Vol. 1, No.1
July to December, 2021

HIMALAYAN NEWS LETTER

Half Yearly

January, 2022

HIMALAYAN FOREST RESEARCH INSTITUTE

From the Director's Desk

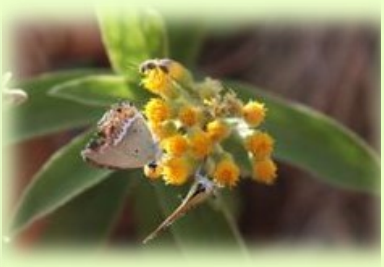
Himalayan Forest Research Institute (HFRI), Shimla is one of the nine Research Institutes of *Indian Council of Forestry Research & Education (ICFRE),* which is an apex body under the Ministry of Environment, Forest & Climate Change, Government of India, and is premier organization in the National Forestry Research System. The *ICFRE* has been undertaking the holistic development of forestry. The HFRI was initially established as High Level Conifer Regeneration Research Centre in May 1977 for carrying out Research on problems associated with natural regeneration of Silver Fir and Spruce. This Centre was upgraded into full fledged research Institute in 1998 and given the name Himalayan Forest Research Institute (HFRI).

The HFRI, Shimla has responsibilities for conducting research in the state of Himachal Pradesh and Union Territories of Jammu & Kashmir and Ladakh. The Institute is to carry out forestry research in the areas of Biodiversity Assessment, Modeling, Conservation, Insect-pests and Disease Management, Planting Stock Improvement of Conifers and broad leaved associates, Agro-forestry Practices in Lower, Mid and Higher Hills and Cold Desert regions, Cultivation and Sustainable Harvesting of Medicinal Plants, Eco-restoration of Cold Desert and mined out areas and Dissemination of Research Findings to various Stakeholders through Extension Activities, etc.

The HFRI has made an attempt to initiate the half yearly Himalayan News Letter and in this first issue, we would like to introduce the readers about various activities done by the Institute for last six months. We sincerely look forward to the suggestions and feedback, seek the kind support and cooperation.

Dr. S.S. Samant
Director

in this issue



Climate Change Challenges, Consequences and Mitigation Measures in Indian Himalayan Region

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Introduction

The Indian Himalayan Region (IHR) is the lifeline of a living being. The vegetation of IHR has a massive source of livelihood in terms of medicine, food, water, fodder, etc. (Kumar *et al.*, 2021). Geographically, the IHR comprises an area of 5.37 lakh km^2, covers 16.2% area of the country (Negi *et al.*, 2012). In addition, 41.5% area of the IHR lies under forest cover, and 17% area persistent with permanent glaciers (Arya and Negi, 2020). Due to varied topography and geographical location, the vegetation mainly exists in various habitats like, tropical, sub-tropical, temperate, sub-alpine and alpine type different forests, leading to wacky climatic conditions (Kumar *et al.*, 2021). The forest ecosystem also helps to maintain the biome's natural biogeochemical pathway. The overexploitation of vegetation in the Himalayan region has abruptly decreased the natural habitat of the endemic species in the ecosystem. In current decade, various human avarice activities like deforestation, habitat destruction, and grazing, coal-burning, etc. have increased, subsequently leading to the cumulative impact on the natural cycle of the IHR (Singh *et al., 2021*). Climate change is the long-lasting change in the statistical distribution of weather parameters like air, temperature, wind pattern, precipitation (Chatterjee and Tandon, 2020).The impact of climate change on monsoon patterns such as unnaturally rainfall, floods, drought, forest fire and extreme cyclonic events in different world regions have been observed in recent years (Baker, 2012). For instance, various faunal and floral species are experiencing vulnerability threats due to changing climate patterns of their natural ecosystem (Chatterjee and Tandon, 2020). Meantime, the world is trying to take significant steps to fight against this serve problem on various platforms. Recently The Glasgow Agreement of UNFCCC (COP-26) worldwide delegates have set specific goals to mitigate climate change consequences, followed by the Paris Agreement. The primary goal is to achieve a net-zero emission rates and keep 1.5° C to come forward with ambitious 2030 emissions (https://unfccc.int/process-and-meetings/the-paris-agreement/the-glasgow-climate-pact-key-outcomes-from-cop26). In this context, India has also set primary targets to mitigate the impact of climate change for achieving concern goals till 2030, such as enhancing 500GW non-fossil energy capacity, 50% non-renewable energy, reduction of 1 billion of carbon emissions, and reducing 45% carbon emissions intensity. Such action for emphasizing the sustainable goals for saving the earth.

Evidence of Climate Change

The greenhouse gases (GHGs) absorb IR rays and reflect these radiations to the earth's surface; these re-emitted radiated energies help to keep warm the earth's surface (Anderson *et al.,* 2016). While the concentration of GHG passes to an average extent, it influences the natural phenomenon of heat budget of earth and leads to Global warming (Taylor, 2001). These non-condensable gases increase the surface temperature, responsible for a higher evaporation rate in the atmosphere leading to global warming, which has a massive negative impact on the living being (Taylor, 2001). The increasing concentration of GHGs like carbon dioxide (CO_2) and methane (CH_4), mainly due to the burning of fossil fuels, have resulted in global warming, and caused rise in sea level, melting glaciers etc. (Taylor, 2001). The concentration of CO_2 in the atmosphere from the pre-industrial era (280 ppm) to the present (~420ppm) has increased very rapidly (Körner, 2004). Dash *et al.* (2007) indicated that the mean air temperature has fluctuated between 1 to 1.1^{0}C, and seasonal temperature variability about 0.8^0 C has enhanced during the last century. However, the water sources are shrinking due to global warming, and many water springs glaciers are experiencing vulnerable risk due to climate change.

Climate Change Consequence in IHR

The overexploitation of vegetation has abruptly decreased the natural habitat of the endemic species in the Himalayan region (Kumar *et al.,* 2021). The consequence of climate change has also shown in various ways on IHR. Using the qualitative research method, Kumar *et al.* (2021) advocated that the fluctuation in the environment gradient of the IHR has also been detected in the last decades. One more study revealed that the mean temperature (0.15^0 - 0.60^0 C) of the Himalayan region has been increased due to the anthropogenic process (Meena *et al.,* 2021). In addition, another study inferred that the mean temperature of the Asian landmass, including the IHR will increase to 3°C by 2050 and 5°C by 2080, if appropriate action will not be taken seriously (Shrestha *et al.*, 2012).

Role of Forests for Global Warming Mitigations

Forest ecosystem plays a crucial role in carbon regulations and mitigation process. The plants utilize CO_2 in respiration during photosynthesis and convert it to O_2 thereby help to stabilize it in the atmosphere. In plants, carbon stored in the form of organic material (Shrestha *et al.,* 2012). The carbon stored in plants get and release in to the soil when the plant dies and decompose. But, in recent decades, Forest ecosystem manipulation like, deforestation, forest fire, illegal harvesting, mining in core zone, land depredations, overexploitation of important medicinal species, interference in protected areas, and overgrazing are leading to the shrinking the forest ecosystem (Singh *et al.,* 2021).

Challenges

Nowadays, whole nations following the concept of development and with intention India is also playing crucial role for country development. But, essential task whether this development is being adopted by sustainable Development Goals (SDGs), which is the central task. The Indian Himalayan region, increasing population, deforestation, the road construction and hydropower project works are going on due to which forest and lotic ecosystems are experiencing biodiversity malfunctioning. Similarly, grazing, extractions of RET species, land degradation activities in the core zone of the hotspot at various region in IHR, are one of the most concerned issues, have led to the shrinking biodiversity, vegetations shift due to human interference in this realm (Kumar *et al.,* 2021). In addition, multiple sources of pollution, such as solid waste decomposition outside corridor of the principal city like, New Delhi, Ghaziabad, Noida, Faridabad, Moradabad, Patna, etc. also experiencing a detrimental impact from inappropriate leachate percolates collection system; these all phenomena accelerate the lotic and lentic ecosystem pollution in the country, and finally, whole patterns lead to precariousness among the existing biodiversity, fresh water and terrestrial biodiversity of the entire ecosystem and also jeopardize the air quality of the country as well as the IHR due to release of methane, carbon gas in the atmosphere due to increasing human population. This phenomenon is a big issue of concern in the current scenario of the nation.

Mitigations Strategy

The conservation and management of the forest ecosystem in the current scenario are conceptually challenging to ecologists, policy planners, and global delegates. Central legacies behind climate change are due to the consistently increasing human population, which have consequently increased the burden on natural resources. Hence, it may not be viable abruptly to control the increasing human population. While substantial efforts that can minimize the impacts of climate change like, increasing terrestrial carbon sequestration sink and identifying the most sequestration endemic tree species by promoting afforestation in the region. This strategy will emphasize the carbon sink pool of that region. For instance, this phenomenon will increase the removing $CO_2$from the atmosphere and stabilize the concentration of GHGs (Morecroft *et al.,* 2019). Furthermore, prominent approaches such as minimizing the tragic devastation by a human process in their ecozone and adopting a mechanism of ecological restoration and educating the regional people about the importance of forest ecosystem for existence or living beings.

Conclusions

It can appropriately be mentioned that a significant policy regarding climate change mitigations in IHR is urgently required and there is a need to carry out more work and documentation regarding the preservation of natural resources. Despite that, long term monitoring of vegetation patterns, permanent observation plots should be established in the various core zones of the forest to understand the forest dynamics, productivity, structure, and function of the forests by the pace of climate change and draw the long-term strategies of sustainable forests management. It is necessary for predicting the future impact of climate change on the forest ecosystem. Therefore, mass multiplication of the species, establishment of *in situ* & *ex situ* conservation and awareness programs for the local people, scientific community, forest department and other stakeholders for conservation management are suggested to maintain the gene pool of such unique and valuable diversity for future generation in sustainable way.

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Insects: Eco-friendly Bio-control Agents in Forest Ecosystem of North-Western Himalaya

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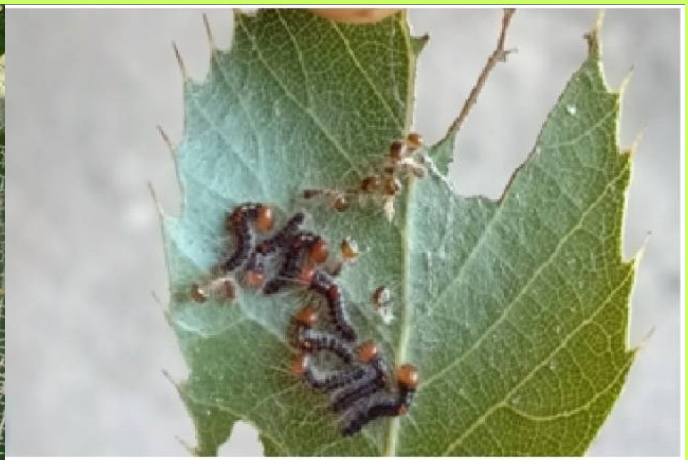
North-Western Himalaya is the abode of rich coniferous forests and broad leaved tree species. Almost whole area is covered by natural forests with few man made plantations. Major tree species of the forestry sector includes *Abies pindrow*, *Cedrus deodara*, *Picea smithiana,* and *Pinus roxburghii* are among the conifers and *Celtis australis*, *Grewia optiva*, *Toona ciliata*, *Robinia psuedoacacia*, *Salix alba*, *Populus ciliata*, *Quercus* spp., *Dalbergia sissoo* and *Acacia catechu* among the broad leaved trees species, and many others are part of the plantation activities. Biotic and abiotic interferences such as drought, floods, forest fires, etc. lead to the outbreak of particular insect-pests on a particular tree. Insects are ubiquitous disturbance agents that play important role in the long-term dynamics of forest ecosystems. Shifts in temperatures which directly influence insects and reduces host tree resistance caused by changes in precipitation which can contribute to forest insect population growth. In the recent years, there have been several instances of insect-pests outbreaks causing alarming damage to the forest trees of North-western Himalaya. The HFRI, Shimla has earlier worked on different aspects of insect pests attack on various broad leaf as well as conifers tree species and has developed effective control measures.

Pest problem is one of the major constraints for achieving higher production in forestry sector. The use of insecticides and pesticides have increased manifolds during the past 3 - 4 decades. Several attempts have been made in the pasts to control the outbreaks in the forests, but they are majorly confined to the use of chemical insecticides/pesticides, but due to their adverse effects on non target organisms (such as pollinators, parasitoids, predators beneficial microbes and wild animals) and persistence in the environment and water bodies make them unsafe to use in large scale control programmes.

Predatory Bug Feeding on Caterpillars



Tent Catterpilar attack on *Quercus* spp.

Many insect species also act as effective bio-control agents as they feed on different stages of other insects e.g., egg/laraval parasitoids, larval predators/parasites, etc. A predator is an organism that lives and feeds in or on a host. Nearly all insect pests have at least one predator that attacks them. Insects that parasitize other invertebrates are parasitic only in their immature stages and kill their host just before maturity. A parasitoid is an insect whose larvae live as parasites that eventually kill their hosts (typically other insects). Most insect parasites (sometimes called parasitoids) are host-specific wasps (Hymenoptera) or flies (Diptera), and many are so small that often not visible to naked eye. An adult parasite can lay eggs in hundreds of host individuals, resulting in the reduction of pest numbers.

Once bio-agents are introduced in the field, they build their population considerably and are capable of bringing down the targeted pest' population below economic threshold level (ETL). However, the crux lies in their mass production and application at the appropriate time. The HFRI has carried out use of predators and parasitoides for bio-control of Lepidopteron insect pests for trichocards, *Crysoperla* spp. successfully in the laboratory and under the field conditions as well.

***Chrysoperla carnea* (Stephens)** (Neuroptera: Chrysopidae) (Insect Predator) is a voracious predator of soft-bodied insect such as juveniles of scale insects and the black scale Saissetiaoleae (Olivier) (Hemiptera: Coccidae). Adult of *Chrysoperla carnea* (Neuroptera: Chrysopidae) feed only on nectar, pollen, and aphid honeydew, but their larvae are active predators. Several species of aphids, spider mites (especially red mites), thrips, whiteflies, eggs of leafhoppers, moths, and leafminers, small caterpillars, beetle larvae, and the tobacco budworm are reported prey. They are considered an important predator of long-tailed mealybug in greenhouses and interior plantscapes.

Larvae of *Chrysoperla* feeding on another larvae

Adult of *Chrysoperla*

***Trichogramma*:** The genus *Trichogramma* (Hymenoptera: Trichogrammatidae) is cosmopolitan in distribution and is present in all terrestrial habitats. *Trichogramma*are primary egg parasitoids of Lepidoptera, but parasitism also occurs in eggs of other orders such as Coleoptera, Diptera, Hemiptera, Hymenoptera and Neuroptera.

Trichocards contain eggs of *Trichogramma* species, which are used to contain the insect-pests whose eggs are host to these *Trichogramma* adults for laying eggs. Trichocards containing eggs of Parasitoid wasps (*Trichogramma* spp.) has been effectively deployed in the field to manage various pests like *Hyblea purea*, *Eutectona machaeralis* and many other lepidopterous insect pests. *Trichogramma* eggs are mass produced and supplied in the form of cards, which can contain approximately 20,000 eggs each depending upon the *Trichogramma* species. These eggs have also been tried in the field to contain the moth defoliators of different oak species of the Himalaya. For the efficient functioning of insect control measures, a thorough knowledge of their life cycle, their pest status, distribution, periodicity, host complex, behavior among others, is a prerequisite, essential for timing of insect-pests. Any measure devised must be practicable, cheap and effective. As these insects have broad host range, the biocontrol agents can be applied in the fields as well as in the nursery plantations with some precautionary measures, as an alternate to chemical insecticides. Using biocontrol agents can minimize our dependency on synthetic insecticides. Because of their eco-friendly nature, we can

Trillium govanianum Wall. ex D.Don (Nag Chhatri): Conservation Needs

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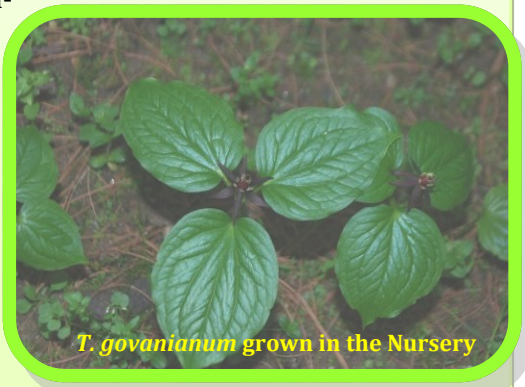
Trillium govanianum locally known as Nag chhatri, of family Trilliaceae is a very important medicinal plant found in high temperate region of North-Western Himalaya. It is a perennial herb found growing in patches in forests under shade, in humus-rich soils between 2500-3500 m amsl in the Himalaya. Plant is up to 25-30 cm tall having three leaves at the tip of stem and tuberous roots. It bear solitary purple flower at the center of the three leaves. Flower is brown with narrow spreading petals. Fruit is red berry around 2 cm in diameter. Roots contain Trillarin, which on hydrolysis yields 2.5% diosgenin—a cortico-steroid hormone. The cortico-steroid hormone isolated from the plant is used in various preparations like sex hormones, cortisone, and allied preparations used to treat rheumatism and regulation of menstrual flow. It is also used to address stomach- related problems. Because of its effective medicinal properties, demand for this drug is high in international markets.

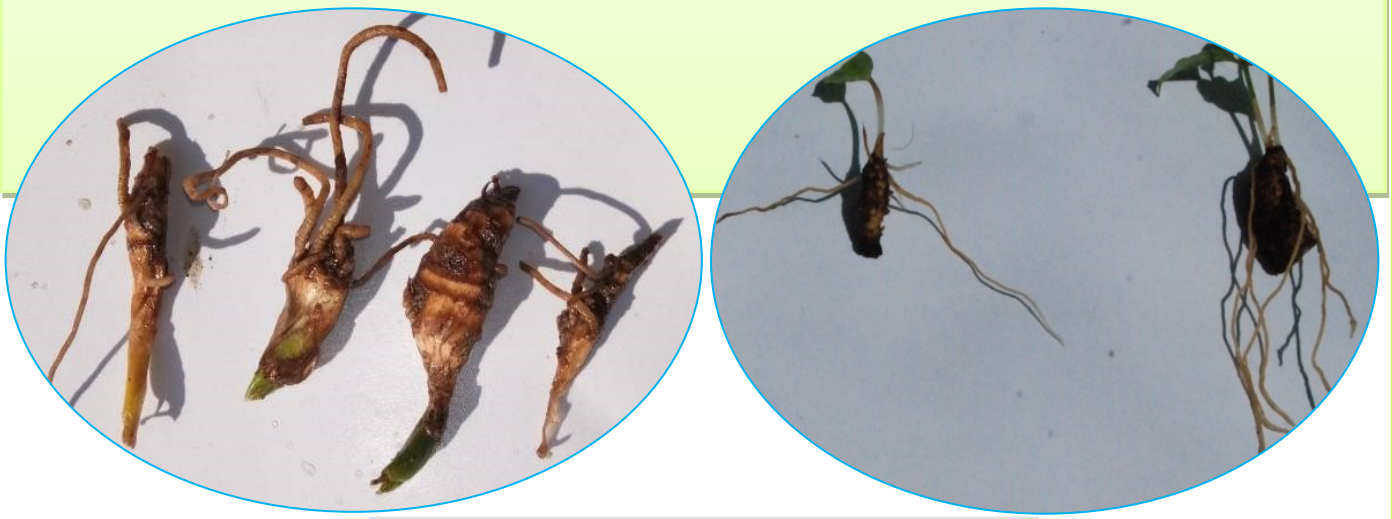
This species was quite in limelight during the recent past years owing to its high demand and heavy extractions from the wild. The species has ready market availability and the local communities have been benefitted considerably. The extraction rate is quite high and at this pace, this species is likely to be extinct in near future. Keeping in view of its conservation needs, under NMPB funded project, carried out exhaustive study of this species and came up with following salient research findings:



T. govanianum grown in the Nursery

- Extensive surveys were carried out for the selection of most probable sites in different geographical locations of Himachal Pradesh and identified 27 sites of *T. govanianum*. Each site was geo-referenced along with characterization of microhabitat.
- There was significant variation in morphometric characteristics viz., shoot length, shoot diameter, leaf length, leaf breadth, length of longest stalk, rhizome length, Rhizome diameter and number of adventitious roots, among different sources of Himachal Pradesh.
- Amongst the 27 sources, it has been observed that diosgenin content (mg/g) as found in the range of 0.033 to 2.03 mg/g. Highest diosgenin content was found in Shikari Devi, Mandi (Sample Code: Tg/ June/Skri/2020 (2.03 mg/g) samples, while minimum (0.033 mg/g) in Hamta, Kullu Samples Code: Tg/ June/Hmt/2020. Further, it has been recorded that out of 27 sources there were 13 sources in which there were significant variations in Diosgenin contents.
- Based on the findings, hormonal treatment of IBA- 150 ppm is recommended for carrying out vegetative propagation of the *T. govananium*.
- Propagation of *T. govanianum* through rhizome, vertically cut into 2 parts, is recommended for mass multiplication as by this method from one plant, we can raise 2 plants.
- Potting media with ratio of humus-3:1:1 Soil-1 :Sand-1 was found to be the best for optimum growth of *T. govanianum*, hence recommended for using this potting media in nurseries for better growth and survival.

- The various seed parameters, ranged from 6.05 to 7.87 mm, length, 2.99 to 3.54, width 2.22 to 2.72 mm, aspect 1.18 to 1.53, diameter 2.50 to 2.99 mm, perimeter 8.77 to 10.25, roundness 0.92 to 0.99 and thickness 2.31to 3.08 mm.
- Seed capsule variation revealed that maximum length of capsule (15.07 mm) recorded with S_1 (Negidug) while minimum (9.56mm) with S_3 (Parot). Maximum capsule diameter (10.19mm) was recorded with S_1(Negidug) while minimum (6.43 mm) with S_3 (Parot). Maximum capsule fresh weight (0.87 gm) was recorded with S_1(Negidug) while minimum (0.25) with S_3 (Parot). Maximum capsule no of seeds (9.80) was recorded with S_1 (Negidug) while minimum (3.30) with (Parot).



Vegetative Propagation of *T. govanianum*

Dactylorhiza hatagirea (D. Don) Soo (Hath- panja): An Endangered Orchid in Full Bloom

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The Himalaya is unbeatably majestic and charming. The youngest fold mountains boasts of vast geographical extent, mesmerizing snow covered ranges and perennial rivers. The chain of parallel ranges extends from west to the east in the form of arc. These are about 2500 km in length and the width varies from 150 to 400 km. The Himalaya is not only the biggest repository of perpetual snow or glaciers, but also harbours a spectrum of biodiversity. Many valuable flora are found exclusively in this region. Since time immemorial, these Himalayan herbs are extensively used in folk medicine, Ayurveda, Siddha, Unani and Tibetan medicine systems. Very recently, the modern health care system has also recognised the potential of these endemic plants to cure many ailments and physiological disorders of human body.

***Dactylorhiza hatagirea* (D Don) Soo** is one such herb which is held in high repute due to its medicinal importance. The plant belongs to Orchidaceae family and it is an attractive perennial orchid. It attains the height up to 30-40 cm. It has slender, hollow and leafy stem and leaves are linear lanceolate in shape with a sheathing leaf base.

The compactly flowered inflorescence is in the form of raceme and bears many purple or pink coloured flowers. The plant bears flowering and fruiting during June – September and produces many minute seeds. The plant is also called as **Himalayan Marsh** orchid and locally known as salam-panja, hath-panja or hatajari. The roots of this marshy orchid are palmately divided into 3-5 lobes, resembling the fingers of hand attributing to the name **Hath -panja.** It is medicinally very important herb and parts of this plant are used in the treatment of many problems related to various vital systems. The rhizome of ***Dactylorhiza hatagirea*** are reported to have nutritive, astringent properties and used to treat diarrhoea and body weakness. Root tubers of hath-panja also act as nervine tonic. It is also considered efficacious in the treatment of cuts, wounds and anaemia.

The plant is native or near native to the Indian Himalayan Region (IHR). It has been reported from Jammu and Kashmir and Ladakh UTs, Himachal Pradesh, Uttrakhand, Sikkim and Arunachal Pradesh. It grows in the alpine and sub- alpine climate of North -Western Himalaya and mostly found in damp marshy places, pastures and meadows between 2500 - 5000 m amsl. It prefers to grow in regions having prolonged winters and temperature ranges between below 0°C- 18°C and moist soils which are granular in structure and sandy loamy in texture.

As per different scientific papers and reports, the continuous and unscientific harvesting of rhizomes for preparation of medicine has led to its extinction in the wild and as of now it is categorised under different status of threat including endangered, critically endangered, and threatened by Conservation Assessment and Management Plan (CAMP) and International Union for Conservation of Nature (IUCN).

Hence, the sight of an endangered species in full bloom and plenty is a real pleasure for anyone. Just like a treat for eyes. During my field visits to cold-deserts in Himachal Pradesh, I was thrilled to find two natural populations of the orchid in Spiti valley and Lahaul valley. One patch of the purplish coloured orchid was near Gue village at an elevation of 3622 m and latitude 32°07'44.2'' and longitude 078°34'13.6". The plants were seen inhabiting a large area at this location. Similarly, other natural population was reported at an elevation of 2934 m and latitude 32° 48'04.6'' and longitude 076°43'35.1" near Tamalu village in Miyar Valley (Lahaul), the lesser Known Himalaya.

At these sites, the plants were many in number and thriving well. These locations are remote and lie interiorly in Trans-Himalayan region. This substantiates that the nature manifests itself beautifully in unspoilt state and it has got inherent potential of resilience. Even so, invariably there is a need to study this unique species for germplasm variability in different populations and devising viable scientific strategies for conservation of the species.

Myrica esculenta Buch. -Ham. ex D. Don an Important Multipurpose Tree of Himachal Pradesh, North Western Himalaya

Swaran Lata and Varsha

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Introduction

In the Indian Himalayan Region (IHR), more than 675 wild edibles are known of which *Myrica esculenta* Buch.-Ham. ex D. Don is highly valued edible species of North Western Himalaya. The genus *'Myrica'* includes approximately 97 species distributed in both temperate and sub-tropical regions of the world. *M. esculenta* is only species of genus 'Myrica' found in India. It is commonly known as Boxberry and Kaphal. It belongs to family Myricaceae. *M. nagi, M. sapida, M. farqhariana* and *M. integrifolia* are its synonyms. Fruits of this plant are one of the tastiest wild fruits of sub-temperate Himalayan region and also recognised for its nutritional and therapeutic potentials. Fruits used in preparation of jams, syrups, refreshing drinks and pickles. Beside this, locals also use this tree as source of fodder, fuel, timber, fibre, etc. Being actinorhizal, it also contributes in improving soil fertility in degraded soils.

Common Names

It is known by different names such as Box Myrtle, Bayberry (English), Ajooree, Nagatenga, Vdulbark (Assami), Kayachhal, Kaiphal, etc.

Botanical Classification

Kingdom: Plantae; Division: Magnoliophyta; Class: Magnoliopsida; Order: Fagales; Family: Myricaceae and Genus: *Myrica*.

Habitat and Distribution

It is distributed in Bangladesh, Borneo, China, Japan, Malaya, Myanmar, Nepal, Philippines, India, Sumatera, Singapore, Thailand and Vietnam in sub-temperate areas. It is native to India and found in Eastern Himalayan states viz., Assam, Arunachal Pradesh, Sikkim, Meghalaya, Mizoram, Nagaland and North Western, and Western Himalayan states UTs viz., Himachal Pradesh, Uttarakhand in sub-temperate regions in between 900-2100 m. In Himachal Pradesh this species is found in mid hill sub-temperate regions of Kullu, Shimla, Mandi, Solan, Sirmaur, Kangra and Chamba districts in between 1200-2100 m. It occurs naturally with other broad-leaved and conifer tree species viz., *Quercus oblongata, Ouercus glauca, Rhododendron arboreum*, *Pinus roxburghii, Pinus wallichiana* and *Cedrus deodara*.

Morphology

It is a medium-sized, dioecious, sub-temperate ever-green tree. Both male and female trees are almost similar in appearance. Outer bark is dark grey, rough, vertically wrinkled while inner bark is dark brown in colour with smooth surface. Leaves are lanceolate with entire or serrate margin,having pale green at lower surface, 10-12 cm in length and dark green at upper surface, often crowded towards the ends of branches. The female flower is very small, sessile, solitary and bracteate. Sepals and petals are absent. The inflorescence is a catkin, axillary in position with 25 flowers. The inflorescence of male flower is compound raceme and each flower has 12 stamens with very short filament. Fruits are succulent drupe, globose in shape, 2-7 mm in diameter, red or dark brown in colour having sweet and sour taste. Shelf life of fruit is 2-3 days. Fruits are rich source of vitamin C and polyphenolic compounds such as tannins, phenols, flavonoids and flavonols. The seeds are 1-6 mm in diameter with oily taste. Flowering and fruiting period is February-June.

Uses

In Himachal Pradesh. *M. esculenta* is known as one of the favourite tree species of local communities of mid hill sub-temperate regions as it provides multiple benefits. Due to its delicious fruits and medicinal properties, it is one of the favourite local fruit of the local communities. This species also contributes significantly in income of local communities because local people collect it in the month of May-June from the forests and agroforestry land use areas and sell them in local market @ Rs. 120-150/kg. Apart from being an important source of income, this species also meets the daily needs of the people mainly firewood, fodder, fibre, dye and timber. *M. esculenta* contains various phytochemicals, which are responsible for the therapeutic importance of this plant. Myricetin is major active compound of *M. esculenta* which has anti-oxidant, anti-cancer, anti-diabetic and anti-inflammatory effects. Because of medicinal properties of the plant, most of the plant parts viz., roots, bark, leaves, fruits, etc. are used by local communities to cure cough, toothache, jaundice, asthma, ulcers, headache ulcers, swelling, anemia, diarrhea, paralysis, fever, ear, body pain, joint pains, mental illness, nose and throat diseases. In Ayurveda, fruits and roots are used to prepare ayurvedic formulations such as Chwayanprash, Brahmarasayan Katphaladi churna, Kaas-har churna, Katphalataila, Katphala kvatha, Khadiradi gutika, Mahavatagajankush rasa, Brihatphala ghrita, Pusyanugachurna, Arimedadi taila, Bala taila, Mahavisagarbhataila, which is used to cure indigestion, loss of memory, arthritis, diarrhoea, dysentery, headache, menorrhagia and other menstrual

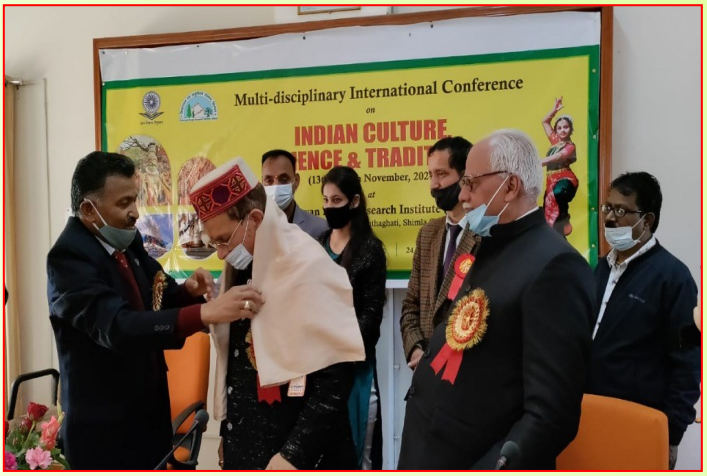
Conclusion

M. esculenta is highly valuable tree species of Himachal Pradesh because each and every part of the species is used by local communities for fulfilling daily livelihood needs. It is also one of most important tree species having huge nutritional, therapeutic, income generation and ecological potential. But, currently natural population of this species is declining fast mainly due to over exploitation, urbanization and over-harvesting along with habitats destruction for developmental activities. In addition to this, this species also have poor natural regeneration. In spite of huge potential of this species in livelihood enhancement of local communities, this species is still not in cultivation and its traditional and commercial use depends only on collections from the wild sources. Thus population assessment, ecological niche modelling, seed germination and propagation studies along with community awareness programmes suggested for its conservation and sustainable management.

***Myrica esculenta* (Kaphal)**

WORKSHOPS/SEMINARS

- The HFRI, Shimla organized Multi-disciplinary International Conference on "Indian Culture, Science & Tradition" in collaboration with Science and Management Society, Himachal Pradesh and 24 Degree & PG Colleges of Himachal Pradesh and Haryana from 13th to 15th November 2021. Sh. Suresh Bhardwaj, Hon'ble Minister of Urban Development, Town & Country Planning, Housing, Parliamentary Affairs, Law and Legal Remembrance, Cooperation Minister, HP inaugurated this Conference on 13th November 2021.



MEETINGS

⇒ Dr. S.S. Samant, Director, HFRI; Dr. Sandeep Sharma, Scientist-G & Group Coordinator Research; Dr. Jagdish Singh, Head, Extension Division and Dr. Vaneet Jishtu, Scientist-E participated in the meeting with the heads of different organizations and Forest Department Leh Laddakh, UT on 8 July 2021 under the Chairmanship of Shri Preet Pal Singh, IFS, Chief Conservator of Forests, Ladakh, Union Territory, which was organized by HFRI, Shimla in collaboration with Ladakh Forest Department.

⇒ An interactive meeting regarding working of VVK was organized by HFRI, Shimla with local representatives and local people at VVK Dharampur on 17th August, 2021, under the Chairmanship of Head Extension Division, HFRI, Shimla.

⇒ Dr. S.S. Samant, Director, HFRI; Dr. Sandeep Sharma, Scientist-G & Group Coordinator Research; Dr. R. K. Verma, Scientist-G & HOO; Dr. Jagdish Singh, Head, Extension Division; Dr. Ashwani Tapwal, Scientist-F & Head, Forest Protection Division; Other Scientists of the Institute, Technical Officers and other staff of the Institute participated in the "*Parthenium* awareness day" organized by HFRI, Shimla through online and offline mode. Dr. S.S. Samant, Director, HFRI gave presentation on "Effect of *Parthenium hysterophorus* on biodiversity of Himalaya"; Dr. Satish Kumar Bhardwaj, HoD, UHF, Nauni gave presentation on "Management of *Parthenium"*; Dr. Ranjeet Kumar, Scientist-E apprised about "*Parthenium hysterophorus:* Effect on Ecosystem of North Western Himalayas" and Dr. Sandeep Sharma gave presentation on " Management of weeds to enhance productivity".

⇒ To evaluate Pre-Thesis and extension of FRI registered Ph.D. Research Scholars, HFRI, Shimla organized One Day Research Advisory Committee (RAC) meeting on 24th August 2021. The meeting was held under the Chairmanship of Dr. S.S. Samant, Director, HFRI, Shimla cum Chairman, RAC. Dr. R. K. Verma, Nodal Officer, FRIDU, all HoDs, Scientists, Technical staff, Ph.D. Scholars, Research Scholars participated in the meeting.

⇒ The HFRI, Shimla organized the Research Advisory Committee (RAC) meeting on 15th November 2021 for reviewing synopsis (11 Nos.) and six monthly progress (2 Nos.) of Ph.D. Research Scholars. The meeting was held under the Chairmanship of Dr. S.S. Samant, Director, HFRI, Shimla cum Chairman, RAC. Dr. R. K. Verma, Nodal Officer, FRIDU, all HoDs, Scientists, Technical staff, Ph.D. Scholars, Research Scholars participated in the meeting.

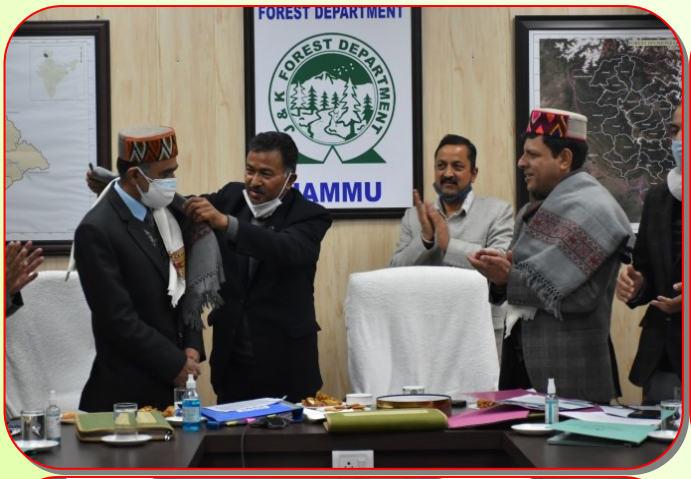
⇒ Sh. Jagdish Singh, Scientist-F; Dr. Ashwani Tapwal, Scientist-F; Dr. Pawan Kumar, Scientist-E; Sh. Pravin Rawat, Scientist-B organized the Meeting with local representatives and local people at VVK, Dharampur.

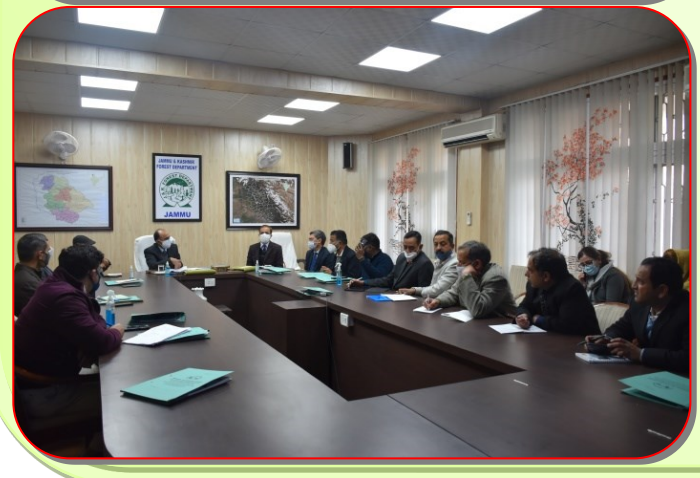
⇒ निदेशक, डॉ. एस.एस. सामंत, हि.व.अनु.सं. की अध्यक्षता में सहायक निदेशक राजभाषा (प्रभारी), संस्थान के विभिन्न प्रभाग प्रमुख ने संस्थान द्वारा उपरोक्त विषय पर आयोजित राजभाषा की द्वितीय तिमाही बैठक में भाग लिया। बैठक के दौरान विभिन्न मूददों पर चर्चा की गयी।

⇒ The HFRI, Shimla organized XXII Research Advisory Group (RAG) Meeting on 15th September, 2021 in the Conference Hall of the Institute. The meeting held online as well as offline under the Chairmanship of Dr. S.S. Samant, Director, HFRI, Shimla due to prevailing COVID-19 pandemic conditions in which of the total twenty three members, eight members joined the meeting online through Google Meet, fifteen members were present in the Conference Hall of the institute.

⇒ Meeting on Detailed Project Reports prepared by HFRI, Shimla for Rejuvenation of Five Major Rivers (Chenab, Jhelum, Beas, Ravi and Sutlej) of Indus River Basin through Forestry Interventions was organized on 22 December, 2021 at Van Bhawan, Jammu with Commissioner Secretary (Forest), J&K UT Govt. PCCF & HoFF J&K UTFD, Senior Forest Officers and Officers from Line Department in the office of PCCF & HoFF, J&K UTFD. Dr. S. S. Samant, Director, HFRI; Dr. Sandeep Sharma, GCR & Nodal Officer, Indus River Basin; Dr. Ashwani Tapwal, Scientist-F, Dr. Ranjeet Kumar, Scientist-E and Dr. Joginder Chauhan, Chief Technical Officer gave detailed presentations on various aspects of the DPRs of Chenab, Jhelum and Ravi Rivers.

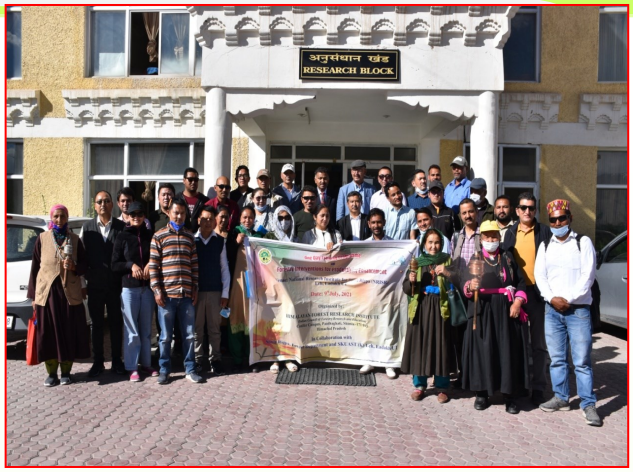
Glimpses of Meetings Organized

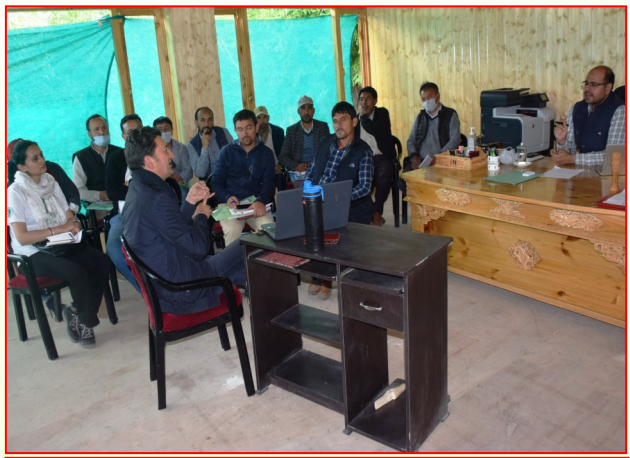


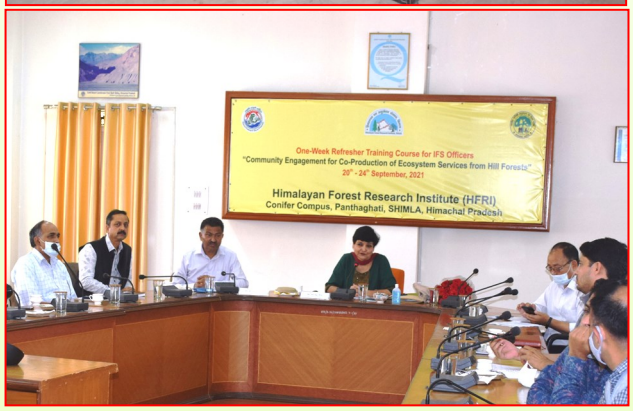


Training Programmes

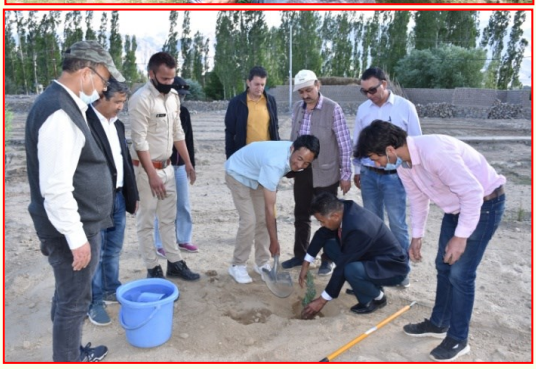
* The HFRI, Shimla in collaboration with National Institute of Sowa Rigpa (NISR), Forest Department and SKUAST (K) of Leh Ladakh, Union Territory organized one day Training Programme on **'Forestry Interventions for Productivity Enhancement'** for frontline staff of Leh, Forest Division, Farmers and Local communities, etc. on 9 July 2021 in the conference hall of NISR, Leh.
* Himalayan Forest Research Institute, Shimla organized one day Interaction-cum training programme at the office of the Kargil Forest Division, Ladakh UT under VVK, Leh on the topic "Goods and Services of Cold Desert Ecosystem" on 12th July 2021.
* The HFRI, Shimla organized **IFS Training** w.e.f. **20-24 September, 2021** in the Conference Hall of the Institute. The meeting held **online** due to prevailing **COVID-19** pandemic conditions in which of the total twenty six IFS officers from different States and Union Territories joined the training programme online through Google Meet.
* The HFRI, Shimla, organized two days Virtual Training Programme on **'Cultivation of important medicinal plants: an option to increase the income of local communities'** on 5 & 6 October 2021 for other stake-holders.
* The HFRI, Shimla organized training programmes in different areas of District Kinnaur under NABARD funded project. Dr. Swaran Lata, Scientist-D was the Coordinator of these training programmes. Dr. Pawan Kumar, Scientist-E delivered talk on "Sustainable conservation of Chilgozapine (*Pinus gerardiana*) in District Kinnaur through insect pests management involving local communities" on the said dates and respective venues of this







Special Days Celebrations



- The HFRI, Shimla organized an interaction program with students and teachers of Suru Valley under **'PRAKRITI'** programme in Kargil district of Ladakh UT on 11 July 2021. Total 85 students including teachers of various remote schools of Suru valley Kargil, Ladakh, UT participated.
- The HFRI, Shimla organized three **Van Mahotsav** on 9 July 2021, 21 July 2021 and 22 July 2021 at three different stations. On 9 July 2021, Van Mahotsav was organized by HFRI, Shimla at Badami Bagh, Leh by planting 50 seedlings of *Juniperus polycarpos.*

Plantation Programmes

- Celebrated **Van Mahotsav** on 21st and 22nd July 2021. Plantation of about 400 plants of different fodder species was done at Rano Panchayat, Solan (HP).

- Planation was carried out in the campus of the Institute and planted about 200 species of fodder, timber and wild fruits.

- The **75th Independence Day** function was celebrated on 15th August, 2021 at Himalayan Forest Research Institute, Shimla in which Scientists, Officers, Employees and Research Scholars of the institute participated. Dr. S. S. Samant, Director, Himalayan Forest Research Institute, Shimla hoisted the national flag on the occasion and addressed the staff.

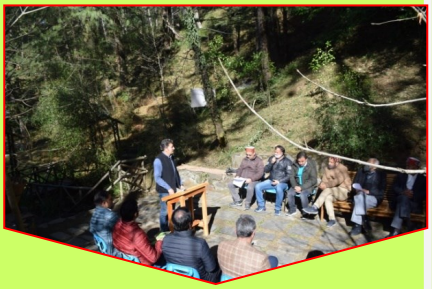
- The **Parthenium Awareness Program** was organized by the Himalayan Forest Research Institute, Shimla on 19th August, 2021 at Conference Hall, HFRI, Shimla.

♦ The HFRI, Shimla celebrated the ***'Rashtriya Ekta Diwas'*** on October 31 October 2021 to mark the Birth Anniversary of Sardar Vallabhbhai Patel: The Iron Man of India who played an important role in the unification of India. On this occasion, after National Anthem, a Unity Rally was taken out from the HFRI, office to lower Panthaghati, Shimla.

♦ The HFRI, Shimla celebrated **"Indian Constitution Day"** on 26 November, 2021 in the Conference Hall of the Institute. On this occasion, about 100 participants including Director, Scientists, Forest and Technical Officers, Ministerial and project staff participated in the programme.

♦ The HFRI, Shimla organized and celebrated **'International Mountain Day'** on 11 December 2021 at Western Himalayan Temperate Arboretum (WHTA), Potter Hill, Shimla under the theme "Sustainable Mountain Tourism". Dr. S. S. Samant, Director welcomed the Key Note Speaker & Participants and addressed the gathering. Sh. Sriniwas Joshi, IAS (Retd.) was the Key Note Speaker.

♦ Under **'Good Governance Week'** (Sushashan Saptah) (20-25, December, 2021), the HFRI, Shimla organized Good Governance Programme on 20 December, 2021. Dr. S.S. Samant, Director welcomed the Guest & participants and addressed the gathering. Dr. Ashwani Kumar Sharma, I.A.S., Special Secretary, Department of Health and Family Welfare, Government of Himachal Pradesh delivered a lecture on Good Governance.



♦ To promote harmony and national integration, The HFRI, Shimla, as per request of **'National Foundation for Communal Harmony' (NFCH),** an autonomous body under the Ministry of Home Affairs, Government of India observed National Communal Harmony Week on 25 November 2021. A Harmony Rally was organized from the main Campus of HFRI upto Sargheen Chowk. Director, Scientists and other staff of the institute participated in Awareness Rally to create awareness among local peoples.

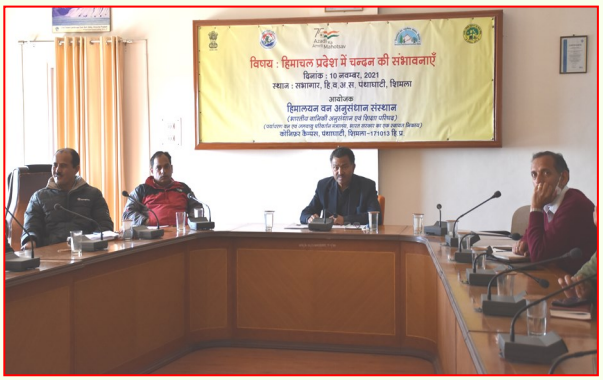
BHARAT KA AMRIT MAHOTSAV

* The HFRI, Shimla, celebrated the **"Bharat Ka Amrut Mahotsava"** - an initiative of Government of India, at Tabo, district Lahaul and Spiti, Himachal Pradesh on 27 thJuly, 2021 under the theme **'Insect Pest and Disease Management in Cold Desert'**.

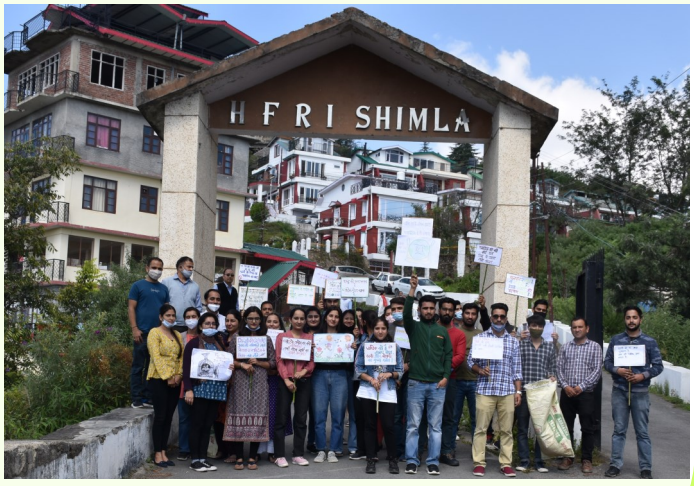
* The HFRI, Shimla celebrated the **"Bharat Ka Amrut Mahotsava"** an initiative of Government of India, in the Conference Hall on 27thAugust, 2021 under the theme 'Environment Awareness among Village Folk'. About 25 villagers from Rajhana Panchayat along with Panchayat Pradhan, Vice Pradhan and ward members participated in the program. The scientists and officers (Forest and technical services) of the institute were also present in the programme.

* The HFRI, Shimla, celebrated **'Bharat Ka Amrut Mahotsava'** on 13 October, 2021 at Khatnol, Khatnol Panchayat, Basantpur Block, District Shimla on topic 'Environmental Conservation Awareness program for the villagers'. The event was attended by 30 participants including Villagers, Teachers, Students, Youth club, Mahila Mandal, etc.

* The HFRI, Shimla organized **'Amrit Mahotsav'** Programme on 10 November 2021 in the conference Hall of the Institute. The main objective of programe was to delebtare posssibilties of Sandalwood cultivation in Himachal Pradesh. In this program 80 participants including scientists, officers and research scholars of the Institute participated and employees working in research centers of the Institute also participated through online.



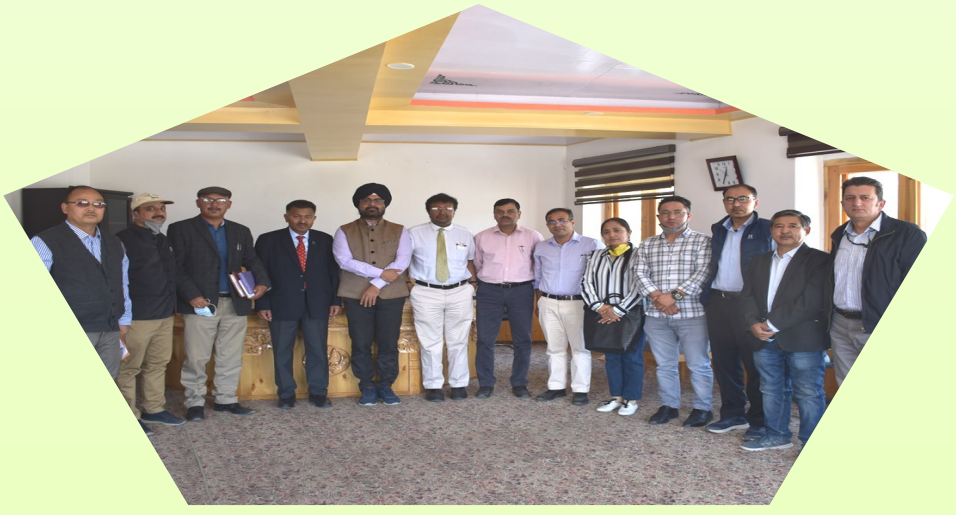
Glimpses of Amrit Mahotsav



PARTICIPATION IN THE WORKSHOPS/SEMINARS

- Dr. Pawan Kumar, Scientist-E, Forest Protection Division virtually participated in the International Conference on Advances in Multi-Disciplinary Sciences and Engineering Research (ICAMSER-2021) organized by Chitkara University, Himachal Pradesh from 2 to 4 July 2021.
- Dr. Balkrishna Tiwari, Scientist-B, Genetic and Tree Improvement Division of this institute participated in one day webinar on "Advancement in Teak Cultivation: Genetic Resources and Technology" organized by IFGTB, Coimbatore – Tamil Nadu on 16th July 2021.
- Dr. R.K. Verma, Scientist-G, Head, Forest Ecology & Climate Change Division of HFRI, Shimla participated in the one day Online Webinar on 09.08.2021 which was organized by Institute of Forest Genetics and Tree Breeding, Coimbatore, Tamil Nadu.

- Dr. S. S. Samant, Director, HFRI and Dr R K Verma, Scientist-G, Head, Forest Ecology & Climate Change Division of HFRI, Shimla participated in the one day Consultation Workshop on "Development of Roadmap for Institutional and Policy Mainstreaming of Sustainable Land and Ecosystem Management in India" on 27.08.2021 (Online) which was organized by Green India Mission Directorate, Ministry of Environment, Forest & Climate Change New Delhi.
- Dr. R K Verma, Scientist-G, Head, Forest Ecology & Climate Change Division of HFRI, Shimla participated in the one day online Webinar on "Indigenous People, Conservation and Livelihood" which was organized by Institute of Forest Genetics and Tree Breeding, Coimbatore, Tamil Nadu on 27.08.2021.



PARTICIPATION IN THE WORKSHOPS/SEMINARS

- Dr. S.S. Samant, Director, HFRI, Shimla participated in a National Webinar on "Role of India in Environment Sustainability: In Context to Bio-resource & Water" on the occasion of "Bharat Ka Amrit Mahotsav" as organized by Department of Botany, School of Sciences, Uttarakhand Open University Haldwani on 27 & 28.08.2021 and delivered initiated talk on Role of Himalayan Biodiversity in Environmental Sustainability.
- Dr. S.S. Samant, Director, HFRI, Shimla participated in Dr. Y.P.S. Pangtey Research Foundation Society one Day National Webinar on "Himalayan Environment: Issues and Challenges" on the occasion of Remembrance Day of Late Professor Y.P.S. Pangtey Lecture Series on 28.08.2021. Delivered lecture on the theme.
- Dr. Vaneet Jishtu, Scientist-E, Forest Ecology & Climate Change Division of HFRI, actively participated in the CAMP (Conservation AssesLadakh UT.sment and Management Prioritization) Workshop from 15th to 17th September 2021 at Leh,
- Dr. Vaneet Jishtu, Scientist-E, Forest Ecology & Climate Change Division as Key Note Speaker given talk on "Plant Diversity of NW Himalaya – Values, Emerging Threats & Conservation Issues" during the two days National Seminar on "National Conference on Biodiversity, Medicinal Plants, Drug Discovery & Sustainable Utilisation", conducted by the St. Andrew's College, Gorakhpur, UP on 08.09.2021.
- Shri P.S. Negi, Scientist-D and Dr. Swaran Lata, Scientist-D participated in the one-day National Scientific Conference on "Contribution of Forest Produce in Rural Livelihoods" which was organized by Eco-Restoration Forest Research Center, Prayagraj on 24th September, 2021. On this occasion, Mr. PS Negi, Scientist-D, delivered an invited lecture on the study on the effect of pre-sowing treatment on seed germination and seedling vigor index of "Kapoor-Kachari" (*Hedychium spicatum* Smith) and Dr. Swarn Lata, Scientist-D, delivered an invited lecture on the topic "Chilgoza: An important woody forest product found in arid temperate regions of the Northwest Himalaya".
- Sh. P. S. Negi, Scientist-D and Dr. Swaran Lata, Scientist-D participated in one day webinar on "*Income Enhancement from Agroforestry*" organized by FRI, Dehradun on 16th Sept., 2021.
- Dr. Pawan Kumar, Scientist-E and Dr. Swaran Lata, Scientist-D participated the "Intellectual Property Rights and Patents" webinar on 23rd September, 2021 by virtual mode organized by Department of Biosciences, Himachal Pradesh University.
- Dr. Vaneet Jishtu, Scientist-E; Dr. Pawan Kumar, Scientist-E; Dr. P. S. Negi, Scientist-D, Dr. Swaran Lata, Scientist-D; Reseach Scholars, and Project Staff of the Institute participated in the 8th International e-conference on "Progress of Science and Technology during Pandemic" on September, 11 & 12, 2021; organised by Him Science Congress Association and presented 08 Number research papers in the conference by them.
- Dr. S.S. Samant, Director, HFRI, Shimla participated as the Guest of Honour in 8th International Conference virtually on Progress of Science and Technology During Pandemic on 11th & 12th September 2021 organized by Him Science Congress Association Himachal Pradesh and delivered invited talk.
- Dr. Ashwani Tapwal, Scientist-F, participated in the webinar on World Fungus Day on 2 October 2021. The webinar was jointly organized by Mycological Society of India (MSI) and Shivaji Science College, Amravati, Maharashtra.

- Dr. R.K. Verma, Scientist-G, Forest Ecology & Climate Change Division of HFRI, Shimla participated in the workshop on Policy Formulation to Legislation from 4 to 7 October 2021 (Online), which was organized by Institute of Secretariat Training & Management, Department of Personnel & Training, Government of India.
- Dr. Pawan Kumar, Scientist-E, Forest Protection Division virtually participated in the webinar on Forest Entomology organized by FRI, Dehradun on 11 October 2021.
- Dr. Pawan Kumar, Scientist-E, Dr. Ranjeet Kumar, Scientist-E; Richa Sharma, JPF; Krishna Kumari, JPF and Sangeeta Verma, JPF and Himani Saini, JPF virtually attended the 3rd International e-Conference on Global Initiative in Agricultural, Forestry and Applied Sciences for Food Security, Environmental Safety and Sustainable Development (GIAFAS-2021) jointly organized by Agriculture and Environmental Technology Development Society (AETDS) and Shri Guru Ram Rai University, Dehradun, Uttarakhand from October 17 - 18, 2021.
- Dr. S.S. Samant, Director; Dr. Sandeep Sharma, Scientist-G; Dr. R.K. Verma, Scientist-G; Dr. Jagdish Singh, Scientist-F; Dr. Ashwani Tapwal, Scientist-F, Dr. Ranjeet Kumar, Scientist-E; Dr. Pawan Kumar, Scientist-E, Sh. P. S. Negi, Scientist-D; Dr. Swaran Lata, Scientist-D; Dr. Balkrishna Tewari, Scientist-B and Sh. Pravin Rawat, Scientist-B from HFRI, Shimla virtually participated in the ICFRE-IUFRO Workshop on "Forest Landscape Restoration", which was jointly organized by ICFRE-IUFRO on 9 - 12 November 2021. Dr. Samant, Director was also in the Panel Discussion for FLR in achieving SDG-15.
- Dr. Balkrishna Tiwari, Scientist-B and Sh. Pravin Rawat, Scientist-B, HFRI participated in the National Conference on "Clonal Forestry in Eco-restoration" held on 10 & 11 November 2021 at Forest Research Centre for Eco-Rehabilitation, Prayagraj. Dr. Balkrishna Tewari presented the research work entitled "Selection of superior and insect pest resistant genotypes of *Salix alba* for cultivation in cold desert area of Himachal Pradesh" during the Conference.
- Dr. S.S. Samant, Director, HFRI, Shimla; Dr. Sandeep Sharma, GCR; Dr. Ashwani Tapwal, Scientist-F, Dr. Ranjeet Kumar, Scientist-E and Dr. Pawan Kumar, Scientist-E participated in the Multi-disciplinary International Conference on "Indian Culture, Science & Tradition" organized by HFRI, Shimla in collaboration with Science and Management Society, Himachal Pradesh and 24 Degree & PG Colleges of Himachal Pradesh and Haryana from 13 to 15 November 2021. Besides, some Technical and Project staff of the institute also attended this International Conference.
- Dr. R.K. Verma, Scientist-G, Forest Ecology & Climate Change Division of HFRI, Shimla participated in the online webinar on "Potential and Prospects of Value Addition in Wild Edibles" organized by Forest Research Institute, Dehradun on 26th November, 2021.
- Dr. S.S. Samant, Director, HFRI, Shimla; Dr. Sandeep Sharma, Scientist-G; Dr. R. K. Verma, Scientist-G; Dr. Balkrishna Tiwari, Scientist-B and Sh. Pravin Rawat, Scientist- B virtually participated in the Webinar on "Climate smart forestry: an instrument for mitigating climate change", which was jointly organized by Forest Research Institute, Dehradun and British High Commission, Chandigarh on 8 December 2021.
- Dr. Swaran Lata, Scientist-D and Dr. Balkrishna Tiwari, Scientist- B participated in the online Regional Research Conference on "Vocal for Local: Sustainable Development of Non-Timber Forest Products for livelihood" organized by Tropical Forest Research Institute, Jabalpur, Madhya Pradesh on 13 December 2021.

- Dr. S.S. Samant, Director, Dr. R.K. Verma, Scientist-G, Dr. Ranjeet Kumar, Scientist-E, Dr. Vaneet Jisthtu, Scientist-E, Dr. Pawan Kumar, Scientist-E, Dr. Balkrishan Tiwari, Scientist-B & Sh. Pravin Kumar, Scientist-B participated in the International Conference on "Secure Himalaya – Safe Himalaya: Reducing Climate Change Induced Risks & Vulnerabilities with Special Focus on GLOF – Glacial Lake Outburst Floods in Himalaya" organized by Department of Environment, Science & Technology, Government of Himachal Pradesh on 18 & 19 December 2021 at Hotel Peter Hoff, Shimla, Himachal Pradesh. As Panelist, Dr. S.S. Samant, Director, HFRI, Shimla delivered a key note address on "Prevailing Practices and Role of Forestry & Biodiversity in CAA".

PARTICIPATION IN TREE GROWERS MELA/ KISAN MELA

- **The HFRI, Shimla participated in an "Exhibition: Destination Himachal Pradesh – 2021" w.e.f. 28-30 September, 2021 at Centarosa Resort Majhgaon Village, P.O. Shamati, Rajgarh Road, Himachal Pradesh. The exhibition was organized by Friendz Exhibition & Promotions Pvt. Ltd.**

- **Dr. Pawan Kumar, Scientist-E and Sh. Akhil Kumar, CTO attended Kisan Mela at CSKHPKV, Palampur, which was organized by Rice and Wheat Research Centre, Malan, Kangra (CSKHPKV, Palampur) on 30 December 2021.**

PARTICIPATION IN THE TRAINING PROGRAMMES

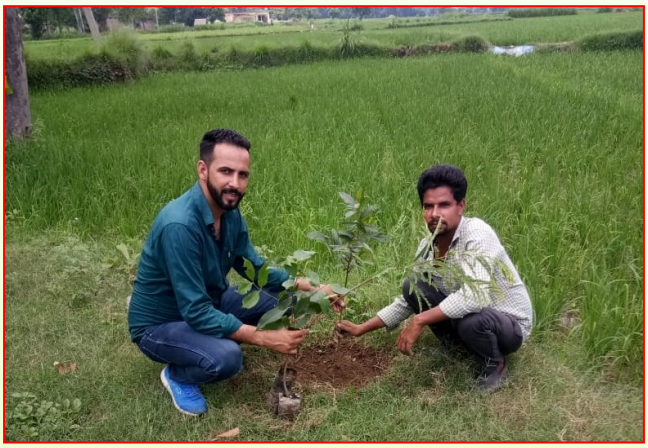
- Sh. Jawala Prashad, Senior Technical Officer and Sh. Rajinder Pal, Sr. Technician participated in the three days training programe on "New Approaches in Agroforestry and Tree-Crop Intercations" held at Agroforesrty Research Institue, Jhansi through vitrual mode from 26 to 28 July 2021.
- Dr. Pawan Rana, Scientist-E and Dr. Ranjeet Kumar, Scientist-D participated in the five days training programe on "Introduction to RS, GIS and GNSS in Forestry" organised by Indian Institute of Remote Sensing through vitrual mode from 02-06 August, 2021.
- Dr. Jagdish Singh, Scientist-F and Head of Division Extension physically participated in the five days training programe on "Management of Training (MoT-7)" organised by ISTM Department of Personnel and Training at New Delhi from 27 September, – 01st ,October 2021.
- Sh. Vinod Kumar, Chief Technical officer and Smt. Sonika Sharma, Senior Technician participated in the three days training on "Plus Tree Selection" organized by KSCSTE-Kerala Forest Research Institute, Peechi w.e.f. 28-30 September 2021 through virtual mode.
- Sh. Akhil Kumar, Chief Technical Officer and Sh. Vipin Kumar, Sr. Technician virtually participated in the three days training programme on "Edible and Medicinal Mushroom Cultivation" organized by RFRI, Jorhat from 4 to 6 October 2021.
- Sh. Dushyant Kumar, Senior Technical Officer and Sh. Arun Kaushal, Technician participated in the five days online training on "Field Survey, Data collection, Ccompilation and Aanalysis" organised by Division of Forest Statistics ICFRE w.e.f. 25 – 29 October 2021.
- Sh. Kuldesh Kumar, Technical Officer and Sh. Shyam Sunder, Senior Technician participated in the three days online training on "Economic Evaluation of Forest" organised by IIFM Bhopal under HRD Plan w.e.f. 27- 29 October 2021.
- Dr. Ashwani Kumar, CTO & Smt. Drishti Sharma Sr. Technician participated in the 5 Days HRD training programme on "Cultivation, Processing Techniques & Management of Non-wood Forest Products including medicinal Plants" from 22 -26 November 2021 organized by Tropical Forest Research Institute, Jabalpur through virtual mode.
- Dr. Ranjeet Kumar, Scientist-E and Dr. Swaran Lata, Scientist-D participated in the training programme on "Ecological Niche Modelling" for ICFRE scientist organized by Center for Ecological Sciences, Indian Institute of Science, Bangaluru & Ashoka Trust for Research in Ecology and the Environment (ATREE), Bangaluru from 6 to 10 December 2021.
- Sh. Pravin Rawat, Scientist-B participated in the training on "Forest Policy, Laws and Environment Laws" conducted by Silviculture and Forest Management Division of FRI, Dehradun for the sceintists of all ICFRE Institutes from 13 to 17 December 2021.
- Dr. Pawan Kumar, Scientist-E and Smt. Shilpa, CTO virtually participated in the DST, New Delhi sponsored training programme on "Climate Change: Challenges and Response", which was organized by Lal Bahadur Shastri National Academy of Administration, Mussoorie, Uttarakhand w.e.f. 20 to 24 December 2021.
- Sh. Pravin Rawat, Scientist-B participated in the Training Programme on "Linkage between Field Forest Manager and R&D Personnel" conducted by CASFOS, Dehradun on 29 & 30 December 2021.
- Dr. Swaran Lata, Scientist-D delivered lecture on topic "Cultivation of *Fritillaria roylei* –an Important temperate medicinal Plant" to different stakeholders during two days training programme on "Cultivation of Important Medicinal Plants: an option for enhancing the income of Local communities" organized by HFRI on 5th & 6th October, 2021.

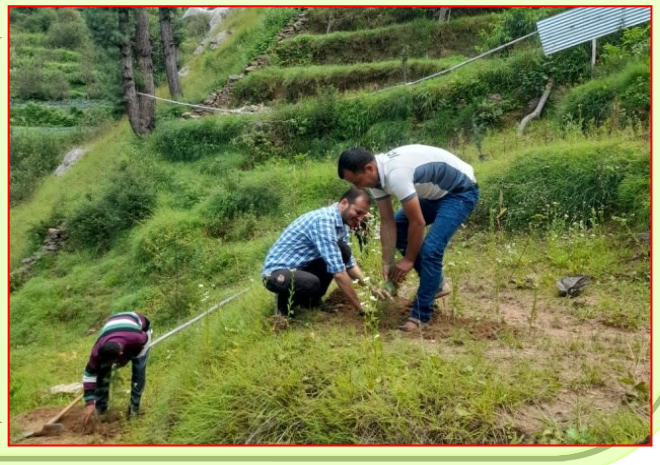
Memorandum of Understanding

⇒ On behalf of ICFRE, the HFRI, Shimla signed Memorandum of Understanding (MoU) with Forest Department, Union Territory of Ladakh on 8 July, 2021 at Civil Secretariat, Leh. The main objective of the MoU was to collaborate in applied research programs, capacity building and knowledge sharing on forests, biodiversity conservation, ecosystems, climate change vulnerability, climate change mitigation and adaptations and livelihood security of forest dependent communities.

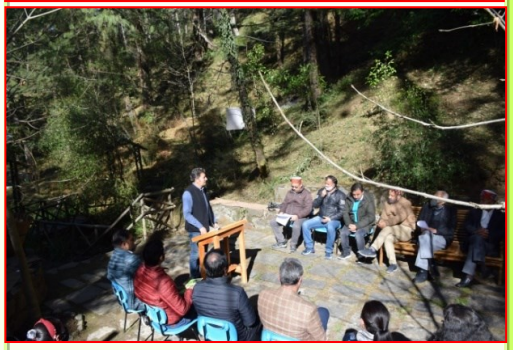
OTHER ACTIVITIES

- Upon the invitation from Hon'ble Lt. Governor Ladakh UT, Charter Agenda for the Ladakh UT was prepared and submitted. Dr. S.S. Samant, Director, HFRI made a presentation on R&D activities of HFRI. Dr. Sandeep Sharma, GCR also participated.
- The HFRI, Shimla, organized "*Har Med Par Ped*" programme on 16 July 2021. About 200 plants of fodder and wild fruit species were planted in boundaries of farmers around different VVKs and Field Research Stations of the Institute located in Himachal Pradesh and Ladakh, UT.
- The Shimla organized a virtual tour of the final year B.Sc. (Hons.) Forestry students of College of Sirsi University of Agriculture Science, Dharwad, Karnataka on 29 July 2021. (Total Participants-67), wherein, Dr. Swaran Lata, Scientist –D delivered a lecture on topic "Floristic Diversity of North –Western Himalaya and Research and Extension activity of HFRI" to the students and the faculty of the university.



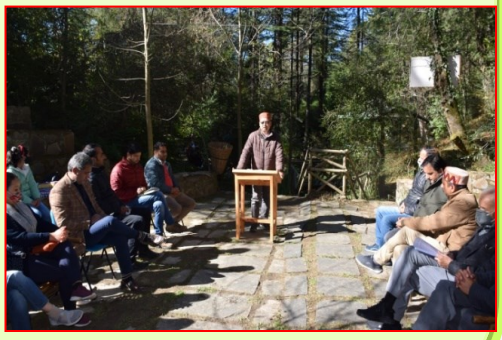


♦ On behalf of ICFRE, Memorandum of Understanding (MoU) was signed between HFRI and Pradhan, Gram Panchayat, Rajhana, Shimla, HP (India) on dated 23.09.2021 at HFRI for the establishment of Demonstration Village (DV) at village Baragaon, Gram Panchayat Rajhana, Shimla.

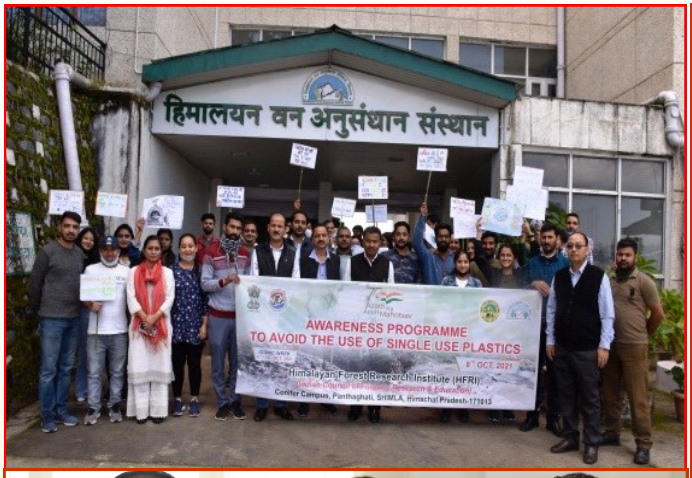


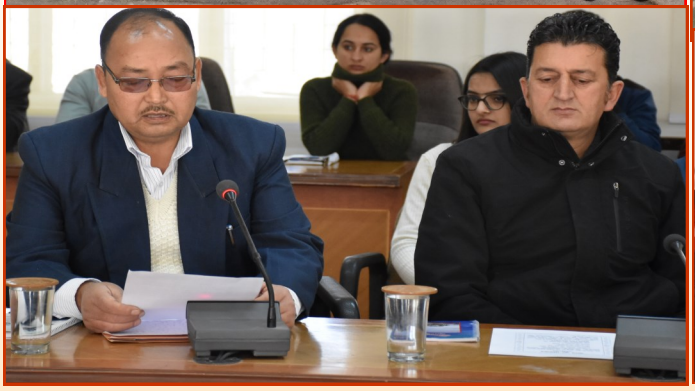
♦ 48 Trainees Range Officers of 6 states viz. Himachal Pradesh, Punjab, Madya Pradesh, Uttarakhand, Assam, Telangana and faculty members of Uttarakhand Forest Training Academy, Haldwani visited HFRI, Shimla on 25 November 2021.

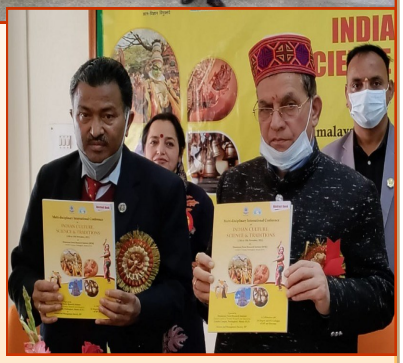
♦ 49 B.Sc. Forestry Students and faculty members of Forest and Research Institute (FCRI), Hyderabad, Telangana visited HFRI, Shimla on 26 November 2021.

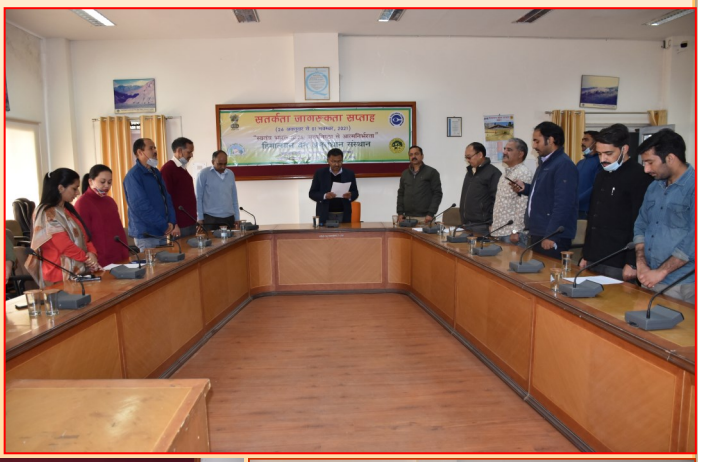


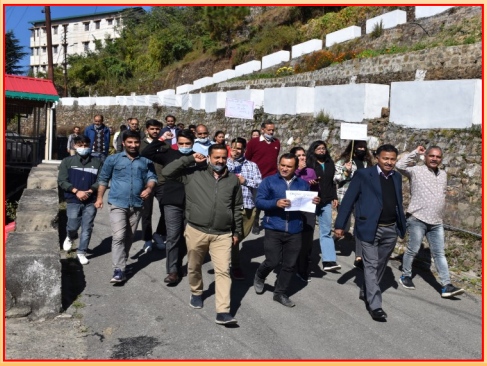
GLIMPSES OF OTHER ACTVITIES

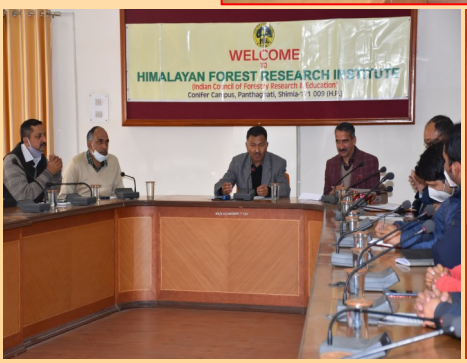


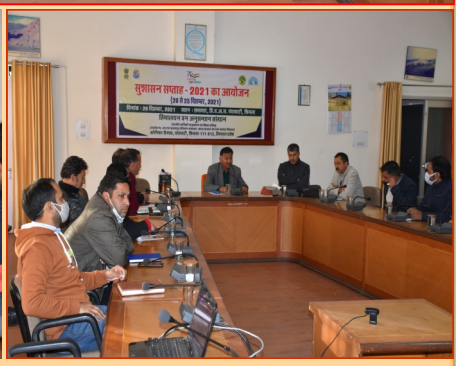












RESEARCH PUBLICATIONS

RESEARCH PAPERS

Anjana, Renu Lata; Samant S.S., Singh Mithilesh (2021). *Betula utilis,* D. Don, A Critically Endangered Timber Line and Multipurpose Angiosperm in Indian Himalayan Region". *Environment Conservation Journal*, 23(3): 155-167, 2021.

Anjana, Renu Lata; Samant S.S. and Singh, Mithilesh (2021). Review on Regeneration Status of *Betula utilis* D. Don: A Critically Endangered Multipurpose Timber Line Species in Indian Himalayan Region. *Environment Conservation Journal*, 22(3): 155-167.

Chauhan, A.; Kumari, P.; Dhiman, P., Kumar, P. and Thakur, M.S. (2021). Studies on Diversity, Distribution and Relative Abundance of Insect Pollinators on Mango in Kyarda Doon Valley of District Sirmaur, Himachal Pradesh. *International Journal of Science and Research,* 10 (9): 630-636.

Kumari, S. and Sharma, S. (2021) Ethno Medicinal Exploration of Selected Medicinal Plants of Baijnath. *Indian Journal of Natural Sciences*,42 (67):3683-3687.

Lata, S., Negi, P. S., Samant, S. S., Seth, M. K. and Sharma, S. (2021). Documentation of traditional alcoholic beverages and their indigenous utilization pattern by Kinnaura tribes of Himachal Pradesh, North Western Himalaya. *Indian Journal of Traditional Knowledge,* 20(4):1002-1013.

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Sharma, Pankaj and Samant, S.S. (2021). Fuelwood extraction trends and conservation prioritization in hydro-electric power project areas in Kullu District, Himachal Pradesh, North-western Himalaya. *Indian Forester*, 147(7):647-656.

Singh, I.; Singh, P.; Rawat, P.; Patel, A. K., Singh M., Singh, K. and Patel, A. K. (2021). Research productivity of Forest Research Institute, Dehradun during 1990-2019: A Scientometric Approach. *Indian Forester*, 147(8): 767-777.

Tapwal., A; Kapoor, K. S.; Thakur, Y. and Kumar, A. (2021). Ectomycorrhizal fungi associated with *Pinus gerardiana* in Kinnaur district of Himachal Pradesh, India. *Studies in Fungi*, 6(1), 425–436

Verma, R., Tapwal, A., Kumar, D. and Puri, S. (2021). Antimicrobial potential and phytochemical profiling of ethnomedicinal plant *Trillium govanianum* Wall. ex D. Don in western Himalaya. *Journal of Herbal Medicine*, 29: 100491.

Wani, Z. A., Samant, S. S. and Pant, S. (2021). Diversity, Utilization Pattern and Representativeness of Dye Yielding Plants in North Western and Western Himalaya, India: An Untapped Source for Bioprospection. *Environment, Development and Sustainability*, DOI:10.1007/s10668-021-01664-x.

POPULAR ARTICLES

Jishtu, V. (2021) Hemis-Shukpachan – The Land of Ladakh's Sacred Juniper Trees. https://hillpost.in/2021/07/hemis-shukpachan-the-land-of-ladakhs-sacred-juniper-trees/116151/

Jishtu, V. (2021). 'SNOLA' – Traditional Festival of Flowers From Remote Kargil Region of Ladakh.https://hillpost.in/2021/10/snola-traditional-festival-of-flowers-from-remote-kargil-region-of-ladakh/116586/.

Jishtu, V. (2021). Mountain Tourism as Sustainable Alternative Livelihood Option for Hill Communities. https://hillpost.in/2021/12/mountain-tourism-as-sustainable-alternative-livelihoodoption-for-hill communities/116816/ comment- page-1/.

BOOK CHAPTERS

Lakhanpal, T.N.; Tapwal, A. and Jishtu, V. (2021). History and development of ectomycorrhizal research in India. *In:* Progress in Mycology- An Indian Perspective (Eds. Satyanarayana, T.; Deshmukh, S.K. and Deshpande, M.), Springer Nature Singapore Pvt. Ltd., 199-222 pp.

Jishtu, V.; Bhondge, S.W.; Varshney, V. K.; Brijbhushan and Chauhan, M. (2021). Indigenous Traditional Knowledge of Lesser-Known Arboreal Tree Flora in Shimla District of Himachal Pradesh, North West Himalaya. In: Lesser-Known Plants Conservation, Management and Sustainable Utilization (Eds.) Anita Tomar and Sanjay Singh. Walnut Publication India, USA, UK. Pp. 1-18.

Lata, S.; Sharma, S.; Sharma, D and Varsha (2021). Indigenous Uses of Lesser Known Wild Edible Plants of Kinnaur District, Himachal Pradesh .In: Lesser-Known Plants Conservation, Management and Sustainable Utilization (Eds.) Anita Tomar and Sanjay Singh. Walnut Publication India, USA, UK. p 236.

BOOK

Anjana, Renu Lata; S.S. Samant and Sayntra Ghosh (2021). *Betula utilis,* D. Don, A Critically Endangered Timber Line and Multipurpose Angiosperm in Indian Himalayan Region", Mahindra Publishing House, Dehradun .

NEW INITIATIVES

- Establishment of VVK, Longani Shibdwala Dharampur, District Mandi, Himachal Pradesh
- Establishment of Botanical Garden in the premises of HFRI, Shimla
- Establishment of Technology Demonstration Centre

VISITS OF DIGNITARIES AND SENIOR FUNCTIONARIES

- Sh. Suresh Bhardwaj, Hon'ble Minister of Urban Development, Town & Country Planning, Housing, Parliamentary Affairs, Law and Legal Remembrance, Cooperation Minister, HP visited the institute on 13 November 2021.
- Professor (Dr.) Sunil Kumar Gupta (Former VC HPU), Chairman, HP State Higher Education Council, Himachal Pradesh HP visited the institute on 13 November 2021.
- Professor R.C. Sobti, Padam Shree; Former Vice Chancellor Panjab University Chandigarh and Former Vice Chancellor Central University, Lucknow visited HFRI, Shimla from 13 to 15 November 2021.
- Dr. Ashwani Kumar Sharma, I.A.S., Special Secretary, Department of Health and Family Welfare, Government of Himachal Pradesh visited the institute on 20 December 2021.

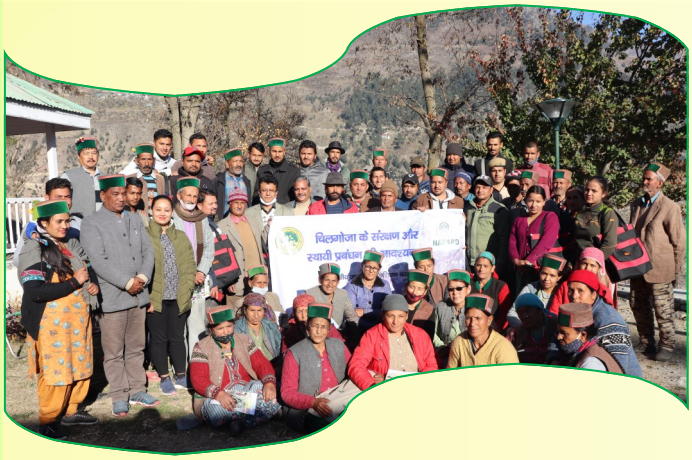
STAFF NEWS – APPOINTMENT/PROMOTION/REPATRIATION ETC.

- **Ms. Neha Thakur joined as Technical Assistant on 14th September, 2021.**
- **Shri Ugrasain, Shri Ankush Kumar, Shri Vikas, Shri Ashish Ranjan and Shri Shubham Malviya joined as Forest Guards, Shri Rohtash joined as MTS in the month of October 2021.**
- **On his transfer to FRI, Dehradun, Shri Roshan Singh, MTS has been relieved on 31 October 2021.**

ABOUT HFRI

Himalayan Forest Research Institute (HFRI) was initially established as High Altitude Conifer regeneration Centre in May 1977 and upgraded as Himalayan Forest Research Institute (HFRI) in 1998. The Institute has been declared as "Centre of Advanced Studies for Cold Desert Afforestation and Pasture Management" by ICFRE with the National mandate of eco-restoration of cold deserts. The mandate of the Institute is to undertake research on natural regeneration of coniferous and broad - leaved species; assess the populations of threated, endemic and economically important species and develop Ecological Niche Model; standardize cost effective nursery techniques of various coniferous and broadleaved species; identify quality seed sources and planting material of various species and establish seed orchards; study ecological aspects of stress sites and cold deserts and work out models for their eco-rehabilitation; study diseases and insect pests of important tree species and suggest their control measures; assess conservation status of important non-wood forest products in the region and standardize their cultivation techniques; develop suitable agro-forestry models for various zones of Himachal Pradesh state and J&K and Ladakh Union Territories; demonstrate the technologies in the Field Research Stations and educate the stakeholders; and build capacities of stakeholders and disseminate research findings to them.

The Institute has well developed infrastructure of laboratories, library, herbarium at its main campus and nurseries and experimental field areas of conducting research and training programmes in the state of Himachal Pradesh and Union Territories of Jammu & Kashmir and Ladakh. The faculty for imparting training by the institute consists of highly qualified, experienced, skilled professionals and researchers. The Institute has about 155 staff including Contractual and Research Staff at present, which is headed by a Director, who is assisted by one Conservator of Forests, two Deputy Conservator of Forests and a team of 11 Scientists having expertise in the field of Ecology, Biodiversity Conservation. Silviculture, Forest Genetics, Medicinal Plants, Forest Protection and Agro-forestry & Extension, and supported by the Technical Staff. Research Coordination Division, coordinates the research activities of these research divisions under the guidance of Director of the Institute. The Institute has four Van Vigyan Kendras, Six Field Research Stations and Two Demo villages.



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