

National Program for
Conservation and Development of Forest Genetic Resources

Pilot Project

On

Creation of Centre of Excellence on Forest Genetic Resources (FGR) of India (CoEFGR)

Funded under

National CAMPA Fund

Ministry of Environment, Forest & Climate Change, Govt. of India
(2016-2022)



BRIEF
PROGRESS



Submitted by



Forest Research Institute (FRI),
New Forest P.O., Dehradun 248 006



BRIEF PROGRESS

Title of the Project:	National Program for Conservation and Development of Forest Genetic Resources : Pilot project on 'Creation of Centre of Excellence on Forest Genetic Resources (CoFGR)' at FRI Dehradun
Funding Agency:	National CAMPA Fund Ministry of Environment, Forest & Climate Change, Govt. of India
Project Period:	6 years (2016 to 2022)
Executing Agency:	FRI Dehradun

Key Highlights

1. The Herbarium of the Forest Research Institute, Dehra Dun has been renovated and installed with Mobile herbarium compactors for the better access and long-term safeguard of specimens.
2. A herbarium FGR database developed.
3. FRI herbarium digitized. The herbarium database has been hosted through a web portal and the online access has been provided to the users.
4. Documented the FGR diversity, population structure, threat and regeneration status of 250 FGR species of Uttarakhand.
5. Identified RET species of Uttarakhand with their GPS locations.
6. Eco-distribution maps of 50 priority FGR species developed using GIS and remote sensing tools.
7. Forest Research Institute, Dehradun and National Bureau of Plant Genetic Resources, New Delhi signed Memorandum of Agreement (MoA) for long-term conservation of Forest seed germplasm in their Seed Bank.
8. The processed, viability determined, well desiccated seeds up to safe moisture level of 100 forestry species deposited in the Gene bank of NBPGR at -18⁰C along with passport details for *ex-situ* conservation.



9. *In vitro* regeneration protocols developed for ten FGR species of high conservation concern in order to achieve whole plant regeneration as well as medium term storage.
10. Protocols for storage of FGR germplasm in the form of 'pollens' for the species of high conservation concern of ten targeted species developed.
11. Analysis and spatial distribution of genetic diversity, identification of genetic diversity hotspots of 5 FGR species completed for conservation and development of in-situ forest field gene banks.
12. Diseased survey in selected forest species and their populations completed in Uttarakhand region.
13. Biochemical characterization of five species in various population lines has been carried out with respect to the Total Flavonoid Contents (TFCs), Total Phenolics Content (TPCs), Tri-Terpenoid Content (TTCs).
14. Propagation techniques standardized for five economically important species having high conservation concern and starting material developed for ten FGR species.
15. The ex-situ field gene banks of six prioritized species established and in-situ Gene banks designated in five species.
16. Proposal for the notification of Centre of Excellence on Forest Genetic Resources at FRI submitted to MoEF&CC.
17. The outcome of the project shared with the Uttarakhand Forest Department through experience sharing workshop.



Summary

Background Information

Forest Genetic Resources (FGRs) constitute a very important sub-set of biodiversity. Conserving FGR is vital, as they are unique and irreplaceable resources for the future. In India alone, more than 340 million people are estimated to be dependent upon the FGRs for their livelihoods. There is a definite need to address the FGR related issues through a comprehensive FGR conservation and development strategy and implementation plan.

As per present state of knowledge, 18,236 higher plant species (18,159 Angiosperms and 77 Gymnosperms) documented from India so far (*BSI, 2015: Plant Discoveries 2014*). More than 80% of this higher plant diversity is contained in the forest habitats ($\approx 14,500$ species). About half of this forest plant diversity constitutes FGRs ($\approx 7,250$ species), the remaining being herbaceous flora including soft climbers, twiners, herbs, and grasses. FGRs contain a huge potential in ensuring food and health security of the country's burgeoning human population and its livestock.

To generate understanding and knowledge on FGR, and to develop and strengthen in situ and ex situ FGR conservation programmes, the National CAMPA Advisory Council (NCAC) of Ministry of Environment, Forests & Climate Change, Govt. of India has sanctioned a pilot project entitled "National Program for Conservation and Development of Forest Genetic Resources: Pilot Project to be implemented at FRI on Creation of Centre of Excellence on Forest Genetic Resources (CoFGR)".

The activities of the projects are being executed through four Working Groups created within the strength of FRI viz. FGR Documentation, FGR Seed and Germplasm Storage, FGR Characterization and FGR Conservation. The progress made under these working groups in last one year is summarized here under:

A. FGR Documentation

1. Upgradation of DD Herbarium

Herbarium of the Forest Research Institute, Dehra Dun which is internationally known as Dehra Dun Herbarium (DD) houses approximately 3,30,000 specimens, the oldest collection dates back to 1807. The system of classification of plant specimens followed is that of Bentham & Hooker. Besides collections from the Indian region,



Herbarium contains specimens from all over the world. To safeguard and expend this valuable genetic resource and for its better access, modernization of herbarium was executed during the year 2016 and 2017 under the CAMPA grant. The DD herbarium building has been renovated through expert's consultation. Mobile herbarium compactors have been procured and installed in the herbarium building for the better access and long-term safeguard of specimens. A total facelift to the existing herbarium has been given. Dicotyledonous floral specimens following the Bentham & Hooker classification has been initiated.



A view of New Herbarium hall with state of art Compactors after furnish



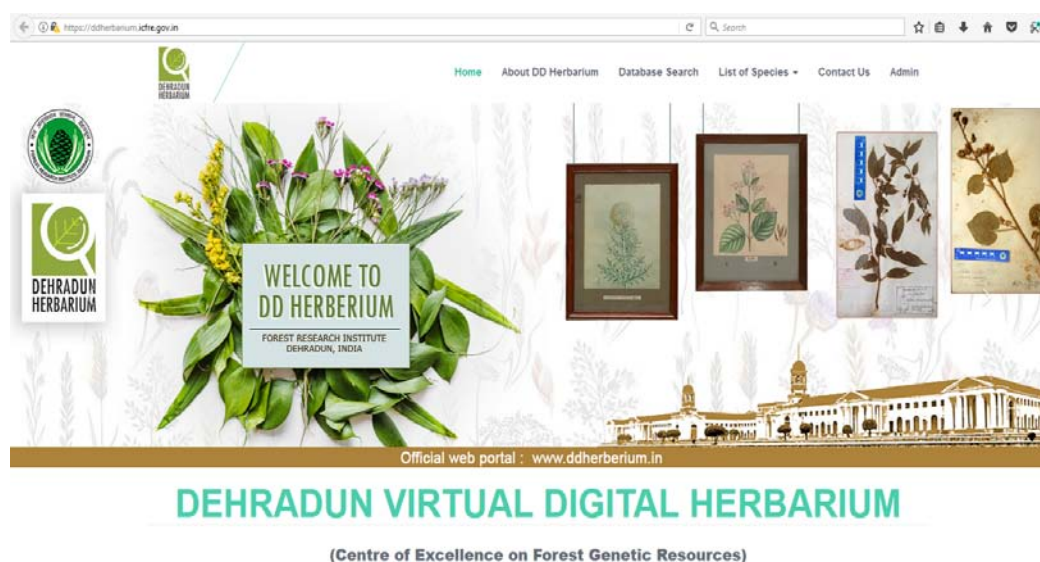
Shifting of Herbarium specimens



2. Digitization of DD herbarium

Being the second largest herbarium of the country, the collection offers a unique insight into the flora of the Indian subcontinent. To make the herbarium data available to taxonomists worldwide, an urgent need for digitizing and developing a database was felt. Accordingly a herbarium database was developed during 2008-2009 with the digitization of one specimen/species. Under the CAMPA funded Co-FGR project, further expansion of DD Herbarium digital database has been undertaken. As per the expert panel review, it was suggested that one specimen/species may not be sufficient to cover all the morpho-variations associated with the species distribution range. Thus, the current project activity envisages digitizing additional two specimen/species (67974 specimens) so as to purge the associated apprehensions. Having this information available through the web once the project gets completed, shall definitely obviate the need to borrow DD specimens or travel to examine them as the information will be accessible for ready reference to a national / international audience more quickly, with less expense and without causing potential damage to preserved materials.

Hence, a herbarium FGR database was developed. The task of the digitization of 67974 specimens has been completed. The herbarium database has been hoisted through a web portal and the online access has been provided to the users. At present the database has record of 1,02,000 specimens belonging to 39,916 species of flowering plants representing approximately 1/3rd of total Herbarium collection.

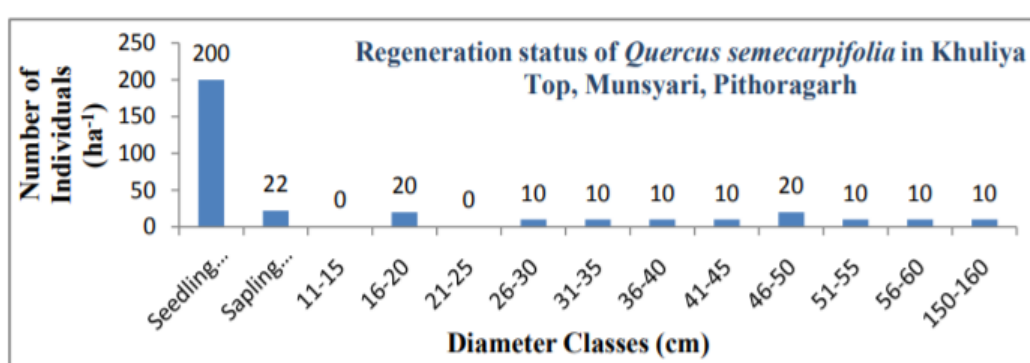
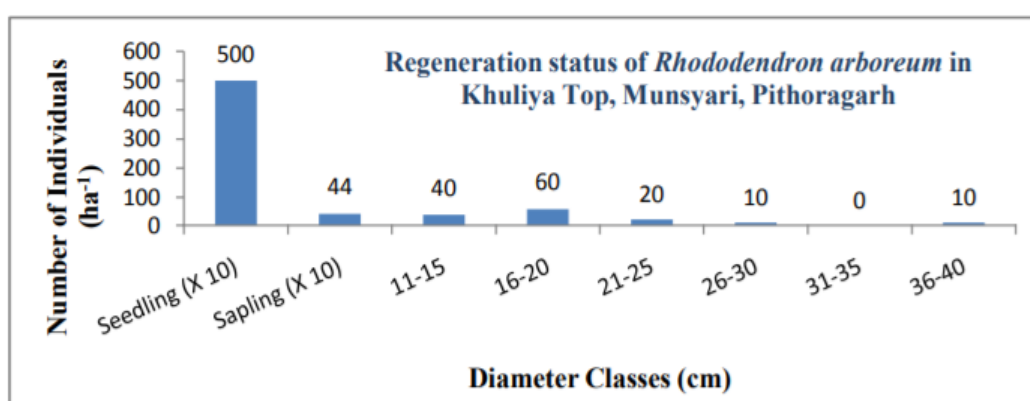


Screen shot of the Dehradun virtual Digital Herbarium Database



3. Documentation of FGR diversity : Target 250 species

A list of 250 priority species (141- tree species, 27 shrubs, 15 lianas/woody climbers and 68 RET species) has been prepared for Uttarakhand (Annexure I). Out of which 50 species have been selected for the preparation of eco-distribution maps. In order to document the FGR diversity, record population size and assess regeneration status of different FGR species in Uttarakhand; distribution of 250 species has been traced from DD Herbarium, BSI Herbarium (Northern Circle), working plans and records from the literature. For ground verification, field surveys of all 250 species in all 44 forest divisions of Uttarakhand has been carried out to check the present status of presence of key species their distribution and regeneration. The GPS coordinates of the selected species and their populations has been recorded and the population structure and regeneration status of the species in various forest areas has been worked out.





Exploration and collection of field data from Champawat Forest Division

4. Development of potential Eco-distribution maps: Target 50 sp.

Eco-geographical mapping of forest tree species is important aspects of germplasm conservation program as the conservation efforts are best aided by vegetation and land use maps. This is particularly important for those species which are co-dominant in occurrence, have sparse distribution and are under some kind of threat. For development of eco-distribution maps of important FGR species, mapping methodology has been developed. The methodology was tested in the Mohand and Sukhblock of Chilllawalii Range, Rajaji National Park, Dehradun (Uttarakhand). The estimation was quite similar to the FSI Forest Type Report (Satellite Image LISS III used) and working plan for Rajaji National Park, indicating the reliability and accurateness of the developed methodology. At present, 50 FGRs species of Uttarakhand has (Annexure II) been mapped through RS and GIS based tools and the targets has been achieved. Some of the important species being mapped are *Betula utilis*, *Quercus semecarpifolia*, *Rhododendron arboreum*, *Taxus wallichiana*, *Myrica esculenta*, *Diploknema butyraceae* etc.



Myrica esculenta



Rhododendron arboreum

Fig. Potential Eco-Distribution map of *Myrica esculenta* and *Rhododendron arboreum*



B. FGR Seed and Germplasm Storage : Target 100 species

It was intended to collect seeds of 100 important FGR species (Annexure III) and their populations under this project for their long term storage and conservation. A list of prioritized FGR species of Uttarakhand district was prepared based on the socio- economic, ecological status of forestry species. The list contains Rare, Endangered, and Threatened (RET) species; fuelwood, food and fodder species; economically and ecologically important species.

1. Collaboration with NBPGR, New Delhi in germplasm conservation

- Memorandum of Agreement (MoA) signed between Forest Research Institute, Dehradun and National Bureau of Plant Genetic Resources, New Delhi regarding long-term conservation of seed germplasm of FGRs at -18°C in their Seed Bank.
- As per the request of FRI, National Bureau of Plant Genetic Resources (NBPGR) New Delhi organised a training course on “Techniques for Conservation of Plant Genetic Resources” from 27th June to 2nd July, 2016. Ten Scientists and research personnel working in various components of CoFGR-CAMPA project, participated in the training.



Training of FRI Scientists at NBPGR New Delhi



Signing MoA between FRI and NBPGR New Delhi

2. Survey of populations for seed collection

- Reconnaissance survey of FGR species conducted and information about their phenology, various morphological parameters of trees like height, crown size, fruit maturity were recorded. Populations of prioritized species were identified and geo-referenced for fruit/seed collection (passport data generated). Fruits/Seeds of FGR species were collected based on their maturity indices. Presently, seeds of 100 species have been collected and processed according to the standard procedures suitable for FGR conservation.
- Seeds of the collected species were cleaned and processed, initial viability determined, carefully desiccated to safe moisture content levels (using desiccant/cool air seed dryer) then stored in air-tight containers at 5⁰C. Quarterly the viability of seeds being monitored.
- Currently seeds of 100 forestry species have been processed for long-term conservation in consultation with team of scientists from NBPGR.



Seed collection of Alnus nepalensis



Seed collection of Berberis vulgaris



Aristolochia elegans



Bischofia javanica



Pinus wallichiana



Pyrus paschia



Dalbergia sissoo



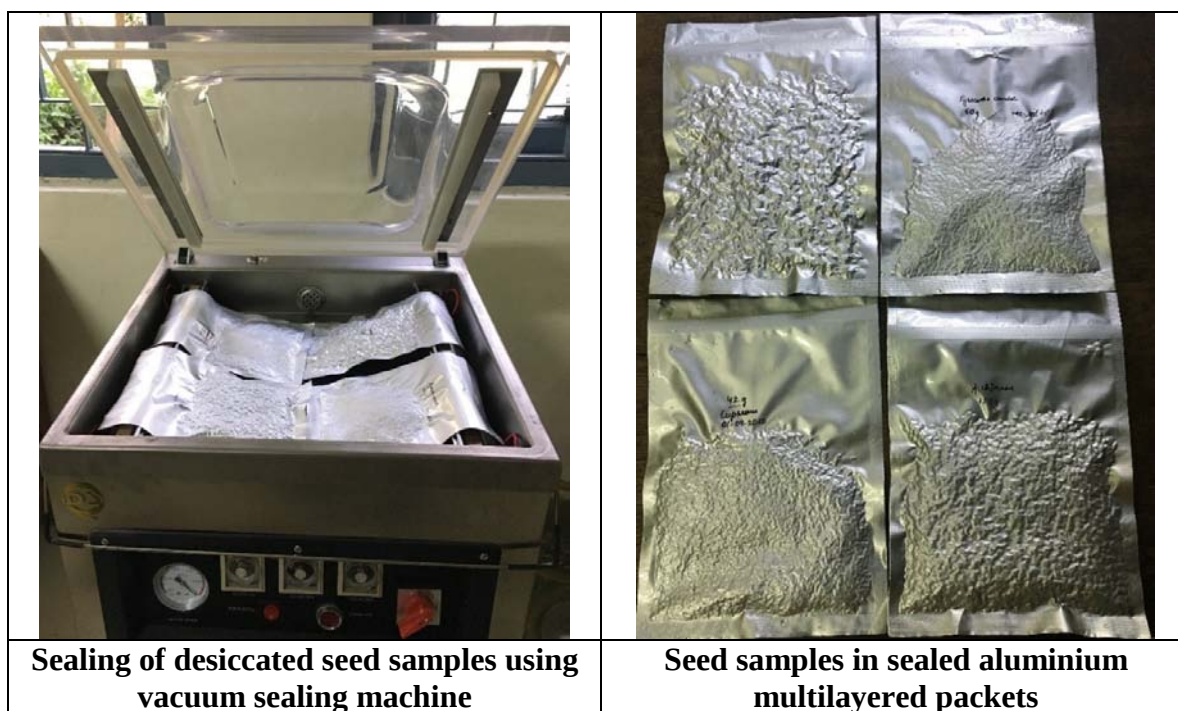
Acacia catechu

Seed Germination Test of FGR species



3. FGR species deposited at NBPGR Seed bank, New Delhi, for long-term conservation

The processed, viability determined seeds of 100 forestry species were desiccated up to safe moisture level and deposited in the Gene bank of ICAR-NBPGR at -18°C along with passport details for *ex-situ* conservation of seed germplasm.



4. *In-vitro* storage of FGR species Target 10 species

In vitro storage in the form of slow growing and/or cryopreserved cultures is one of the ways of conserving valuable germplasm in medium and long term, respectively.

This objective can be fulfilled once the protocols for whole plant regeneration from these stored cultures i.e. callus, shoot tips, slow growing shoot cultures etc is developed. With an aim to conserve Forest Genetic Resources (FGRs) of very high conservation concern or those having recalcitrant seeds or both, *in vitro* regeneration protocols have been developed for ten species in order to achieve whole plant regeneration as well as medium term storage.

Species : *Desmodium oojeinense*, *Taxus contorta*, *Hippophae salicifolia*, *Albizia julibrisin*, *Aristolochia punjabensis*, *Oroxylum indicum*, *Hymenodictyon orisense*, *Dysoxylum gotadhora*, *Catamixis baccharoides*, *Rhus parviflora*, *Butea pellita*.

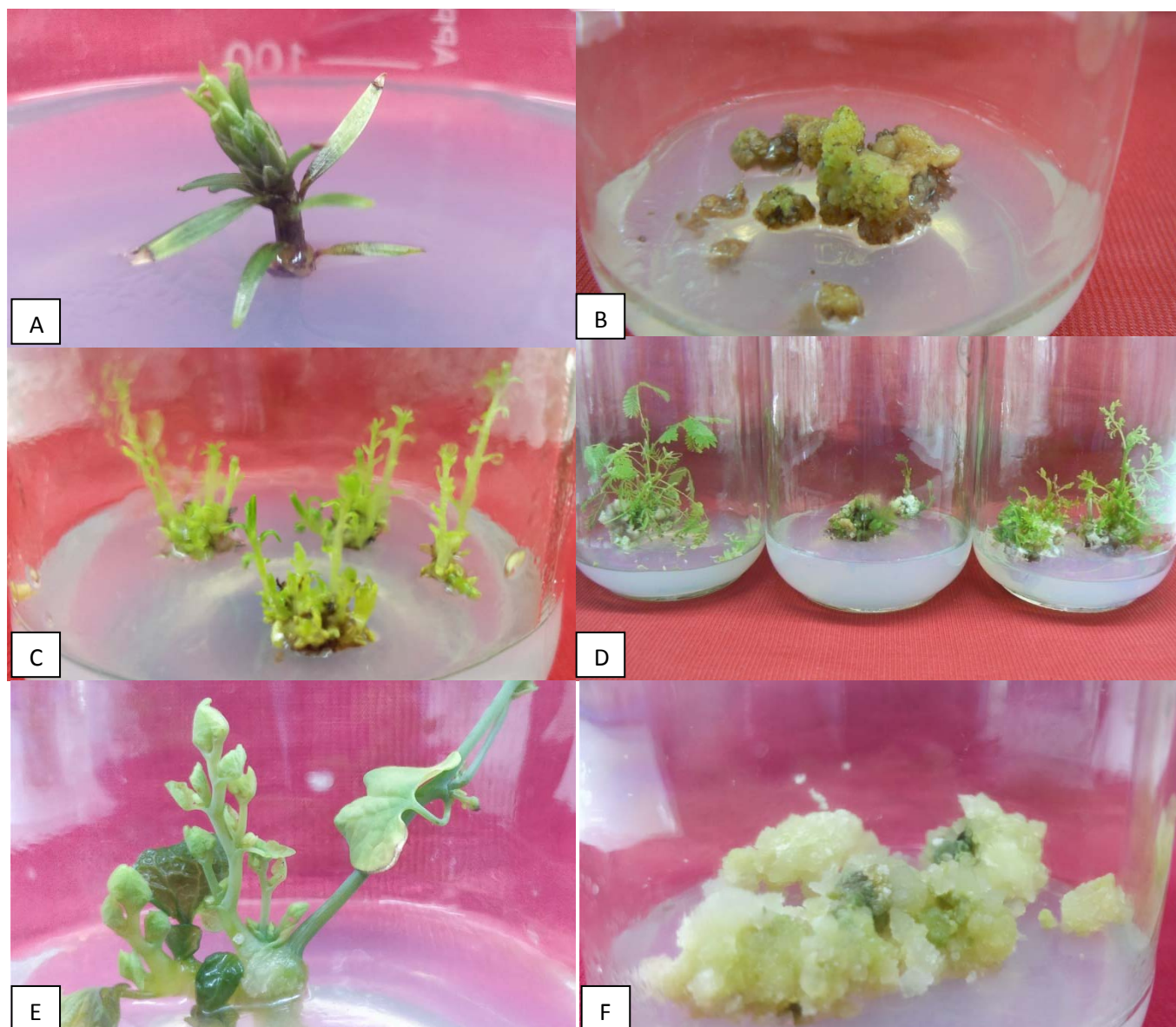


Fig. A- *In vitro* shoot elongation in *T. contorta*, B- Callus regrowth in *D. oojeinense*, C- proliferation of *in vitro* cultures in *H. salicifolia*, D- proliferation of *in vitro* cultures in *A. julibrisin*, E- proliferation of *in vitro* cultures in *A. punjabensis*, F- Callus culture in *P. eriocarpum*.

5. Pollen Storage of Species of High Conservation Concern

Target 10 species

Protocols for storage of FGR germplasm in the form of 'pollens' for the species of high conservation concern of ten targeted species has been developed.

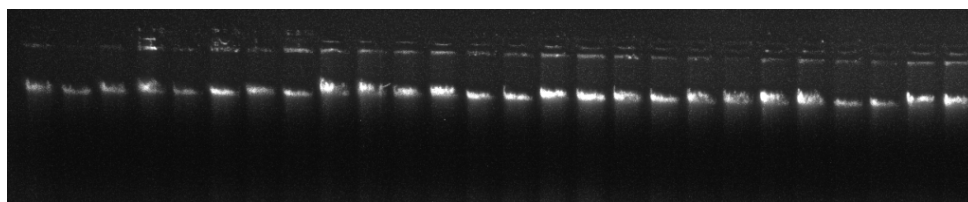
Species : The pollens of *Heteropanax fragrans*, *Oroxylum indicum*, *Diploknema butyraceae* and *Sterculia colorata*, *Butea peltata*, *Rauwolfia serpentina*, *Crateva adansonii*, *Alstonia scholaris*, *Mahonia jaunsarensis*, *Sapium insigne*, *Buxus wallichiana* and *Sophora mollis*.



C. FGR Characterization Target 5 species

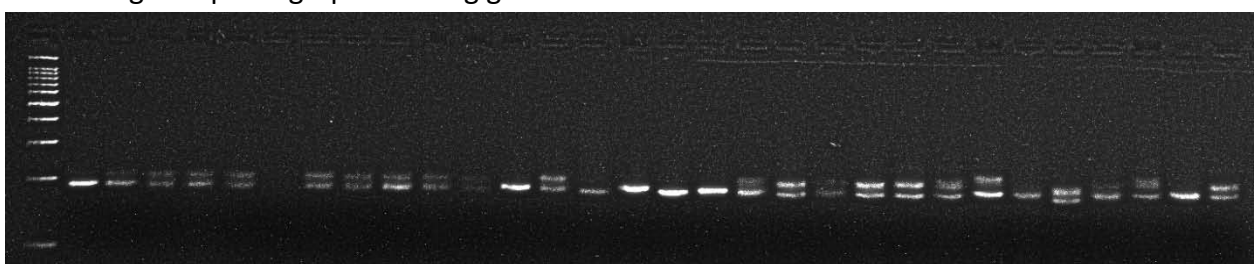
Genetic diversity of forest trees plays a major role in the sensitivity, stability and dynamics of forest ecosystems, and it is one of the most important determinants in conferring adaptive potential to populations or a species. A better understanding of the diversity of a species is crucial for its sustainable use and conservation. Five species viz. *Rhododendron arboreum* (Burans), *Taxus wallichiana* (Thuner), *Quercus semecarpifolia* (Kharsu), *Betula utilis* (Bhojpatra) and *Myrica esculenta* (Kafal) were prioritized for molecular characterization and genetic diversity estimation.

Extensive survey and sampling work has been carried out in Uttarakhand hills for the selected species. Samples of the selected species have been collected from their natural zone of occurrence and stored at -80°C. A total of 30-35 samples/trees were collected from each population in all the species. The samples of these populations were segregated for chemical examination and DNA fingerprinting. Genotyping of the extracted DNA of the various populations carried out using robust polymorphic SSR markers.

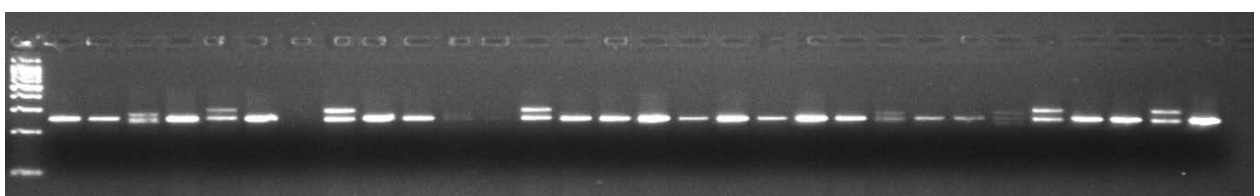


Rhododendron arboreum

Fig. Gel photograph showing genomic DNA isolated from *R. arboreum*



PCR profile of *R. arboreum* genotypes using SSR primer R460



PCR profile of *Q. semecarpifolia* genotypes using SSR primer CN627959

Fig. SSR genotyping of samples



- a) Genetic diversity analysis completed in all five targeted species viz. *Rhododendron arboreum* (Burans), *Taxus wallichiana* (Thuner), *Quercus semecarpifolia* (Kharsu oak), *Betula utilis* (Bhojpatra) and *Myrica esculenta* (Kafal). Spatial distribution of genetic diversity, in the range of distribution of the species and genetic diversity hotspots worked out for conservation and development of in-situ forest field gene banks. Multidisciplinary approach combining nuclear microsatellite DNA based analysis of populations of various species and the Geographic Information Systems (GIS) based tools were used for the spatially interpretation of the genetic characteristics. To develop the diversity maps or grid-based genetic distance models, genetic parameters of geo-referenced samples were used for interpolation. GIS based spatial analysis was used to develop conservation strategies and better visualization and interpretation of the genetic parameter. The brief outcomes/ key messages are hereunder :
- i) In general high genetic diversity and allelic richness has been recorded in all the five species viz. *Q. semecarpefolia*, *T. wallichiana*, *B. utilis*, *M. esculenta* and *R. arboreum* in Himalayan range. This is a good sign for their fitness and adaptive potential and need to be maintained in future.
 - ii) Significant genetic structuring was detected in the populations of *Q. semecarpefolia*, *B. utilis*, and *R. arboreum*, and therefore, conserving any random population will not serve the conservation purpose. The diverse populations may be identified in each genetic cluster.
 - iii) High inbreeding was detected in *T. wallichiana*, *Q. semecarpifolia*, populations that could have been arisen from the mating between related individuals. Augmented gene flow from genetically diverse and distinct populations needs to be considered as a way of increasing fitness.
 - iv) High priority be given to the populations with higher allelic diversity for conservation programme. By looking on the overall statistics of the genetic data of three high altitude species (*B. utilis*, *Q. semecarpefolia*, and *T. wallichiana*), the populations present in Pithoragarh forest division (particularly DarmaValley and Narayan Ashram Forest in Dharchula range) came up as most important reservoir of allelic diversity, and could be considered at top priority in conservation programme.
 - v) The diversity hotspots could be recommended here could be prioritized for their conservation either through in situ or ex situ means. In order to



make their best possible use, it will be important to harvest any available seed from these populations for growing the plantations, establishment of *ex-situ* field gene banks and local seed production areas.

- vi) In order to make best possible use of the high genetic diversity forests, it will be important to establish seed production areas in these forests and the seed from such areas should be used for plantations and infusing diversity in less diversity populations.

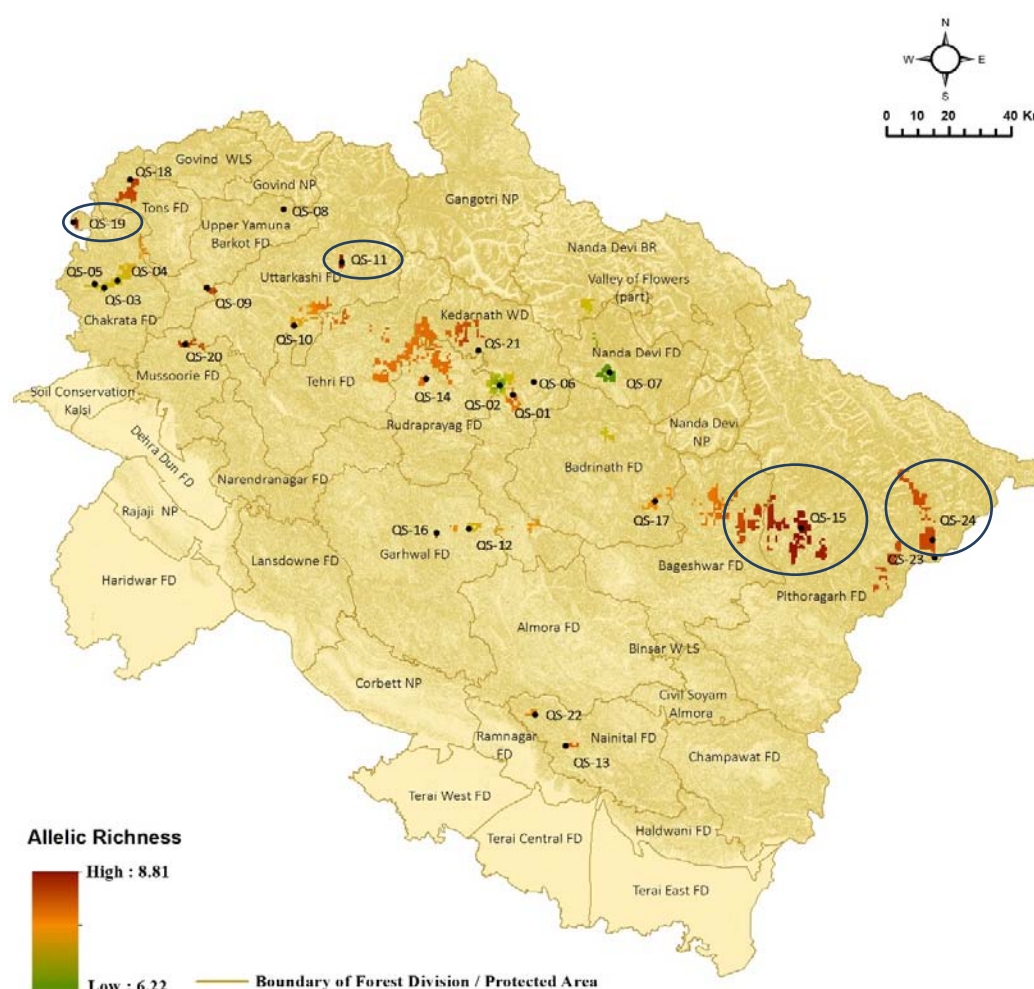


Fig. Spatial distribution of Allelic Richness (Rs) among Sampled Populations of *Q. semecarpifolia* for identification of diversity hotspots for conservation and development of in-situ field gene banks/gene conservation areas.

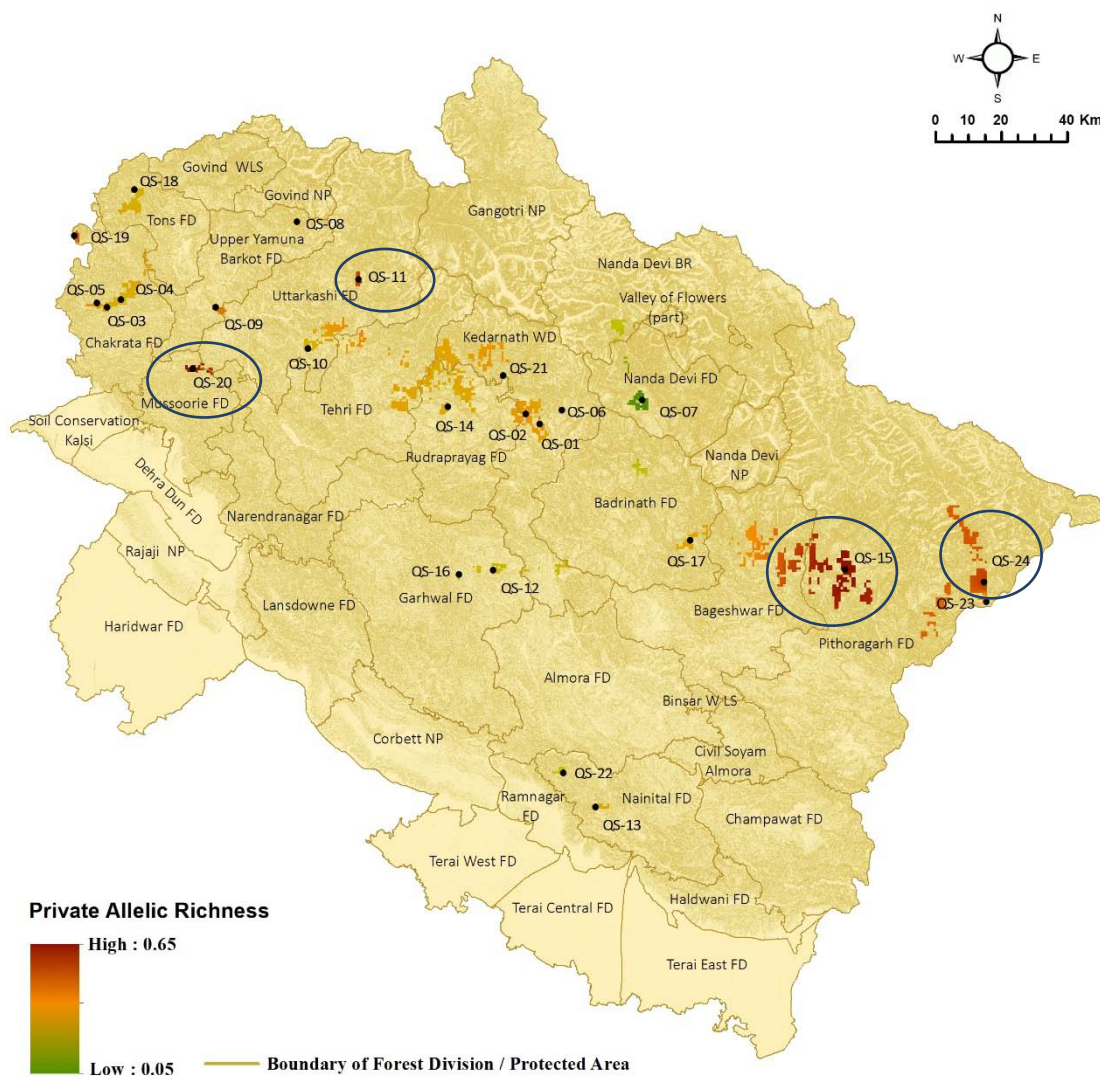


Fig. Spatial Distribution of Private allelic richness (PRs) among sampled populations of *Q. semecarpifolia*

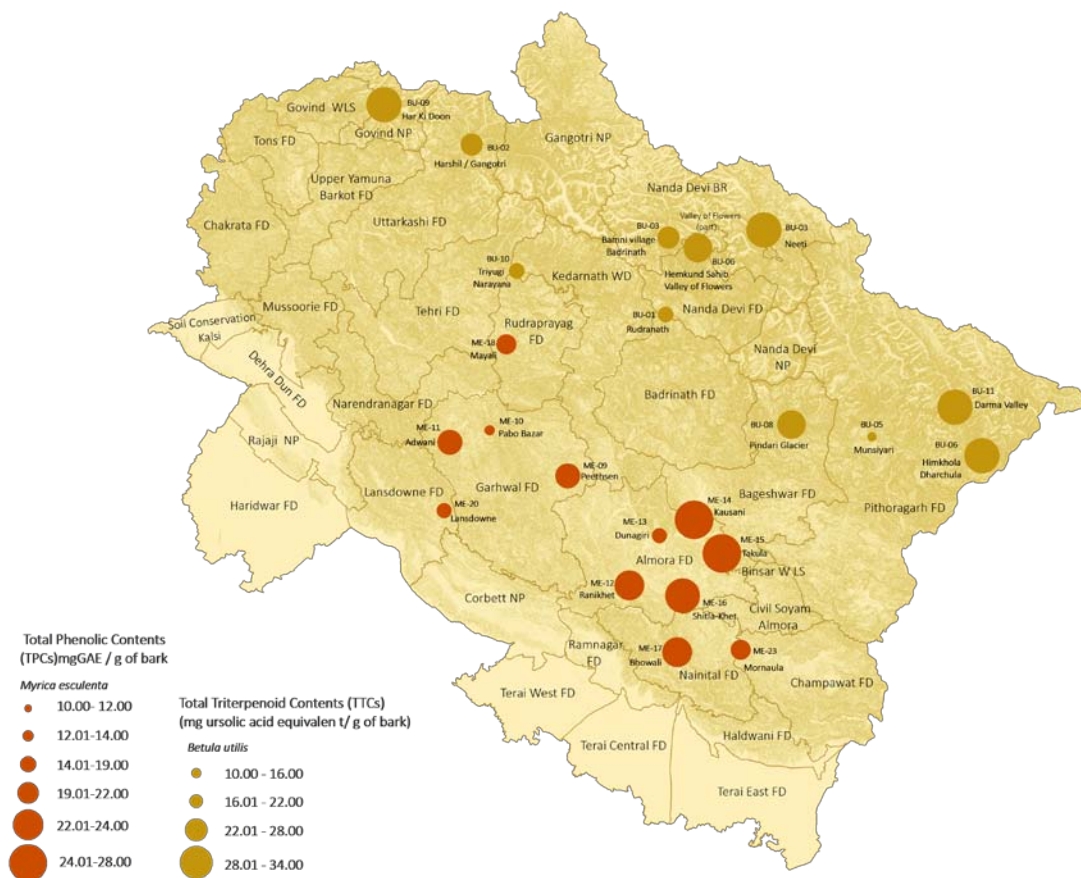
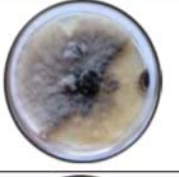
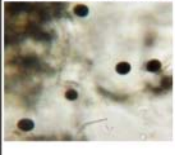
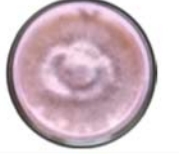
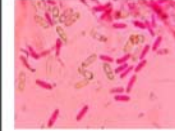
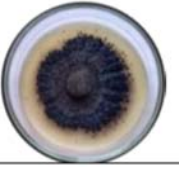
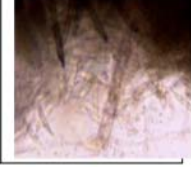


Fig. Variation in Total Triterpenoid (TTCs) content in populations of *Betula utilis* and Total Phenolic content in populations of *Myrica esculenta*

- Diseased survey in selected species and their populations completed in Uttarakhand region. Isolation and identification of the fungal entity and pure fungal cultures were maintained in fungal repository of FRI.
- Biochemical characterization of the selected species in various population lines has been carried out with respect to the Total Flavonoid Contents (TFCs), Total Phenolics Content (TPCs), Tri-Terpenoid Content (TTCs).



Species	Disease symptoms (Causal fungus)	Fungal morphology (culture and spores)	
RA (a)	Leaf spot (<i>Alternaria</i>) 		
RA (b)	Leaf blight (<i>Colletotrichum</i>) 		
	Leaf blight (<i>Nigrospora</i>) 		
RA (c)	Leaf blight (<i>Gleosporium</i>) 		
RA (f)	leaf blight (<i>Colletotrichum</i>) 		
RA (g)	leaf spot (<i>Colletotrichum</i>) 		

Diseases in *Rhododendron arboreum*

D. FGR conservation

Five priority species were sort listed for FGR Conservation as per the target of the project. The species are *Cinnamomum tamala*, *Diploknema butyracea*, *Rhododendron arboreum*, *Myrica esculanta* and *Taxus wallichiana*. Information on distribution and status of prioritized species has been extracted through the existing records. Preliminary survey of the selected species for conservation has been for the identification of the source populations for the conservation works.

1. Develop propagation techniques

Propagation techniques have been standardized for *Rhododendraon arboreum*, *Diploknema butyracea*, *Cinnamomum tamala* and *Taxus wallichiana*. Germplasm of these species collected from different populations and propagated in the nursery. Air



layering has also proved effective in *Cinnamomum tamala* and *Diploknema butyracea* for their propagation. The source populations were propagated through the standardized methods for the establishment of field gene banks.



Fig. Propagation of *Diploknema butyracea* through seeds as well as cuttings has been standardised



Cinnamomum tamala

Taxus wallichiana

Fig. Successful air layering in *Cinnamomum tamala*, successful rooting in cutting of *Taxus wallichiana*



2. Establishment of Field Gene banks Target 10 species

Field gene bank is one of the techniques in the strategy for plant genetic conservation. Field genebanks are the areas where the germplasm of some valuable species is kept in protected places that may be a necessary for conservation strategy for some species. These live plants undergo continuous growth and require continuous maintenance. Field gene banks provide an easy and ready access to the plant genetic resources, for characterization, evaluation or utilization. The *ex-situ* field gene banks of six prioritized species viz. *Diploknema butyracea*, *Cinnamomum tamala*, *Myrica esculenta*, *Taxus wallichiana*, *Rhododendron arboreum*, and *Toona ciliata* has been established at different sites where the land was provided by Uttarakhand Forest Department.

Species	Locations (where established)	Geo-Coordinates	Seed Sources included
<i>Diploknema butyracea</i>	Kali Kumayoun Range, Champawat Forest Division, Uttarakhand	N 29°29'40.4" E 080°05'49.8" Alt.:1098 m	1. Champawat 2. Pithoragarh 3. FRI Dehradun 4. Almora
<i>Rhododendron arboreum</i>	Devidhura Forest Range, Chanpawat Forest Division, Uttarakhand	N 29°26'50.3" E 079°46'57.0" Alt: 2161m	1. Pauri 2. Tehri 3. Uttarkashi 4. Chakrata (Kalsi)
<i>Myrica esculenta</i>	Bhowali Forest Range, Nainital Forest Division, Uttarakhand	N29°23'25.1" E 079°27'40.7" Alt: 1564 m	1. Pithauragarh 2. Champawat 3. Pauri
<i>Cinnamomum tamala</i>	Nalena-II Forest Range, Nainital Forest Division, Uttarakhand	N 29°21'27.0" E 079°27'25.1" Alt: 1700 m	1. Nainital 2. Pauri 3. Pithauragarh 4. Tehri
<i>Taxus wallichiana</i>	Malari Beat, Joshimath Forest Range, Nanda Devi National Park Forest Division, Uttarakhand	N 30°40'42.1" E 079°53'42.6" Alt.: 3230 m	1. Chakrata, (Kalsi) 2. Chamoli, 3. Uttakashi, 4. Auli
<i>Toona ciliata</i>	Village/range Maikhura, Karnpryag, Karnpryag Forest Division, Dist Chamoli, Uttarakhand	N30°15'52.1" E 079°16'10.0" Alt : 1767 m	Germplasm of 23 selected mother trees

In-situ field gene banks or Gene Conservation Areas (GCAs) of five species have been identified in 28 locations in the existing forest areas based on genetic diversity parameters.



In-situ Field Gene banks

In-situ field gene banks or gene conservation areas are of particular relevance in the conservation of genetic resources of long-lived forest tree species. They could potentially be very useful in incorporating the genes or gene pools from threatened, endangered and fragmented populations. In the case for forest trees that are either endangered or threatened and for species with recalcitrant seeds, *ex situ* gardens cannot accommodate large populations of tree species and consequently their genetic base is narrow. The forest gene bank is an *in situ* site that serves as a repository of genes from as many diverse populations of a species.

A primary requirement in the establishment of *In-situ* field gene banks is to identify the spatial distribution of the species and then to identify where populations of the species are reasonably large. The genetic diversity of the populations needs to be determined and the hot-spots of genetic diversity identified. Further, based on the genetic diversity parameters, assessment needs to be made on the genetic differentiation of the populations to identify those that might constitute candidates for the conservation of genetic resources. The *in-situ* Gene Banks have been identified in the following species based on the genetic diversity estimates and the allelic richness.

i) *Quercus semecarpifolia* (Kharsu oak)

The gene pool in particular the populations from the Dharchula forest area and Tiuni forest area (Chakrata) had highest level of genetic diversity, allelic richness and maximum proportion of private alleles. On the contrary, populations from other administrative regions lacked these features. Thus, *Q. semecarpifolia* genetic resources in the following forest regions should be maintained by *in situ* conservation and could be considered at top priority in conservation programme. It is also one of the areas with the highest risk of allele loss because of the high observed levels of inbreeding, compared to other parts of the study area. The following seven areas can be designated as Forest Gene banks for Kharsu oak.

Sr. No.	Location	Comp.	Beat	Range	Forest division	Latitude (⁰ N)	Longitude (⁰ E)	Altitude (m)
1	Raditop (QS09)	4	Tiyan	Mugarsanti	Upper Yamuna Barkot	30°45'19.506"	78°12'33.297"	2685
2	Bhukkitop (QS11)	5c	Bhukki-I	Taknaur	Gangotri	30°50'28.44"	78°39'37.446"	2802
3	Munsiyari (QS15)	3	Khalia	Munsiyari	Pithoragarh	30°3'49.737"	80°12'37.377"	3063
4	Mundhola (QS19)	9	Punal	Deoghar	Chakrata	30°56'27.297"	77°45'20.5"	2708
5	Pinswar (QS21)	4	Kalishila	Ukhimath	Kedarnath WLS	30°35'8.207"	79°7'26.856"	1963



6	Narayan Ashram (QS23)	NF	NF	Dharchula	Pithoragarh	29°58'40.157"	80°39'21.017"	2794
7	Himkhola (QS24)	6	Hiragomri First	Dharchula	Pithoragarh	30°1'53.058"	80°38'51.742"	3007

ii) *Myrica esculenta* (Kafal)

The hotspots of allelic richness and private alleles are centered in Takula (Almora), Shitla-Khet (Almora), Bhowali (Nainital) and Sandev, Didihat (Pithoragarh) forest areas, the eastern region of Uttarakhand. Therefore, entire region could be considered as genetically diverse zone for future conservation programs. One population of Garhwal region i.e. Mayali village, South Jakholi (Rudraprayag) areas also depicted good allele richness. Hence these populations with the highest allele richness can be given a top priority for conservation and can be designated as Forest Gene Banks.

Sr. No.	Location	Comp.	Beat	Range	Forest division	Latitude (°N)	Longitude (°E)	Altitude (m)
1	Sandev (ME08)	5c	Sandev	Didihat	Pithoragarh	29°48'57.799"	80°13'5.425"	1703
2	Takula (ME15)	NF	NF	Almora	Almora	29°43'56.44"	79°41'52.471"	1442
3	Shitla-khet (ME16)	NF	NF	Almora	Almora	29°35'44.4"	79°33'18.255"	1612
4	Bhowali (ME17)	7a	Ninglat-II	Bhowali	Nainital	29°24'53.845"	79°32'18.664"	2022
5	Mayali (ME18)	-	Mayali village	South Jakholi	Rudraprayag	30°23'24.824"	78°53'38.075"	1716

iii) *Taxus wallichiana* (Thuner)

The hotspots of allelic richness and genetic diversity in Thuner are centered in Hari ki Doon (Govind Wildlife Sanctuary), and Darma valley & Himkhola area of Dharchula range (Pithoragarh Forest Division). Besides, Mundhola (Chakrata Forest Division) & Mornaula (Nainital Forest Division) also bear considerable amount of genetic diversity and allelic richness. Hence these populations can be given a top priority for conservation and can be designated as Forest Gene Banks.

Sr. No.	Location	Comp.	Beat	Range	Forest Division	Latitude (°N)	Longitude (°E)	Altitude (m)
1	Mundhola (TW12)	9	Punal	Deogarh	Chakrata	30°56'27.552"	77°45'16.703"	2710
2	Himkhola (TW15)	6	Hiragomri-I	Dharchula	Pithoragarh	30°1'41.167"	80°38'51.291"	2837
3	Mornaula (TW18)	10a	-	North Gola	Nainital	29°26'27.16"	79°45'52.881"	2191
4	Har ki Dun (TW19)	5	Harki Dun	Har ki Dun	Govind WLS	31°7'40.5"	78°23'42.973"	3363
5	Darma Valley (TW21)	NF	NF	Dharchula	Pithoragarh	30°10'28.928"	80°34'33.564"	2879



iv) ***Betula utilis (Bhojpatra)***

The hotspots of allelic richness and genetic diversity in Bhojpatra are centered in Triyugi Narayan & Rudranath East area of Kedarnath Wildlife Sanctuary, and Darma valley & Himkhola area of Dharchula range (Pithoragarh Forest Division). Hence these two regions (covering four populations) can be given a top priority for conservation and can be designated as Forest Gene Banks.

Sr. No.	Location	Comp.	Beat	Range	Forest division	Latitude (⁰ N)	Longitude (⁰ E)	Altitude (m)
1	Rudranath, Gopeshwar (BU01)	2	Rudranath East	Gopeshwar	Kedarnath Wildlife	30°31'12.327"	79°19'15.268"	3343
2	Himkhola (BU06)	9	Hiragomri-II	Dharchula	Pithoragarh	30°3'3.748"	80°38'59.957"	3675
3	Triyugi Narayan (BU10)	5	Triyugi Narayan-II	Ukhimath	Kedarnath Wildlife	30°37'33.622"	78°55'37.883"	3386
4	Darma Valley (BU11)	NF	NF	Dharchula	Pithoragarh	30°12'19.696"	80°32'59.761"	3133

v) ***Rhododendraon arboreum (Burans)***

The hotspots of allelic richness and genetic diversity in Burans are centered in North Jakholi range (Rudranath Forest Deivision), Dhanaulti area (Narendranagar Forest Division) and Chaurangikhal (Gangotri Forest Division). The highest private allele richness is centered in Chirbatiya (Tehri Forest Division). Besides, Dunagiri (Almora Forest Division), Ghes & Gwaldam area (Badrinath Forest Division) also bear considerable amount of genetic diversity and allelic richness. Hence these populations can be given a top priority for conservation and can be designated as Forest Gene Banks.

Sr. No.	Location	Comp.	Beat	Range	Forest division	Latitude (⁰ N)	Longitude (⁰ E)	Altitude (m)
1	Chaurangi Khal (RA11)	29b	Dhotri-IV	Mukhem	Gangotri	30°38'9.655"	78°29'15.242"	2064
2	Dunagiri (RA16)	NF	NF	Dwarhaat	Almora	29°49'0.844"	79°26'57.411"	2121
3	Chirbatiya (RA18)	7b	Tharti	Bhilangana	Tehri	30°22'55.02"	78°50'7.01"	2050
4	Badhanital (RA19)	6	Badhani	North_Jakholi	Rudraprayag	30°29'40.927"	78°56'46.102"	2454
5	Dhanaulti (RA22)	4	Kaddukhal	Saklana Chamba	Narendranagar	30°24'14.803"	78°18'0.745"	2381
6	Ghes (RA23)	NF	NF	Pindar East	Badrinath	30°8'36.443"	79°43'8.773"	2376
7	Gwaldam (RA24)	6a	Sarkot	Pindar Central	Badrinath	30°1'32.836"	79°34'41.455"	1905



Legend:

- *Betula utilis*
- *Myrica esculenta*
- *Quercus semecarpifolia*
- *Rhododendron arboreum*
- *Taxus wallichiana*

Abbreviations:

- FD - Forest Division
- WD - Wildlife Division
- NP - National Park
- WLS - Wildlife Sanctuary
- TR - Tiger Reserve
- BR - Biosphere Reserve

Fig.: Area that can be designated for *In-situ* conservation through Gene Banks or Gene Conservation Areas (GCAs)



Diploknema butyracea



Myrica esculenta

Established Ex-situ Field Gene Banks

E. Notification for Centre of Excellence

A Centre of Excellence on Forest Genetic Resources (CoE-FGR) was created in FRI in the year 2016 involving the existing strengths of scientists. Proposal for the notification of Centre of Excellence on Forest Genetic Resources already submitted to DIG (RT), MoEF&CC vide letter no. 3-11/ICFRE(R)/RP/FGRMN/ PartII/407 dated 21-07-2020.



ANNEXURE I
FGR SPECIES : EXPLORATION & DOCUMENTATION

Sl. No	Botanical Name	Family	Local/ Common Name	Synonyms
TREES				
1.	<i>Abies pindrow</i> (Royle ex D.Don) Royle,	Coniferae	Morinda, Low level silver Fir	<i>Abies chiloensis</i> Carrière; <i>Abies himalayensis</i> Lavallée; <i>Abies pindrow</i> var. <i>intermedia</i> A.Henry; <i>Abies webbiana</i> var. <i>pindrow</i> (Royle ex D.Don) Brandis; <i>Picea pindrow</i> (Royle ex D.Don) Loudon; <i>Pinus pindrow</i> Royle ex D.Don; <i>Pinus spectabilis</i> var. <i>pindrow</i> (Royle ex D.Don) Voss
2.	<i>Abies spectabilis</i> (D.Don) Mirb.	Coniferae	High level Silver Fir	<i>Abies brevifolia</i> (A.Henry) Dallim.; <i>Abies chilrowensis</i> Parl.; <i>Abies spectabilis</i> (D. Don) Spach; <i>Abies spectabilis</i> var. <i>brevifolia</i> (A.Henry) Rehder; <i>Abies spectabilis</i> subsp. <i>langtangensis</i> (Silba) Silba; <i>Abies spectabilis</i> var. <i>langtangensis</i> Silba; <i>Abies webbiana</i> (Wall. ex D.Don) Lindl.; <i>Abies webbiana</i> var. <i>brevifolia</i> A.Henry; <i>Pinus spectabilis</i> D.Don
3.	<i>Acacia catechu</i> (Linnaeus f.) Willdenow, <i>Sp. Pl.</i> 4: 1079. (1806).	Mimocaceae	Babul, Kikar	<i>Senegalia catechu</i> (L. f.) P. J. H. Hurter & Mabb., Mabblerley's Pl.-Book 1021. 2008; <i>Acacia wallichiana</i> DC.; <i>Mimosa catechu</i> L. f
4.	<i>Acer caesium</i> Wall. ex Brandis	Sapindaceae	Kainju, Bara Kainju, Kainjal	<i>Acer luteolum</i> Borbás
5.	<i>Acer oblongum</i> Wall. ex DC.	Sapindaceae	Pangoi, Paranga, Kirmola, Kirmoli	<i>Acer discolor</i> Hort. ex Rehder, <i>Acer nepalense</i> Hort. ex Pax, <i>Acer oblongifolium</i> Hort. ex Dippel
6.	<i>Acer sterculiaceum</i> Wall.	Sapindaceae	Kainchli, Kabasi, Dudh, Kainju	<i>Acer platanifolium</i> Griff.; <i>Acer sterculiaceum</i> var. <i>tomentosum</i> A.E.Murray; <i>Acer villosum</i> Wall.; <i>Acer villosum</i> f. <i>sterculiaceum</i> (Wall.) Schwerin
7.	<i>Acronychia pedunculata</i> (L.) Miq	Rutaceae		<i>Acronychia apiculata</i> Miq.; <i>Acronychia arborea</i> Blume; <i>Acronychia barberi</i> Gamble; <i>Acronychia elliptica</i> Merr. & L.M.Perry; <i>Acronychia laurifolia</i> Blume
8.	<i>Aegle marmelos</i> (L.) Corrêa	Rutaceae	Bel, Bili, Bael, Vilva	<i>Aegle marmelos</i> var. <i>mahurensis</i> Zate; <i>Belou marmelos</i> (L.) Lyons; <i>Bilacus marmelos</i> (L.) Kuntze; <i>Crateva marmelos</i> L.; <i>Crateva religiosa</i> Ainslie; <i>Feronia pellucida</i> Roth.
9.	<i>Aesculus indica</i> (Wall. ex Camb.) Hook.	Sapindaceae	Pangar, Bankhor, kandur,	<i>Pavia indica</i> Wall. ex Cambess.; <i>Pavia indica</i> Royle; <i>Pawia indica</i> Kuntze
10.	<i>Alangium salviifolium</i> (L.f.) Wangerin	Cornaceae	Akola, Ankora, Bismar	<i>Alangium acuminatum</i> Wight ex Steud. [Invalid]; <i>Alangium decapetalum</i> Lam.; <i>Alangium lamarckii</i> Thwaites; <i>Alangium latifolium</i> Miq. ex C.B.Clark; <i>Alangium mohillae</i> Tul.; <i>Karangolum salviifolium</i> (L.f.) Kuntze



11.	<i>Albizia chinensis</i> (Osbeck) Merrill	Mimocaceae	Siran	<i>Acacia stipulata</i> DC.; <i>Albizia marginata</i> (Lam.) Merr.; <i>Albizia stipulata</i> (DC.) Boivin; <i>Albizia stipulata</i> B.Boivin; <i>Inga purpurascens</i> Hassk.; <i>Mimosa chinensis</i> Osbeck.
12.	<i>Albizia julibrissin</i> Durazzini,	Mimocaceae	Bhondir, Kurmura	<i>Acacia julibrissin</i> (Durazz.) Willd.; <i>Acacia nemu</i> Willd.; <i>Albizia nemu</i> (Willd.) Benth.; <i>Feuillea julibrissin</i> (Durazz.) Kuntze; <i>Mimosa julibrissin</i> (Durazz.) Scop.; <i>Mimosa speciosa</i> Thunb
13.	<i>Albizia lebbbeck</i> (Linnaeus) Benth	Mimocaceae	Kala Siris, Sirsa	<i>Acacia lebbbeck</i> (L.) Willd.; <i>Acacia macrophylla</i> Bunge; <i>Acacia speciosa</i> (Jacq.) Willd.; <i>Albizia latifolia</i> B.Boivin; <i>Albizia lebbbeck</i> var. <i>leucoxylon</i> Hassk.; <i>Mimosa lebbek</i> L.
14.	<i>Albizia odoratissima</i> Benth	Mimocaceae	Kali Siris	<i>Acacia lomatocarpa</i> DC.; <i>Acacia odoratissima</i> (L.f.) Willd.
15.	<i>Albizia procera</i> (Roxb.) Benth.	Mimocaceae	Safed Siris, Karha, Karhai	<i>Acacia procera</i> (Roxb.) Willd.; <i>Acacia procera</i> var. <i>elata</i> (Roxb.) Baker; <i>Acacia procera</i> var. <i>roxburghiana</i> E.Fourn.; <i>Albizia procera</i> var. <i>elata</i> (Roxb.) Baker; <i>Albizia procera</i> var. <i>roxburghiana</i> E.Fourn.; <i>Feuillea procera</i> (Roxb.) Kuntze
16.	<i>Alnus nepalensis</i> D. Don	Cupuliferae	Kunis, Puzala	<i>Alnus boshia</i> Buchanan-Hamilton ex D. Don; <i>Clethropsis nepalensis</i> (D. Don) Spach.
17.	<i>Alnus nitida</i> (Spach) Endl.	Cupuliferae	Uti, Kunis	<i>Clethropsis nitida</i> Spach.
18.	<i>Alstonia scholaris</i> (Linnaeus) R. Brown	Apocynaceae	Saptarni, Satian, Chhatian	<i>Echites scholaris</i> Linnaeus, Mant. Pl. 1: 53. 1767; <i>Pala scholaris</i> (Linnaeus) Roberty.
19.	<i>Anogeissus latifolia</i> (Roxb. ex DC.) Wall. ex Guill. & Perr.	Combretaceae	Bakli, Bankli	<i>Conocarpus latifolius</i> Roxb. ex DC
20.	<i>Azadirachta indica</i> A.Juss	Meliaceae	Nim, Neem	<i>Azadirachta indica</i> var. <i>minor</i> Valetton; <i>Azadirachta indica</i> var. <i>siamensis</i> Valetton; <i>Azadirachta indica</i> subsp. <i>vartakii</i> Kothari, Londhe & N.P.Singh; <i>Melia azadirachta</i> L.; <i>Melia indica</i> (A. Juss.) Brandis
21.	<i>Bauhinia purpurea</i> Linn.	Caesalpinaceae	Guiral, Khairwal, Khairwal papri	
22.	<i>Bauhinia racemosa</i> Lamarck	Caesalpinaceae	Jhinjhora, Jhanjhora	<i>Bauhinia parviflora</i> Vahl; <i>Piliostigma racemosum</i> (Lam-arch) Benth
23.	<i>Bauhinia variegata</i> Linn.	Caesalpinaceae	Kachnar	
24.	<i>Betula alnoides</i> Buch.-Ham. ex D.Don	Cupuliferae	Kath Bhuj	<i>Betula acuminata</i> Wall., <i>Betula cylindrostachya</i> var. <i>pilosa</i> (Regel) Regel; <i>Betula cylindrostachya</i> var. <i>subglabra</i> Regel.
25.	<i>Betula utilis</i> D.Don	Cupuliferae	Bhojpatra, Bhuj	<i>Betula albosinensis</i> var. <i>septentrionalis</i> C.K.Schneid.; <i>Betula bhojpatra</i> Lindl. ex Wall.; <i>Betula bhojpatra</i> var. <i>glandulifera</i> Regel; <i>Betula bhojpatra</i> var. <i>latifolia</i> Regel; <i>Betula castanae</i> Buch.-Ham. ex Hook.f.; <i>Betula utilis</i> var. <i>glandulifera</i> Regel; <i>Betula utilis</i> var. <i>latifolia</i> Regel



26.	<i>Bischofia javanica</i> Blume	Euphorbiaceae	Paniala, Kot Semla, Kaen, Bhillar	<i>Andrachne apetala</i> Roxb. ex Wall.; <i>Andrachne trifoliata</i> Roxb.; <i>Bischofia cummingiana</i> Decne.; <i>Bischofia javanica</i> var. <i>lanceolata</i> Müll.Arg.; <i>Bischofia javanica</i> var. <i>oblongifolia</i> (Decne.) Müll.Arg.; <i>Bischofia javanica</i> var. <i>toui</i> (Decne.) Müll.Arg.
27.	<i>Boehmeria rugulosa</i> Wedd.	Artocarpeae	Genthi, Genti	<i>Boehmeria nervosa</i> Madden [Invalid]; <i>Pouzolzia rugulosa</i> (Wedd.) Acharya & Kravtsova; <i>Ramium rugulosum</i> (Wedd.) Kuntze; <i>Ramium tenue</i> Kuntze.
28.	<i>Bombax ceiba</i> Linn.	Malvaceae	Simal, Semal	<i>Bombax aculeatum</i> L.; <i>Bombax ceiba</i> Burm.f.; <i>Bombax ceiba</i> var. <i>leiocarpum</i> Robyns; <i>Bombax heptaphyllum</i> Cav.; <i>Bombax malabaricum</i> DC.; <i>Bombax thorelii</i> Gagnep.; <i>Bombax tussacii</i> Urb.; <i>Gossampinus malabarica</i> Merr.; <i>Gossampinus rubra</i> Buch.-Ham.; <i>Salmalia malabarica</i> (DC.) Schott & Endl.
29.	<i>Boswellia serrata</i> Roxb. ex Colebr.	Burseraceae	Salai, Salar,	<i>Boswellia balsamifera</i> Spreng.; <i>Boswellia glabra</i> Roxb.; <i>Boswellia thurifera</i> Roxb. ex Fleming; <i>Chloroxylon dupada</i> Buch.-Ham.
30.	<i>Bridelia retusa</i> (Linn.) A.Juss. m.	Euphorbiaceae	Ekdania, Gondni, Gaya, Khaja	<i>Andrachne doonkyboisca</i> B.Heyne ex Wall.; <i>Bridelia chineensis</i> Thin; <i>Bridelia cinerascens</i> Gehrm.; <i>Bridelia crenulata</i> Roxb.; <i>Bridelia fordii</i> Hemsl.; <i>Bridelia fruticosa</i> Pers.; <i>Bridelia retusa</i> var. <i>glabra</i> Gehrm.; <i>Bridelia retusa</i> var. <i>glauca</i> Hook.f.; <i>Bridelia retusa</i> var. <i>pubescens</i> Gehr
31.	<i>Buchanania cochinchinensis</i> (Lour.) M.R.Almeida	Anacardiaceae	Piyal, Kath Bhilawa	<i>Buchanania lanzan</i> Spreng., <i>Spondias simplicifolia</i> Rottb. (1996).
32.	<i>Butea monosperma</i> (Lam.) Taub.	Pipilionaceae	Dhak, Palas	<i>Butea braamania</i> DC.; <i>Butea frondosa</i> Roxb.; <i>Butea frondosa</i> Willd.; <i>Butea frondosa</i> var. <i>lutea</i> (Witt.) Maheshw.; <i>Butea monosperma</i> Kuntze; <i>Erythrina monosperma</i> Lam.; <i>Plaso monosperma</i> (Lam.) Kuntze; <i>Plaso monosperma</i> var. <i>flava</i> Kuntze; <i>Plaso monosperma</i> var. <i>rubra</i> Kuntze; <i>Rudolphia frondosa</i> (Willd.) Poir
33.	<i>Buxus wallichiana</i> Baill.,	Euphorbiaceae	Papri, Sansadu, Chikri	
34.	<i>Careya arborea</i> Roxb.	Myrtaceae	Kumbhi, Kumbi	<i>Barringtonia arborea</i> (Roxb.) F.Muell.; <i>Careya orbiculata</i> Miers; <i>Careya sphaerica</i> Roxb.; <i>Careya venenata</i> Oken; <i>Cumbia coneanae</i> Buch.-Ham.
35.	<i>Carpinus viminea</i> Wall. ex Lindl. Synonyms:	Coryleae	Shinroi, Shangri, Chamkharik	<i>Carpinus davidii</i> (Franch.) C.K.Schneid.; <i>Carpinus fargesii</i> C.K.Schneid.; <i>Carpinus fargesii</i> Franch.; <i>Carpinus fargesii</i> var. <i>latifolia</i> S.Y.Wang & C.L.Chang
36.	<i>Cassia fistula</i> Linn	Caesalpinaceae	Amaltas, Kiral, Sinara	<i>Bactrylobium fistula</i> Willd.; <i>Cassia bonplandiana</i> DC.; <i>Cassia excelsa</i> Kunth; <i>Cassia fistuloides</i> Collad.; <i>Cassia rhombifolia</i>



				Roxb.
37.	<i>Cedrus deodara</i> (Roxb. ex Lamb.) G.Don,	Coniferae	Deodar, Devadaru, Kelon	<i>Abies deodara</i> (Roxb. ex Lamb.) Lindl.; <i>Cedrus deodara</i> var. <i>argentea</i> Carrière; <i>Cedrus indica</i> Chambray; <i>Cedrus libani</i> var. <i>deodara</i> (Roxb. ex Lamb.) Hook.f.; <i>Cedrus libani</i> subsp. <i>deodora</i> (Roxb. ex Lamb.) P.D.Sell; <i>Larix deodara</i> (Roxb. ex Lamb.) K.Koch; <i>Pinus deodara</i> Roxb. ex Lamb.
38.	<i>Celtis australis</i> L.	Urticaceae	Kharak-chena	<i>Celtis alpina</i> Royle; <i>Celtis australis</i> var. <i>eriocarpa</i> (Decne.) Hook. f.; <i>Celtis australis</i> f. <i>variegata</i> Schelle ex Geerinck; <i>Celtis eriocarpa</i> Decne.; <i>Celtis excelsa</i> Salisb. [Illegitimate]; <i>Celtis kotschyana</i> Steven; <i>Celtis lutea</i> Pers.; <i>Celtis serrata</i> Dippel.
39.	<i>Celtis tetrandra</i> Roxb.	Urticaceae		<i>Celtis acata</i> Buch.-Ham.; <i>Celtis fengqingensis</i> Hu ex E.W.Ma; <i>Celtis formosana</i> Hayata; <i>Celtis glabra</i> Planch.; <i>Celtis hamiltonii</i> Planch.; <i>Celtis kunmingensis</i> C.C.Cheng & D.Y.Hong; <i>Celtis mollis</i> Planch.; <i>Celtis napalensis</i> Planch.; <i>Celtis roxburghii</i> Planch.
40.	<i>Cinnamomum tamala</i> (Buch.-Ham.) T.Nees & Eberm.	Lauraceae	Dalchini, Gur-andra	<i>Cinnamomum reinwardtii</i> Nees; <i>Cinnamomum veitchii</i> Lukman.; <i>Cinnamomum zwartzii</i> Lukman.; <i>Laurus tamala</i> Buch.-Ham.; <i>Laurus tazia</i> Buch.-Ham. <i>Persea tamala</i> Spreng.
41.	<i>Cordia dichotoma</i> G.Forst.	Boraginaceae	Lassora, Lassura	<i>Cordia brownii</i> A.DC.; <i>Cordia griffithii</i> C.B.Clarke; <i>Cordia indica</i> Lam.; <i>Cordia latifolia</i> Roxb.; <i>Cordia loureiroi</i> Roem. & Schult.; <i>Cordia lowriana</i> Brandis; <i>Cordia obliqua</i> Willd.; <i>Cordia obliqua</i> var. <i>wallichii</i> (G.Don) C.B.Clarke; <i>Cordia premnifolia</i> Ridl.; <i>Cordia suaveolens</i> Blume; <i>Cordia tomentosa</i> Wall.
42.	<i>Cornus capitata</i> Wall. ex Roxb.	Cornaceae	Thanboi, Bhamora	<i>Benthamia capitata</i> (Wall.) Nakai; <i>Benthamidia capitata</i> (Wall.) H.Hara; <i>Cynoxylon capitatum</i> (Wall.) Nakai; <i>Dendrobenthamia capitata</i> (Wall.) Hutch.; <i>Benthamia fragifera</i> Lindl.; <i>Benthamidia capitata</i> f. <i>grandis</i> Murata.
43.	<i>Cornus macrophylla</i> Wall.	Cornaceae		<i>Swida macrophylla</i> (Wall.) Soják; <i>Thelycrania macrophylla</i> (Wall.) Pojark.; <i>Cornus alpina</i> W.P.Fang & W.K.Hu; <i>Cornus brachypoda</i> C.A.Mey.; <i>Cornus corynostylis</i> Koehne
44.	<i>Corylus jacquemontii</i> Decne.	Betulaceae	Bhutia Badam	<i>Corylus colurna</i> var. <i>lacera</i> A.DC.; <i>Corylus lacera</i> Wall. [Invalid]; <i>Corylus tiliacea</i> Decne.
45.	<i>Crateva adansonii</i> subsp. <i>odora</i> (Buch.-Ham.) Jacobs			<i>Crateva odora</i> Buch.-Ham.; <i>Crateva roxburghii</i> R.Br.; <i>Crateva tapia</i> subsp. <i>odora</i> (Buch.-Ham.) S.M.Almeida; <i>Crateva tumulorum</i> Miq.; <i>C. religiosa</i> var. <i>roxburghii</i> (R. Br.) Hook. f. & Thomson
46.	<i>Cupressus torulosa</i> D. Don	Coniferae	Leuri, Leauri, Devidiar	<i>Cupressus sempervirens</i> var. <i>indica</i> Parl.
47.	<i>Dalbergia lanceolaria</i> L.f.	Papilionaceae		<i>Dalbergia arborea</i> sensu B. Heyne ex Roth., <i>Dalbergia frondosa</i> Roxb. ex DC., <i>Dalbergia</i>



				<i>zeylanica</i> Roxb.
48.	<i>Dalbergia sissoo</i> Roxb..	Pipilionaceae	Shisham, Sissoo	<i>Pterocarpus sissoo</i> (Roxb. ex DC.) Wight & Arn
49.	<i>Daphniphyllum himalayense</i> (Benth.) Müll	Euphorbiaceae	Ratendu	<i>Goughia himalayensis</i> Benth
50.	<i>Diospyros melanoxylon</i> Roxb var. <i>tupru</i> (Buch.-Ham.) V. Singh	Ebenaceae	Pinna	<i>Diospyros tupru</i> Buch.-Ham., <i>Diospyros exsculpta</i> Buch.-Ham., <i>Diospyros tomentosa</i> Roxb.
51.	<i>Diospyros montana</i> C.B. Clarke	Ebenaceae	Tendu	
52.	<i>Diploknema butyracea</i> (Roxb.) H.J. Lam.	Sapotaceae	Chiura, Phalwana, Phulel, Phulua	<i>Bassia butyracea</i> Roxb., <i>Madhuca butyracea</i> (Roxb.) J.F. Macbr.
53.	<i>Elaeodendron glaucum</i> (Rottb.) Pers..	Celastraceae	Dhebri, jangela, Jangel, paniala	<i>Cassine glauca</i> (Rottb.) Kuntze; <i>Mangifera glauca</i> Rottb.
54.	<i>Engelhardtia spicata</i> var. <i>integra</i> (Kurz) W.E.Manning ex Steenis	Juglandaceae	Mowa, Mauwa	<i>Engelhardtia colebrookiana</i> Lindl.
55.	<i>Erythrina suberosa</i> Roxb.	Pipilionaceae	Dhaul, Dhal, Madar	<i>Erythrina sublobata</i> Roxb., <i>Erythrina alba</i> Roxb. ex Wight & Arn., <i>Erythrina maxima</i> Roxb. ex Wight & Arn
56.	<i>Ficus auriculata</i> Lour.	Moraceae	Tirmal, Tirboi	<i>Ficus macrophylla</i> Roxb. & Buch.-Ham. ex Sm
57.	<i>Ficus benghalensis</i> L.	Moraceae	Bar, Bargat	<i>Ficus indica</i> sensu L., <i>Urostigma benghalense</i> (L.) Gasp.
58.	<i>Ficus neriifolia</i> J.E. Sm.	Moraceae	Dudhla, Dudhoi, Parphuta	<i>Ficus neriifolia</i> var. <i>nemoralis</i> (Wall. ex Miq.) Corner, <i>Ficus nemoralis</i> Wall. ex Miq.
59.	<i>Ficus racemosa</i> L.	Moraceae	Gular	<i>Ficus glomerata</i> Roxb., <i>Ficus goolerea</i> Roxb.
60.	<i>Ficus rumphii</i> Blume	Moraceae	Pilkhan, Khabar, Pilkhoi	<i>Urostigma rumphii</i> (Blume) Miq., <i>Ficus cordifolia</i> Roxb
61.	<i>Ficus semicordata</i> Buch.-Ham. ex J.E. Sm.	Artocarpeae	Khain, Kheina, Jarhphali	<i>Ficus cunia</i> Buch.-Ham. ex Roxb.
62.	<i>Ficus virens</i> Aiton	Moraceae	Khabar, Duthli, Pilkhoi, Pakhar, Kobra, Pilkharu	<i>Ficus infectoria</i> Roxb., <i>Ficus lacor</i> Rehder, <i>Ficus virens</i> var. <i>glabella</i> (Blume) Corner
63.	<i>Falconeria insignis</i> Royle	Euphorbiaceae	Khinna, Khindra, Khinni, Khirni	<i>Sapium insigne</i> (Royle) Trimen, <i>Falconeria wallichiana</i> Royle, <i>Falconeria malabarica</i> Wight, <i>Excoecaria insignis</i> (Royle) Müll., <i>Carumbium insigne</i> (Royle) Kurz.
64.	<i>Flacourtia jangomas</i> (Lour.) Raeusch.	Capparidaceae	Sialu, Katari, Kandhura, Phalama	<i>Flacourtia cataphracta</i> Roxb. ex Willd.
65.	<i>Fraxinus micrantha</i> Lingelsh.	Oleaceae		



66.	<i>Garuga pinnata</i> Roxb.	Burseraceae	Kharpat	
67.	<i>Gmelina arborea</i> Roxb. ex Sm.	Verbenaceae	Gamhar, Kumhar, Kahmhar	<i>Gmelina sinuata</i> Link., <i>Gmelina oblongifolia</i> Roxb.
68.	<i>Grewia asiatica</i> L.	Tiliaceae	Phalsa, Phalsa-Dhaman	<i>Grewia hainesiana</i> Hole, <i>Grewia subinaequalis</i> DC.
69.	<i>Grewia optiva</i> J.R. Drumm. ex Burret	Tiliaceae	Bhimal, Bewal, Biul, Biur	
70.	<i>Haldina cordifolia</i> (Roxb.) Ridsdale	Rubiaceae	Haldu	<i>Nauclea cordifolia</i> Roxb., <i>Adina cordifolia</i> (Roxb.) J. D. Hooker ex B. D. Jackson
71.	<i>Holoptelea integrifolia</i> (Roxb.) Planch.	Urticaceae	Papri, Kala Papri, Banchilla	<i>Ulmus integrifolia</i> Roxb.
72.	<i>Hovenia dulcis</i> Thunb.	Rhamnaceae		
73.	<i>Hymenodictyon orixense</i> (Roxb.) Mabb.	Rubiaceae	Bhulan, Kukurkat	<i>Cinchona orixensis</i> Roxb., <i>Cinchona excelsa</i> Roxb., <i>Hymenodictyon excelsum</i> (Roxb.) Wall.
74.	<i>Juglans regia</i> L.	Juglandaceae	Akhrot, Akhor, Okhar	
75.	<i>Juniperus polycarpus</i> C. Koch	Coniferae	Dhup, Himalayan Pencil Cedar	<i>Juniperus macropoda</i> Boiss
76.	<i>Kydia calycina</i> Roxb.	Malvaceae	Pula, Pulu, Puli	<i>Kydia fraterna</i> Roxb., <i>Kydia roxburghiana</i> Wight
77.	<i>Lagerstroemia parviflora</i> Roxb.	Lythraceae	Dhaura, Dhauri, Adhuari	
78.	<i>Lannea coromandelica</i> (Houtt.) Merr. J	Anacardiaceae	Jhingham, Jhinghini	<i>Dialium coromandelicum</i> Houtt.
79.	<i>Litsea monopetala</i> (Roxb.) Pers.	Lauraceae	Karka, Karkawa	<i>Tetranthera monopetala</i> Roxb., <i>Litsea polyantha</i> Juss.
80.	<i>Litsea glutinosa</i> (Lour.) C.B.Rob.	Lauraceae	Chandna, Maida-lakri	<i>Litsea glutinosa</i> var. <i>glutinosa</i>
81.	<i>Machilus duthiei</i> King ex Hook.f.	Lauraceae	Kawala Bhojo	<i>Persea duthiei</i> (King ex Hook.f.) Kosterm.
82.	<i>Machilus gamblei</i> King ex Hook.f	Lauraceae		<i>Persea gamblei</i> (King ex Hook.f.) Kosterm., <i>Reinwardtia</i> 6: 192. 1962. <i>Machilus bombycina</i> King ex Hook.f.
83.	<i>Machilus odoratissima</i> Nees in Wall.	Lauraceae	Kawala, Kaula, Kaulu	<i>Laurus odoratissima</i> Wall., <i>Persea odoratissima</i> (Nees) Kosterm.
84.	<i>Madhuca longifolia</i> (J. Koenig ex L.) J.F. Macbr. var. <i>latifolia</i> (Roxb.) A. Chev	Sapotaceae	Mauwa, Mahua, Mohwa	<i>Bassia latifolia</i> Roxb., <i>Madhuca latifolia</i> (Roxb.) J.F. Macbr., <i>Madhuca indica</i> J.F. Gmel
85.	<i>Mangifera indica</i> L.	Anacardiaceae	Am, Ambi	<i>Mangifera austroyunnanensis</i> Hu
86.	<i>Melia azedarach</i> L.	Meliaceae	Dek, Bakain, Deknoi	<i>Melia azedarach</i> var. <i>glabrior</i> C.DC., <i>Melia azedarach</i> var. <i>intermedia</i> (Makino) Makino
87.	<i>Milusa velutina</i> (Dunal) Hook.f. &			<i>Uvaria velutina</i> Dunal, <i>Guatteria velutina</i> (Dunal) A. DC., <i>Uvaria villosa</i> Roxb.



	Thoms.			
88.	<i>Mitragyna parvifolia</i> (Roxb.) Korth:	Rubiaceae	Kaem, Phaldu	<i>Nauclea parvifolia</i> Roxb., <i>Stephegyne parvifolia</i> (Roxb.) Korth
89.	<i>Moringa oleifera</i> Lam.	Moringaceae	Sohjna, Sainjna, Sondna	<i>Moringa pterygosperma</i> Gaertn
90.	<i>Myrica esculenta</i> Buch.-Ham. ex D. Don	Myricaceae	Kaiphall, Kaphal	<i>Myrica nagi sensu</i> Hook.f., non Thunb., <i>Myrica esculenta</i> (Buch.-Ham. ex D. Don) I.M. Turner
91.	<i>Neolitsea cuipala</i> (D. Don) Kosterm.	Lauraceae		<i>Litsea languinosa</i> (Nees) Nees, <i>Tetranthera cuipala</i> D. Don, <i>Tetradenia lanuginosa</i> Nees
92.	<i>Olea europaea</i> subsp. <i>cuspidata</i>	Oleaceae	Kahu, Kau	<i>Olea cuspidata</i> Wall. & G. Don, <i>Olea asiatica</i> Desf., <i>Olea ferruginea</i> Royle
93.	<i>Olea paniculata</i> R. Br.	Oleaceae	Gair, Gaild	<i>Olea glandulifera</i> Desf., <i>Olea glandulifera</i> Wall. ex G. Don, <i>Olea glandulosa</i> DC
94.	<i>Oroxylum indicum</i> (L.) Kurz	Bignoniaceae	Tarlu, Pharra, Pharnat, Tantia	<i>Bignonia indica</i> L., <i>Spathodea indica</i> (L.) Pers., <i>Calosanthes indica</i> (L.) Blume
95.	<i>Ougeinia oojeinensis</i> (Roxb.) Hochr.,	Pipilionaceae	Sandan	<i>Dalbergia oojeinensis</i> Roxb., Fl. Ind. 3: 220 (1832)
96.	<i>Phanera retusa</i> Benth.	Caesalpinaceae	Semla	<i>Bauhinia retusa</i> Roxb., <i>Bauhinia semla</i> Wunderlin, <i>B. emarginata</i> Roxb. ex G. Don, <i>Lasiobema retusum</i> (Benth.) de Wit.
97.	<i>Phyllanthus emblica</i> Linn.	Euphorbiaceae	Aonla, Amla	<i>Emblica officinalis</i> Gaertn
98.	<i>Picea smithiana</i> (Wall.) Boiss.	Coniferae	Himalayan Spruce, Roi, Rai	<i>Pinus smithiana</i> Wall., <i>Picea morinda</i> Link
99.	<i>Piliostigma malabaricum</i> (Roxb.) Benth.	Caesalpinaceae	Khatta Jhabjhora, Khatua	<i>Bauhinia malabarica</i> Roxb.; <i>Piliostigma malabaricum</i> var. <i>acidum</i> (Reinw. ex Korth.) de Wit.
100.	<i>Pinus roxburghii</i> Sarg.	Coniferae	Chir, Sarol, Sirli, Kihain	<i>Pinus longifolia</i> Roxb.
101.	<i>Pinus wallichiana</i> A.B. Jacks.	Coniferae	Kail, Blue Pine	<i>Pinus excelsa</i> D. Don, <i>Pinus griffithii</i> Mcc., <i>Pinus nepalensis</i> Chambray.
102.	<i>Pistacia chinensis</i> Bunge, ssp. <i>integerrima</i> (J.L. Stewart) Reich.f	Anacardiaceae	Kakkar, Kakroi	<i>Pistacia integerrima</i> J.L. Stewart
103.	<i>Pittosporum napaulense</i> (DC.) Rehder & E.H. Wilson	Pittosporaceae		<i>Senecia napaulensis</i> DC., <i>Pittosporum floribundum</i> Royle, <i>Pittosporum floribundum</i> Wight & Arn
104.	<i>Populus ciliata</i> Wall. ex Royle	Salicaceae	Baion, Sharphara, Tilaunju, Kapasi, Pahari Pipal	
105.	<i>Premna mollissima</i> Roth	Verbenaceae	Bakar, Bakarcha	<i>Gumira mollissima</i> (Roth) Kuntze, <i>Premna latifolia</i> Roxb., <i>Premna mucronata</i> Roxb., <i>Premna viburnoides</i> Wall. ex Schauer



106.	<i>Prunus cerasoides</i> Buch. Ham. ex D. Don	Rosaceae	Padam, Phaja	<i>Prunus puddum sensu</i> Hook.f
107.	<i>Prunus cornuta</i> (Wall. ex Royle) Steud.	Rosaceae	Jamoi, Jamroi, Jamnoi	<i>Cerasus cornuta</i> Wall. ex Royle
108.	<i>Pterospermum acerifolium</i> (Linn.) Willd.	Sterculiaceae	Mayeng, Kanakchampa	<i>Pentapetes acerifolia</i> L.
109.	<i>Punica granatum</i> L.	Lythraceae	Anar, Danoi	<i>Punica nana</i> L.
110.	<i>Putranjiva roxburghii</i> Wall.	Euphorbiaceae	Jiaputa, Putijia	<i>Nagea putranjiva</i> Roxb., <i>Drypetes roxburghii</i> (Wall.) Hurus
111.	<i>Pyrus pashia</i> Buch.Ham. ex D. Don	Rutaceae	Mehul, Indian Wild Pear	
112.	<i>Quercus floribunda</i> Lindl. ex A. Camus	Fagaceae	Moru	<i>Quercus dilatata</i> Lindl. ex A.DC.
113.	<i>Quercus glauca</i> Thunb.	Fagaceae	Phanat, Inai, Bani	
114.	<i>Quercus lanata</i> Sm	Fagaceae	Banj	<i>Quercus lanuginosa</i> D. Don, <i>Quercus banga</i> Ham. ex Hook.f.
115.	<i>Quercus leucotrichophora</i> A. Camus	Fagaceae	Ban, Banj	<i>Quercus incana</i> Roxb., <i>Quercus lanata</i> var. <i>incana</i> Wenz., <i>Quercus leucotrichophora</i> A. Camus
116.	<i>Quercus semecarpifolia</i> Sm.	Fagaceae	Kharshu	<i>Quercus cassura</i> Buch.-Ham. ex D. Don, <i>Quercus obtusifolia</i> D. Don.
117.	<i>Rhododendron arboreum</i> Sm.	Ericaceae	Burans	<i>Rhododendron windsorii</i> Nutt.
118.	<i>Salix tetrasperma</i> Roxb.	Salicaceae	Bed, Jalmala, Laila, Bhainsh	<i>Salix disperma</i> D. Don, <i>Salix suaveolens</i> Andersson
119.	<i>Schleichera oleosa</i> (Lour.) Merr.	Sapindaceae	Gausam, Gosam, Kusum	<i>Pistacia oleosa</i> Lour., <i>Schleichera trijuga</i> Willd
120.	<i>Semecarpus anacardium</i> L.f	Anacardiaceae	Bhilawa, Marking Nut tree	
121.	<i>Shorea robusta</i> Roxb. ex C.F. Gaertn.	Dipterocarpaceae	Sal	
122.	<i>Spondias pinnata</i> (L.f.) Kurz	Anacardiaceae	Ambara, Hog plum tree	<i>Mangifera pinnata</i> L.f, <i>Spondias mangifera</i> Willd
123.	<i>Sterculia villosa</i> Roxb. ex Sm.	Sterculiaceae	Godgudala	
124.	<i>Stereospermum chelonoides</i> (L.f.) DC.	Bignoniaceae	Padal	<i>Bignonia chelonoides</i> L.f., <i>Stereospermum tetragonum</i> DC.
125.	<i>Stranvaesia nussia</i> Lindl.			<i>Stranvaesia glaucescens</i> Lindl.
126.	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Jaman, Jamun	<i>Myrtus cumini</i> L.
127.	<i>Syzygium nervosum</i> A.Cunn. ex DC.	Myrtaceae	Piaman, Thuti	<i>Eugenia operculata</i> Roxb.
128.	<i>Taxus wallichiana</i> Zucc.	Coniferae	Thuner, Thuniara	<i>Taxus baccata</i> L. subsp. <i>wallichiana</i> (Zucc.) Pilg.
129.	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	<i>Terminalia glabra</i> (Roxb.) Wight & Arn., <i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn. var. <i>angustifolia</i> (Roxb.) C.B. Clarke.



130.	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae	Baheda	<i>Myrobalanus bellirica</i> Gaertn.
131.	<i>Terminalia chebula</i> Retz.	Combretaceae	Har, Harr, Hararh	<i>Myrobalanus chebula</i> (Retz.) Gaertn., <i>Terminalia reticulata</i> Roth, <i>Terminalia gangetica</i> Roxb.
132.	<i>Terminalia tomentosa</i> Wight & Arn	Combretaceae	Sain, Asaina	<i>Terminalia alata</i> Roth
133.	<i>Toona ciliata</i> M. Roem. Synonyms:	Meliaceae	Tun	<i>Cedrela toona</i> Roxb. ex Rottler, <i>Toona hexandra</i> (Wall.) M. Roem.
134.	<i>Toona sinensis</i> (A. Juss.) M. Roem.	Meliaceae	Darlu, Darli, Darloi	<i>Cedrela sinensi</i> A. Juss., <i>Cedrela serrata</i> Royle, <i>Toona serrata</i> (Royle) M. Roem.
135.	<i>Trema orientalis</i> (L.) Blume	Urticaceae	Jiban	<i>Celtis orientalis</i> L.
136.	<i>Tsuga dumosa</i> (D. Don) Eich.	Coniferae	Tansen	<i>Pinus dumosa</i> D. Don
137.	<i>Ulmus wallichiana</i> Planch.	Urticaceae	Emroi, Imroi	<i>Ulmus wallichiana</i> subsp. <i>xanthoderma</i> Melville & Heybroek
138.	<i>Vachellia nilotica</i> (L.) P. J. H. Hurter & Mabb. subsp. <i>indica</i> (Benth.) Kyal. & Boatwr.	Mimocaceae	Babul, Kikar	<i>Acacia arabica</i> var. <i>indica</i> Benth. (basionym); <i>Acacia nilotica</i> subsp. <i>indica</i> (Benth.) Brenan
139.	<i>Wendlandia heynei</i> (Schult.) Santapau & Merchant	Rubiaceae		<i>Rondeletia heynei</i> Schult., <i>Rondeletia exserta</i> Roxb., <i>Wendlandia exserta</i> (Roxb.) DC.
140.	<i>Wrightia arborea</i> (Dennst.) Mabb.	Apocynaceae	Dudhi, Kutaj	<i>Periploca arborea</i> Dennst., Schlus., <i>Nerium tomentosum</i> Roxb., <i>Wrightia tomentosa</i> Roem. & Schult.
141.	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Ber, Beri, Pamdi ber	<i>Ziziphus jujuba</i> (L.) Gaertn., <i>Rhamnus jujuba</i> L.
SHRUBS				
142.	<i>Justicia adhatoda</i> L.	Acanthaceae	Bansa, Arusa, Vasica	<i>Adhatoda zeylanica</i> Medik., <i>Adhatoda vasica</i> Nees
143.	<i>Asparagus adscendens</i> Roxb.	Liliaceae	Hazar-muli, Jhirna	
144.	<i>Berberis asiatica</i> Roxb. ex DC.	Berberidaceae	Kashmoi, Kingora	<i>Berberis aristata sensu</i> Hook.f. & Thomson,
145.	<i>Berberis chitria</i> Buch.-Ham. ex Lindl.	Berberidaceae	Kingora	<i>Berberis chitria</i> var. <i>occidentalis</i> Ahrendt
146.	<i>Berberis lycium</i> Royle	Berberidaceae	Kashmoi, Kingora	<i>Berberis angustifolia</i> Roxb.
147.	<i>Callicarpa macrophylla</i> Vahl	Verbenaceae	Daia	<i>Callicarpa incana</i> Roxb., <i>Callicarpa roxburghii</i> Wall. ex Walp.
148.	<i>Calotropis gigantea</i> (L.) W.T. Aiton	Asclepiadaceae	Madar, Safed Ak	<i>Asclepias gigantea</i> L.



149.	<i>Calotropis procera</i> (Aiton) W.T.Aiton	Asclepiadaceae	Madar, Ak	<i>Asclepias procera</i> Aiton, <i>Calotropis hamiltonii</i> Wight
150.	<i>Caragana gerardiana</i> Benth.	Papilionaceae	Kathur, Kanta	<i>Caragana spinosissima</i> Benth., <i>Aspalathus gerardianus</i> (Royle ex Benth.) Kuntze
151.	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Rubiaceae	Maindal, Mainphal, Madana	<i>Gardenia spinosa</i> Thunb., <i>Gardenia dumetorum</i> Retz., <i>Randia spinosa</i> (Thunb.) Blume, <i>Randia oocarpa</i> Ridl., <i>Xeromphis spinosa</i> (Thunb.) Keay, <i>Catunaregam dumetorum</i> (Retz.) Tirveng., <i>Randia dumetorum</i> (Retz.) Lam
152.	<i>Debregeasia saeneb</i> (Forssk.) Hepper & J.R.I.	Artocarpeae	Tushiari, Sansaru, Siar, Sinar	<i>Rhus saeneb</i> Forssk., <i>Boehmeria salicifolia</i> D. Don, <i>Debregeasia hypoleuca</i> (Steud.) Wedd.
153.	<i>Elaeagnus conferta</i> Roxb.	Elaeagnaceae	Loharu	<i>Elaeagnus latifolia</i> Bedd.
154.	<i>Ephedra gerardiana</i> Wall. ex Stapf	Gnetaceae	Tut-gandha	
155.	<i>Helicteres isora</i> L.	Sterculiaceae	Maror-phal, Kapasi	
156.	<i>Hippophae salicifolia</i> D. Don.	Elaeagnaceae	Dhurchuk, Tarwa, Chuma	<i>Elaeagnus salicifolia</i> (D. Don) A. Nelson, <i>Hippophae rhamnoides</i> subsp. <i>salicifolia</i> (D. Don) Servettaz
157.	<i>Indigofera cassioides</i> Rottler ex DC.	Papilionaceae	Sakira	<i>Indigofera leptostachya</i> DC., <i>Indigofera violacea</i> Roxb., <i>Indigofera elliptica</i> Roxb., <i>Indigofera arborea</i> Roxb., <i>Indigofera pulchella</i> Roxb.
158.	<i>Phlogacanthus thyrsiformis</i> (Roxb. ex Hardw.) Mabb.	Acanthaceae		<i>Justicia thyrsiformis</i> Hardw., <i>Justicia thyrsiflora</i> Roxb.
159.	<i>Phoenix loureiroi</i> Kunth,	Palmae	Khajur	<i>Phoenix humilis</i> Royle ex Becc., <i>Phoenix humilis</i> var. <i>loureiroi</i> (Kunth) Becc.
160.	<i>Picrasma quassioides</i> (D. Don) Benn.	Simarubiaceae	Karui	<i>Simaba quassioides</i> D. Don.
161.	<i>Prinsepia utilis</i> Royle	Rosaceae	Bhekoi, Bhek, Bhekal, Bhekar	
162.	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	Apocynaceae	Sarpgandha	<i>Ophioxylon serpentinum</i> L., <i>Ophioxylon belgaumense</i> Wight
163.	<i>Rhus parviflora</i> Roxb.	Anacardiaceae	Ninas, Ninawa	
164.	<i>Skimmia anquetilia</i> N.P. Taylor & Airy Shaw	Rutaceae	Kathur-chara, Gurlpata	<i>Skimmia laureola</i> (DC.) Sieb. & Zucc. ex Walp., <i>Limonia laureola</i> Wall.
165.	<i>Uraria picta</i> (Jacq.) Desv. ex DC., <i>Prodr.</i> 2: 324 (1825).	Papilionaceae	Prishniparni	<i>Hedysarum pictum</i> Jacq., <i>Doodia picta</i> Roxb.
166.	<i>Vitex negundo</i> L.	Verbenaceae	Shimalu, Chhatimal, Nishinda	<i>Vitex incisa</i> Lam., <i>Vitex paniculata</i> Lam., <i>Vitex bicolor</i> Willd.
167.	<i>Zanthoxylum armatum</i> DC.	Rutaceae	Timbur, Timru, Tejbai	<i>Zanthoxylum alatum</i> Roxb.
168.	<i>Ziziphus xylopyrus</i>	Rhamnaceae	Bhander, Keth	<i>Rhamnus xylopyrus</i> Retz., <i>Ziziphus caracutta</i>



	(Retz.) Willd.		Ber	Buch.--Ham. ex Roxb.
CLIMBERS				
169.	<i>Phanera vahlii</i> (Wight & Arn.) Benth.	Caesalpinaceae	Maljhan, Malo	<i>Bauhinia vahlii</i> Wight & Arn., <i>Bauhinia racemosa</i> Vahl
170.	<i>Calamus tenuis</i> Roxb.	Palmae	Bet, Bent	<i>Calamus royleanus</i> Griff.
171.	<i>Celastrus paniculatus</i> Willd.	Celastraceae	Malkangni, Malkakni	
172.	<i>Chonemorpha fragrans</i> (Moon) Alston	Apocynaceae		<i>Echites fragrans</i> Moon, <i>Chonemorpha macrophylla</i> (Roxb.) G. Don
173.	<i>Clematis gouriana</i> Roxb. ex DC.	Ranunculaceae	Bel kum, Bel kungu	
174.	<i>Clematis montana</i> Buch.-Ham. ex DC.	Ranunculaceae	Kaunia bali,	<i>Clematis montana</i> var. <i>grandiflora</i> Hook.
175.	<i>Cryptolepis dubia</i> (Burm.f.) M.R.Almeida	Asclepiadaceae	Dudhi, Medha-singhi, Karanta	<i>Periploca dubia</i> Burm.f., <i>Fl. Indica</i> : 70.. 1768. <i>Cryptolepis buchananii</i> Roem, & Schult.
176.	<i>Holboellia latifolia</i> Wall.	Berberidaceae	Gophla, Jungli sharifa	
177.	<i>Hiptage benghalensis</i> (L.) Kurz	Malpighiaceae	Mudh Malti, Madhavilata	<i>Banisteria benghalensis</i> L.
178.	<i>Pueraria tuberosa</i> (Roxb. ex Willd.) DC.	Papilionaceae	Sural, Saral, Sarur	<i>Hedysarum tuberosum</i> Roxb. ex Willd.
179.	<i>Smilax ovalifolia</i> Roxb., Fl. Ind. 3: 794 (1832).	Liliaceae	Ram-dataun	<i>Smilax macrophylla</i> Roxb.
180.	<i>Spatholobus parviflorus</i> (Roxb. ex DC.) Kuntze	Papilionaceae	Maula, Malha-bel	<i>Butea parviflorus</i> Roxb. ex
181.	<i>Stephania glabra</i> (Roxb.) Miers	Menispermaceae	Parha	<i>Cissampelos glabra</i> Roxb.
182.	<i>Tinospora sinensis</i> (Lour.) Merr.	Menispermaceae	Gurch, Giloe, Gulancha	<i>Tinospora malabarica</i> (Lam.) Hook.f.)
183.	<i>Ventilago denticulata</i> Willd.	Rhamnaceae	kali-Bel	<i>Ventilago calyculata</i> Tul.
RET				
184.	<i>Acacia pseudo-eburnea</i> Dunn	Mimosaceae		
185.	<i>Aria lanata</i> (D.Don) Decne.	Rosaceae		<i>Pyrus lanata</i> Don
186.	<i>Aristolochia punjabensis</i> Lace	Aristolochiaceae		
187.	<i>Berberis rawatii</i> U.L. Tiwari and B.S. Adhikari	Berberidaceae		
188.	<i>Berberis kumaonensis</i> C.K. Schneid.	Berberidaceae		
189.	<i>Berberis lambertii</i> Parker	Berberidaceae		
190.	<i>Berberis osmastonii</i>	Berberidaceae		



	Dunn			
191.	<i>Berchemia floribunda</i> Wall.,	Rhamnaceae	Kouloi	
192.	<i>Berchemia lineata</i> DC.,	Rhamnaceae	Angari	<i>Rhamnus lineata</i> L., <i>Ziziphus lineata</i> Willd.
193.	<i>Boehmeria penduliflora</i> Wedd. ex D.G.Long	Urticaceae	Pahari Kikar	<i>Boehmeria densiflora</i> var. <i>penduliflora</i> (Wedd. ex D.G.Long) Acharya & Yonek.
194.	<i>Brassaiopsis aculeata</i> (Buch.-Ham. ex D. Don) Seem.	Araliaceae		<i>Hedera aculeata</i> Buch.-Ham. ex D. Don
195.	<i>Caragana sukiensis</i> C.K. Schneid.	Fabaceae		<i>Caragana hoplites</i> Dunn, <i>Caragana nepalensis</i> Kitam.
196.	<i>Carallia brachiata</i> (Lour.) Merr.	Rhizophoraceae	Freshwater Mangrove	<i>Baraultia madagascariensis</i> Spreng.; <i>Barraldeia madagascariensis</i> Spreng., <i>Bruguiera nemorosa</i> Blanco; <i>Carallia arguta</i> Koord. & Valetton; <i>Carallia baraldeia</i> Arn.; <i>Carallia calycina</i> Benth.; <i>Carallia celebica</i> Blume; <i>Carallia cerisopsitolia</i> Miq.
197.	<i>Catamixis baccharoides</i> Thomson	Asteraceae	Catamixis	
198.	<i>Cyathea spinulosa</i> Wall. ex Hook.	Cyatheaceae	Tree Fern	<i>Cyathea taiwaniana</i> Nakai
199.	<i>Ceriscoides turgida</i> (Roxb.) Tirveng.	Rubiaceae	Thanela	<i>Gardenia turgida</i> Roxb.
200.	<i>Cinnamomum glanduliferum</i> (Wall.) Meisn.	Lauraceae	Nepal camphor	<i>Camphora glandulifera</i> (Wall.) Nees
201.	<i>Cleyera japonica</i> Thunb.	Pentaphylacaceae	Japanese cleyera	<i>Cleyera ochracea</i> sensu Dyer
202.	<i>Cochlospermum religiosum</i> (L.) Alston, Handb. .	Bixaceae	Gejra, Arlu	<i>Bombax gossypium</i> L.; <i>Bombax religiosum</i> L.; <i>Cochlospermum balicum</i> Boerl.; <i>Cochlospermum gossypium</i> DC.; <i>Maximiliana gossypium</i> Kuntze ; <i>Wittelsbachia gossypium</i> Mart. & Zucc
203.	<i>Colutea nepalensis</i> Sims	Fabaceae		<i>Colutea arborescens</i> Linnaeus var. <i>nepalensis</i> (Sims) Baker., <i>Colutea persica</i> var. <i>buhsei</i> sensu Rech.f.
204.	<i>Cotoneaster frigidus</i> Wall.	Rosaceae		<i>Cotoneaster affinis</i> Auct., <i>Cotoneaster himalayensis</i> Hort.
205.	<i>Dalbergia latifolia</i> Roxb.	Papilionaceae	Black Rosewood, Bombay blackwood	<i>Dalbergia emarginata</i> Roxb.
206.	<i>Datisca cannabina</i> L.	Datisceae	False hemp	<i>Datisca nepalensis</i> D. Don
207.	<i>Dillenia pentagyna</i> Roxb.	Dilleniaceae	Karmal, Dog Teak	<i>Dillenia augusta</i> Roxb.; <i>Dillenia baillonii</i> Pierre ex Laness.; <i>Dillenia floribunda</i> Hook.f. & Thomson; <i>Dillenia hainanensis</i> Merr.
208.	<i>Dodecadenia grandiflora</i> Nees	Lauraceae	Dodecadenia	<i>Tetranthera grandiflora</i> Wall.
209.	<i>Drypetes assamica</i> (Hook.f.) Pax & K.Hoffm	Euphorbiaceae	Khadbehula	<i>Cyclostemon assamicus</i> Hook.f.



210.	<i>Dysoxylum gotadhora</i> (Buch.--Ham.) Mabb.	Meliaceae	Cup-Calyx, White Ceda	<i>Guarea gotadhora</i> Buch.--Ham., <i>Mem. Wern. Nat. Hist. Soc.</i> 6: 307. (1832), <i>Dysoxylum binectariferum</i> (Roxb.) Hook, f. ex Bedd.
211.	<i>Ephedra gerardiana</i> var. <i>sikkimensis</i> Stapf	Gnetaceae		<i>Ephedra saxatilis</i> Wall.
212.	<i>Euonymus grandiflorus</i> Wallich	Celastraceae		<i>Euonymus grandiflorus</i> var. <i>angustifolius</i> Chen H. Wang; <i>E. mairei</i> H. Léveillé.
213.	<i>Ficus glaberrima</i> Blume	Moraceae		<i>Urostigma glaberrimum</i> (Blume) Miq
214.	<i>Ficus microcarpa</i> L.f.	Moraceae		<i>Ficus retusa</i> var. <i>crassifolia</i> W.C.Shieh, <i>Ficus dilatata</i> Miq.
215.	<i>Ficus pomifera</i> Wall. ex King	Moraceae		
216.	<i>Fraxinus xanthoxyloides</i> (Wall. ex G. Don) A. DC.	Oleaceae.		<i>Ornus xanthoxyloides</i> Wall. ex G. Don
217.	<i>Glochidion ellipticum</i> Wight	Phyllanthaceae		<i>Phyllanthus assamicus</i> Müll. Arg., <i>Glochidion malabaricum</i> (Müll. Arg.) Bedd., <i>Glochidion assamicum</i> (Müll. Arg.) Hook.f.
218.	<i>Heteropanax fragrans</i> (Roxb. ex DC.) Seem.	Araliaceae		<i>Panax fragrans</i> Roxb. ex DC
219.	<i>Ilex fragilis</i> J. D. Hooker	Aquifoliaceae		<i>Ilex fragilis</i> f. <i>kingii</i> Loesener; <i>I. fragilis</i> f. <i>subcoriacea</i> C. J. Tseng; <i>I. opienensis</i> S. Y. Hu
220.	<i>Ilex pseudo-odorata</i> Loes.	Aquifoliaceae		<i>Ilex odorata</i> Hook.f.
221.	<i>Indopiptadenia oudhensis</i> (Brandis) Brenan	Mimosaceae		<i>Piptadenia oudhensis</i> Brandis
222.	<i>Lindera nacusua</i> (D. Don) Merr.	Lauraceae		<i>Benzoin bifarium</i> (Nees) Chun; <i>Daphnidium bifaria</i> Wall.; <i>Lindera bifaria</i> (Nees) Benth. ex Hook. fil.; <i>Lindera bifaria</i> (Nees) Hosseus; <i>Tetranthera bifaria</i> Wall
223.	<i>Macaranga indica</i> Wight,	Euphorbiaceae	Indian Macaranga	<i>Macaranga adenantha</i> Gagnep.; <i>Tanarius indicus</i> (Wight) Kuntz
224.	<i>Macaranga pustulata</i> King ex J. D. Hooker	Euphorbiaceae		<i>Macaranga denticulata</i> (Blume) Müller
225.	<i>Macropanax dispermu</i> s (Blume) Kuntze	Araliaceae		<i>Macropanax oreophilus</i> Miq., <i>Aralia disperma</i> Blume; <i>Brassaiopsis disperma</i> (Blume) K.Koch.
226.	<i>Magnolia kisopa</i> (Buch.-Ham. ex DC.) Figlar	Magnoliaceae	Chaam, Chaur	<i>Michelia kisopa</i> Buch.-Ham. ex DC.
227.	<i>Mahonia jaunsarensis</i> Ahrendt,	Berberidaceae	Jaunsar Barberry	<i>Berberis jaunsarensis</i> (Ahrendt) Laferr.
228.	<i>Marsdenia griffithii</i> Hook.f.	Apocynaceae		<i>Marsdenia lucida</i> Hook.f. & Thomson
229.	<i>Maytenus rufa</i> (Wall.) Cufod.	Celastraceae		<i>Celastrus rufus</i> Wall.
230.	<i>Meizotropis pellita</i> (Hook.f. ex Prain) Sanjappa	Pipilionaceae	Patwadangar	<i>Butea pellita</i> Hook.f. ex Prain
231.	<i>Meliosma arnottiana</i> (Wight) Walp.	Sabiaceae		<i>Meliosma wallichii</i> Planch.
232.	<i>Mezoneuron</i>	Caesalpiniaceae	Hooded-	<i>Caesalpinia cucullata</i> Roxb



	<i>cucullatum</i> (Roxb.) Wight & Arn.		flowered brasiletto	
233.	<i>Neolitsea pallens</i> (D. Don) Momiy. & H. Hara	Lauraceae		<i>Litsea consimilis</i> (Nees) Nees; <i>Litsea umbrosa</i> var. <i>consimilis</i> (Nees) Hook. f.; <i>Tetradenia consimilis</i> Nees; <i>Tetradenia pallens</i> D. Don.
234.	<i>Olex nana</i> Wall	Oleaceae	Dwarf Olax	
235.	<i>Osmanthus fragrans</i> Loureiro	Oleaceae	Sweet osmanthus	<i>Olea acuminata</i> Wall. ex G. Don, <i>Olea buchananii</i> Lamb. ex D. Don
236.	<i>Phoenix acaulis</i> Buch	Arecaceae	Dwarf date palm	<i>Phoenix acaulis</i> var. <i>melanocarpa</i> Griff.
237.	<i>Pittosporum eriocarpum</i> Royle	Pittosporaceae		
238.	<i>Prunus undulata</i> Buch.-Ham. ex D. Don	Rosaceae		<i>Laurocerasus undulata</i> (Buch.-Ham. ex D. Don) M. Roem.
239.	<i>Pterocarpus marsupium</i> Roxb.	Fabaceae	Indian Kino, Vijayasar, Bijasal,	<i>Lingoum marsupium</i> (Roxb.) Kuntze; <i>Pterocarpus bilobus</i> G. Don; <i>Pterocarpus marsupium</i> var. <i>acuminata</i> Prain
240.	<i>Rivea ornata</i> (Roxb.) Choisy	Convolvulaceae	Phanji	
241.	<i>Saurauia napaulensis</i> DC.	Actinidiaceae	Bhakara, Goganda, Gogina, Gugna	<i>Saurauia napaulensis</i> var. <i>montana</i> C.F. Liang & Y.S. Wang
242.	<i>Sloanea tomentosa</i> (Benth.) Rehder & Wilson	Elaeocarpaceae		<i>Echinocarpus tomentosus</i> Benth.
243.	<i>Sophora mollis</i> (Royle) Baker	Fabaceae	Peeli Sakina	<i>Sophora mollis</i> Graham in Wall., <i>Numer. List. n. 5335</i> (1832), <i>nom. nud.</i> , <i>Edwardsia mollis</i> Royle
244.	<i>Staphylea emodi</i> Wall. ex Brandis	Staphyleaceae	Chitra, Marcchob, Nagdaun	
245.	<i>Symplocos cochinchinensis</i> var. <i>laurina</i> (Retz.) Noot.	Symplocaceae	Bholiya	<i>Symplocos spicata</i> Roxb.
246.	<i>Toricellia tiliifolia</i> DC.	Toricelliaceae		
247.	<i>Trachycarpus takil</i> Becc.	Palmae	Thakil palm	<i>Chamaerops martiana</i> Duthie
248.	<i>Turpinia cochinchinensis</i> (Lour.) Merr.	Staphyleaceae	Indomalaya Turpinia	<i>Turpinia nepalensis</i> Wall
249.	<i>Uncaria scandens</i> (Sm.) Hutch	Rubiaceae		<i>Cephalanthus cavaleriei</i> H. Lév., <i>Nauclea scandens</i> Sm, <i>Nauclea pilosa</i> Kuntze, <i>Uncaria pilosa</i> Roxb.,
250.	<i>Viburnum cordifolium</i> Wall. ex DC.	Caprifoliaceae		
251.	<i>Wallichia oblongifolia</i> Griffith	Arecaceae	Himalayan dwarf fishtail palm	<i>Harina densiflora</i> (Martius) Walpers; <i>H. oblongifolia</i> (Griffith) Griffith; <i>Wallichia densiflora</i> Martius.



ANNEXURE II

FGR SPECIES: ECO-DISTRIBUTION MAPPING

S.No	Species name
1	<i>Abies spectabilis</i>
2	<i>Acer ceasium</i>
3	<i>Albizia odoratissima</i>
4	<i>Albizia julibrissin</i>
5	<i>Alnus nepalensis</i>
6	<i>Bauhinia semla</i>
7	<i>Betula utilis</i>
8	<i>Bombax ceiba</i>
9	<i>Boswellia serrata</i>
10	<i>Buchanania lanzan</i>
11	<i>Buxus wallichiana</i>
12	<i>Carallia brachiata</i>
13	<i>Carpinus viminea</i>
14	<i>Cassine glauca</i>
15	<i>Cinnamomum tamala</i>
16	<i>Cochlospermum religiosum</i>
17	<i>Cornus capitata</i>
18	<i>Corylus jacquemontii</i>
19	<i>Dispyros montana</i>
20	<i>Diploknema butyracea</i>
21	<i>Ficus neriifoliavar.nemoralis</i>
22	<i>Flacourtiajagomas/Fraxinus xantholoodes</i>
23	<i>Fraxinus micrantha</i>
24	<i>Hovenia dulcis</i>
25	<i>Hymenodictyon orixense</i>
26	<i>Juglans regia</i>
27	<i>Juniperus macropoda</i>
28	<i>Litsaea glutinosa</i>
29	<i>Machilus gamblei</i>
30	<i>Madhuca longifolia</i>
31	<i>Myrica esculenta</i>
32	<i>Olea cuspidata</i>
33	<i>Oroxylum indicum</i>
34	<i>Ougeinia oojeinensis</i>



35	<i>Pittosporum napaulense</i>
36	<i>Populus ciliata</i>
37	<i>Premna latifolia</i>
38	<i>Prunus cerasoides</i>
39	<i>Pterospermum acerifolium</i>
40	<i>Quercus glauca</i>
41	<i>Quercus lanata</i>
42	<i>Quercus semicarpifolia</i>
43	<i>Rhododendron arboreum</i>
44	<i>Semecarpus anacardium</i>
45	<i>Stereospermum chelonoides</i>
46	<i>Taxus baccata</i>
47	<i>Terminalia chebula</i>
48	<i>Trema orientalis</i>
49	<i>Tsuga dumosa</i>
50	<i>Ulmus wallichiana</i>



ANNEXURE III

Prioritized 100 FGR Species Selected for the Development of Long-Term Seed Storage Protocol and Storage in the Seedbank

Sr. No.	Species	Family	Location
1.	<i>Acer caesium</i>	Aceraceae	Bajrikhand, Kanasar Range, Chakrata FD
2.	<i>Abies pindrow</i>	Pinaceae	Chakrata FD
3.	<i>Acacia catechu</i>	Mimosaceae	Kalsi FD
4.	<i>Acer oblongum</i>	Aceraceae	Dehradun FD
5.	<i>Acronychia pedunculata</i>	Rutaceae	Nakraunda Forest
6.	<i>Aegle marmelos</i>	Rutaceae	Kansro, Rajaji National Park; Chhakata Range, Haldwani; Srinagar, Garhwal
7.	<i>Ailanthus excels</i>	Simaroubaceae	Sirsoli, Ukhimath, Kedarnath FD
8.	<i>Albizia chinensis</i>	Mimosaceae	Sahiya, Chakrata FD
9.	<i>Albizia julibrissin</i>	Mimosaceae	Arakot, Chamba
10.	<i>Albizia lebbeck</i>	Mimosaceae	Dehradun FD
11.	<i>Albizia odorotissima</i>	Mimosaceae	Rajpur Road, Mussoorie FD
12.	<i>Albizia procera</i>	Mimosaceae	Raiwala, Rajaji National Park
13.	<i>Alnus nepalensis</i>	Cupuliferae	Khirsu, Civil Soyam, Garhwal FD, Srinagar
14.	<i>Alnus nitida</i>	Cupuliferae	Tiuni, Kotigarh range, Tons FD
15.	<i>Bauhinia purpurea</i>	Caesalpinaceae	Dogri range, Haldwani FD
16.	<i>Bauhinia retusa</i>	Caesalpinaceae	Dugra Forest, Bhatwara, Tehri FD
17.	<i>Bauhinia vahlii</i>	Caesalpinaceae	Kilmori Forest, Bhatwara, Tehri FD
18.	<i>Bauhinia variegata</i>	Caesalpinaceae	FRI Campus, Dehradun
19.	<i>Berberis asiatica</i>	Berberidaceae	Garhwal FD
20.	<i>Berberis lyceum</i>	Berberidaceae	Tiuni, Devdhar Range, Chakrata FD
21.	<i>Betula utilis</i>	Betulaceae	Mana, Badrinath FD
22.	<i>Bischofia javanica</i>	Euphorbiaceae	Jauljivi, Pithoragarh FD
23.			
24.	<i>Bombax ceiba</i>	Bombacaceae	Ratal, Tehri FD
25.	<i>Boswellia serrata</i>	Burseraceae	Near Chandi Devi Temple, Rajaji NP
26.	<i>Buchanania cochinchinensis</i>	Anacardiaceae	Near Chandi Devi Temple, Rajaji NP
27.	<i>Buxus wallichiana</i>	Buxaceae	Mandal, Kedarnath WLS; Jodi, Chakrata FD
28.	<i>Carpinus viminea</i>	Betulaceae	Kanchula Kharak, Mandal, Kedarnath WLS
29.	<i>Cassia fistula</i>	Caesalpinaceae	Dehradun FD
30.	<i>Cedrus deodara</i>	Pinaceae	Mayawati, Lohaghat Range,



			Champawat FD
31.	<i>Celastrus paniculatus</i>	Celastraceae	Narkota, Rudraprayag FD
32.	<i>Celtis australis</i>	Ulmaceae	Chaprali, Pauri FD
33.	<i>Celtis tetrandra</i>	Ulmaceae	Almora FD
34.	<i>Chukrasia tabularis</i>	Meliaceae	Dehradun FD
35.	<i>Cinnamomum camphora</i>	Lauraceae	Dehradun FD
36.	<i>Cinnamomum tamala</i>	Lauraceae	Bhaunkhal, Chaukhutia, Ranikhet FD
37.	<i>Cocculus laurifolius</i>	Menispermaceae	Mussoorie FD
38.	<i>Cordia dichotoma</i>	Boraginaceae	Judo, Kalsi FD
39.	<i>Corylusja cquemontii</i>	Betulaceae	Mandal Forest, Kedarnath Badrinath FD, Chamoli
40.	<i>Crotalaria cytisoides</i>	Fabaceae	Mussoorie FD
41.	<i>Cryptolepis dubia</i>	Asclepiadaceae	Jhingardhar, Bhatwara, Tehri FD
42.	<i>Cupressus torulosa</i>	Cupressaceae	Dehradun FD
43.	<i>Dalbergia lanceolaria</i>	Fabaceae	Sushila Tiwari Herbal Garden, Rishikesh
44.	<i>Dalbergia sissoo</i>	Fabaceae	Thano Range, Dakpathar, Kalsi
45.	<i>Elaea dendronglaucum</i>	Celastraceae	Ghandherdhar, Bhatwara, Tehri FD
46.	<i>Engelhardtia spicata</i>	Juglandaceae	Ramnagar FD
47.	<i>Flacourtia jangomas</i>	Salicaceae	Maangu, Bhatwara, Tehri FD
48.	<i>Fraxinus micrantha</i>	Oleaceae	Buranskhand, Dhanaulti, Mussoorie FD Mandal Forest, Kedarnath WLS
49.	<i>Fraxinus xanthoxyloides</i>	Oleaceae	Kailashpur Beat, Joshimath Range
50.	<i>Grewia optiva</i>	Tiliaceae	Chaprali, Pauri FD
51.	<i>Haldina cordifolia</i>	Rubiaceae	Dehradun FD; Haridwar FD; Kalsi FD
52.	<i>Hippophae salicifolia</i>	Elaeagnaceae	Upper Yamuna FD; Hanuman Chatti Badrinath; Joshimath Range, Badrinath FD Kedar valley, Kedarnath FD
53.	<i>Holoptelea integrifolia</i>	Ulmaceae	Chila Range, Haridwar FD Ramnagar FD
54.	<i>Hymenodictyon orixense</i>	Rubiaceae	Ramnagar, Nainital FD
55.	<i>Indigoferaca ssioides</i>	Fabaceae	Thalka, Bhatwara, Tehri FD
56.	<i>Juglans regia</i>	Juglandaceae	Vinayak, Koshi Range, Nainital FD
57.	<i>Justicia adhatoda</i>	Acanthaceae	Tehri FD
58.	<i>Kydia calycina</i>	Malvaceae	Yamuna Pul, Mussoorie FD Agrakhal, Narendra Nagar, FD
59.	<i>Leucomeris spectabilis</i>	Asteraceae	Chimtakhal, Almora FD
60.	<i>Lyonia ovalifolia</i>	Ericaceae	SanjhaDarbar, Mussoorie FD
61.	<i>Mallotus philippensis</i>	Euphorbiaceae	Dudhli, Dehradun FD
62.	<i>Melia composite</i>	Meliaceae	Dehradun FD



63.	<i>Morus alba</i>	Moraceae	Jhajra range, Dehradun FD
64.	<i>Myrica esculenta</i>	Myricaceae	Mussoorie FD
65.	<i>Oroxylum indicum</i>	Bignoniaceae	Near Mansadevi Temple, Rajaji NP; Motichur, Rajaji NP; Rudraprayag Forest; Belpadav, Tarai East Haldwani; Kaladunghi Ramnagar
66.	<i>Phyllanthus emblica</i>	Euphorbiaceae	Pathri van, Haridwar FD
67.	<i>Picea smithiana</i>	Pinaceae	Deovan, Kanasar Range, Chakrata FD
68.	<i>Piliostigma malabaricum</i>	Caesalpinaceae	Ramnagar FD; Rajaji National Park
69.	<i>Pinus roxburghii</i>	Pinaceae	Tons FD
70.	<i>Pinus wallichiana</i>	Pinaceae	Tanta Village, Dharchula Range, Dhanaulti, Mussoorie FD; Near Gamshali, Joshimath Range
71.	<i>Pittosporum eriocarpum</i>	Pittosporaceae	Mussoorie FD
72.	<i>Pongamia pinnata</i>	Fabaceae	Motichur Rajaji NP
73.	<i>Premna mollissima</i>	Verbenaceae	Bhogpur, Thano Range, Dehradun FD
74.	<i>Prunus cerasoides</i>	Rosaceae	Dharasu, Uttarkashi FD
75.	<i>Punica granatum</i>	Lythraceae	Soni, Ranikhet Range, Almora FD
76.	<i>Putranjiva roxburghii</i>	Euphorbiaceae	Dehradun FD
77.	<i>Pyracantha crenulata</i>	Rosaceae	Korwa, Chakrata FD
78.	<i>Pyrus pashia</i>	Rosaceae	Near GoluDevta Temple, Almora FD
79.	<i>Rhamnus triquetra</i>	Rhamnaceae	Jhadipani, Mussoorie FD
80.	<i>Rhododendron arboreum</i>	Ericaceae	Radi Top, Upper Yamuna FD
81.	<i>Rhus parviflora</i>	Anacardiaceae	Tiuni, Devdhar Range, Chakrata FD
82.	<i>Rhus punjabensis</i>	Anacardiaceae	Kantha, Ukhimath, Kedarnath FD
83.	<i>Rubus ellipticus</i>	Rosaceae	Purola, Tons FD
84.	<i>Salix tetrasperma</i>	Salicaceae	Nakraunda, Rajaji NP.
85.	<i>Spatholobus parviflorus</i>	Fabaceae	Near WII, Dehradun FD
86.	<i>Sterculia villosa</i>	Sterculiaceae	Timli Range, Dehradun FD
87.	<i>Stereospermum chelonoides</i>	Bignoniaceae	Ramnagar FD Rajaji NP
88.	<i>Terminalia bellirica</i>	Combretaceae	Kansro Range, Rajaji National Park
89.	<i>Terminalia chebula</i>	Combretaceae	Dehradun FD
90.	<i>Terminalia citrina</i>	Combretaceae	Dehradun FD
91.	<i>Toona ciliate</i>	Meliaceae	Motichur, Rajaji NP Haldwani FD
92.	<i>Toona sinensis</i>	Meliaceae	SanjhaDarbar, Mussoorie FD
93.	<i>Tsuga dumosa</i>	Pinaceae	Tilthin, Narayan ashram Dharchula Range, Pithoragarh FD



94.	<i>Ulmus wallichiana</i>	Ulmaceae	Chakrata FD
95.	<i>Uncaria scandens</i>	Rubiaceae	Pithoragarh FD
96.	<i>Withania somnifera</i>	Solanaceae	Sushila Tiwari Herbal Garden, Rishikesh
97.	<i>Wrightia arborea</i>	Apocynaceae	Rajaji NP
98.	<i>Ziziphus xylopyrus</i>	Rhamnaceae	Ramnagar FD; Timli FD
99.	<i>Ziziphus jujube</i>	Rhamnaceae	Narendra Nagar FD, Tehri Garhwal FD
100.	<i>Ziziphus oxyphylla</i>	Rhamnaceae	Tiuni, Deoghar Range, Chakrata FD



Forest Research Institute (FRI),
New Forest P.O., Dehradun 248 006

