricata*were established. Seeds were inoculated on half strength concentration of Murashige and Skoog (MS) basal medium. Seedling was then transferred on full strength MS medium supplemented with different concentrations and combinations of auxins and cytokinins for mass multiplication. Shoot and root proliferation rate (80%) was found in combination of 2mg/LIndole-3-butyric acid (IBA), 0.2mg/Lindole-3- acetic acid (IAA) and 0.4mg/L gibberellic acid (GA_3). Plantlets were then hardened under controlled conditions of greenhouse containing equal ratio sand, coco-peat, perlite and vermiculite with 75 percent survival rate.

CHEMOTYPING OF *AZADIRACHTA INDICA* (NEEM) FOR AUGMENTED PRODUCTION OF COMMERCIALLY SIGNIFICANT OIL AND AZADIRACHTIN

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The work presented was focussed on identification of superior chemotypes of *Azadirachta indica* A. Juss (Neem) having high fatty oil and Azadirachtin (Aza) content.In fact, plant secondary metabolites comprising extremely diverse groups of compounds with applications in various domains viz., pharmaceuticals, agrochemicals, flavours, fragrances, colouring agents, pesticides and food additives, exhibit high levels of variation in form and abundance both across and within species. Neem, owing to its exceptional phytochemical composition is regarded as nature's chemical factory with hundreds of bioactive compounds biosynthetically accumulated in different parts of the tree. With more than 150 compounds isolated so far, a limonoid called Azadirachtin (Aza) proved to be the key constituent and a wonderful insecticide controlling more than 200 species of insect pests without causing any detrimental impact to soil and environment. Neem oil, another neem product has tremendous industrial applications in manufacturing bio-pesticides, bio-fertilizers, and a range of medicinals, cosmetics and toiletries. All these diverse applications have made neem products the most required commodity both in local as well as export markets. In recent years, there has been huge demand by fertilizer industries for neem oil with high Aza content following the directives of Government of India that has made it mandatory for Urea Producing Industries to produce 100% neem coated urea. This has necessitated augmented production of neem oil with high Aza content to realize the present as well as projected demand, which can be achieved by commercial plantations of genetically improved and chemotypically superior planting stock of neem under various plantations and agro-forestry systems. The bottlenecks, in this context are considered to be unavailability of chemotypically superior planting stock of neem. With the aim to indentify superior chemotypes of neem, reconnaissance survey of natural populations and plantation of neem were carried out in the states of Uttar Pradesh, Madhya Pradesh, Haryana, Punjab, Bihar, Rajasthan, Gujarat and Maharastra, and the entire northeastern and southern states of India and neem seeds were collected and analyzed for fatty oil and Aza contents using advanced chromatographic tools and techniques. Biochemical analyses of seeds revealed a large variation in fatty oil and Aza content across the seed sources. The average maximum azadiractin content was recorded upto 2000 µg/g of the kernel and about eight progenies with 3500 µg/g of the kernel, which was substantially higher than average reported so far. Similarly, oil content in kernel was found to be maximum with an average of 35.55% and about eight genotypes ≥ 46% oil. The superior chemotypes have been shortlisted and ranked based on based on oil and Aza yield. The selected superior chemotype of neem will be popularized among farmers, NGOs and industries willing to undertake large-scale commercial plantation to meet the increased demand for Aza and neem oil. Commercial manufacturers have demonstrated that they Neem seeds with high oil and Aza content can fetch higher price, so there exists substantial opportunities for the benefits of neem commercialization to have increased impacts on the neem growers.

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RURAL DEVELOPMENT THROUGH CULTIVATION OF MEDICINAL PLANTS IN DEMAND

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India is the richest source of medicinal plants. The history of cultivation and use of medicinal plants in India is quite ancient. About 80% of the population of developing countries relies on traditional plants based medicines for their health requirements. Cultivation of plants is the best way to provide plant material needed for medicinal use, trade and export. Cultivation develops standard of quality, safety and efficacy of plants used in traditionally prepared drugs and also pharmaceutical industries. It also reduces possibility of misidentification and adulteration. WHO has insisted to develop Good Agricultural Practices for growing medicinal plants to guarantee quality of raw drug and facilitate the standardization of quality of ISM drugs. This paper elaborates details of cultivation practices, propagation methods, planting time, imitation schedule, post harvest management, Latin name, Hindi name, habitate, active ingredients, therapeutic use, market rates etc.

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VEGETATIVE PROPAGATION STUDIES IN *SWERTIA SPECIOSA* WALL D.DON

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Swertia speciosa is a perennial medicinal alpine herb distributed in marshy localities of timber zones in Indian Himalaya ranging from 2400 to 4000 m asl. This species had reported to contain bioactive compounds like xanthone, amaroswerin, amarogentin and urosolic acid as in *S. chirayita* and it is considered as a substitute of *S. chirayita.* These major bioactive compounds of *S. speciosa* play significant role as hepatoprotective, anti-hepatotoxic, anti-microbial, anti-inflammatory, anti-carcinogenic, anti-leprosy, hypoglycemic, anti-malarial and anti-tumor. *S.chirayita* was critically endangered medicinal herb and original populations of many of it have been vanishing due to high demand of Pharmaceutical industries. Therefore, large scale propagation of *S.speciosa* should be taken up immediately by developing appropriate technologies as this species can act as an alternate source of many valuable bioactive compounds which were found in *S. chirayita.* The present experiment was conducted at Tungnath (3600 m asl), Garhwal Himalaya in different conditions such as open and net house. The topaze and rhizome parts were treated with hormonal solutionsof IAA, IBA and NAA 100,200, 300 ppm each for 24 hrs. Treated parts were planted in raised beds under both open and net house conditions.Maximum plant survival (40%) and rooting (60%) was found in IAA 100 ppm treatments against minimum plant survival (9%) and rooting (10%) in control plants which was proliferated fromtopazes under open condition, but in the same treatment (100 ppm IAA) resulted in 20% plant survivaland 45% rooting for the plants which were proliferated from rhizome. In nethouse conditions, maximum plant survival (20%) and rooting (5%) was observed in NAA 100ppm treated topaze raised plants against minimum survival (8%) and rooting (2%) in control conditions. The same treatment was resulted in 18% survival and6%rootingin rhizomeraised plants in net house conditions. Under net house conditions both IAA and IBA were failed produce any viable plants. The study indicates open beds are highly suitable for vegetative propagation of this species with minimal investment.

HIGH ALTITUDE PLANTS: COSERVATION AND SCIO-ECONOMIC DEVELOPMENT

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About 90% of the total medicines come from plant kingdom. The recognition of medicinal plants is continuously growing due to several reasons, including escalating faith in herbal medicine. The instant rising demand of plant-based drugs is creating heavy pressure on some selected high value medicinal plant population in the wild due to overharvesting. Medicinal plants are the local heritage with global importance and play a central role, not only as traditional medicines used in many cultures, but also as trade commodities which meet the demand of often distant markets. Mountain ecosystems are hotspots for plant conservation efforts because they held a high overall plant diversity as communities replace each other along altitude and climatic gradients, including high proportion of endemic species. Most of the plant species were virtually left on growing in the natural habitat in forest, villages and rural homesteads. From socio-economic point of view, medicinal plants provided a critical source of income of many rural communities. Some high valued medicinal plants due to their narrow geographical distribution and climate specific nature provide a significant resource to income to the farmers of that particular geographical area. On the other hand, homestead acts as in situ conservation of medicinal plant species situated in different geographical strata. Species richness of medicinal plants in the homestead can act as an in-situ germplasm conservation site specially for economically valuable medicinal species. Medicinal plants bear a great potentiality from economic point of view. The scientific cultivation of medicinal plants can meet the demand of rising market as well as become a source of socio-economic development of the rural people. Although, there are many problems which are to be dealt like lack of awareness regarding knowledge of medicinal plants, cultivation methods, pricing system, dealers and government policies. This field of multiple purpose should be looked after with strong governmental polices and liable agencies to execute.

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