



GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: C
BIOLOGICAL SCIENCE

Volume 18 Issue 2 Version 1.0 Year 2018

Type: Double Blind Peer Reviewed International Research Journal

Publisher: Global Journals

Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Utilization Pattern, Distribution, and Tree Diversity of Betalghat Block, Nainital District (Western Himalaya)

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GJSFR-C Classification: FOR Code: 069999



Strictly as per the compliance and regulations of:



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Abstract- The Himalayan region is the repository of socio-cultural and biological diversity with high valued plants. Participatory Rural Appraisal (PRA) tools were used to document the diversity, distribution and utilization pattern of trees in the Betalghat Block of Nainital District (Western Himalaya). A total of 148 species belongs to 109 genera, and 50 families were recorded from the study area. Maximum numbers of species were reported in the altitudinal zone 1001-1500m followed by the altitudinal zone, 500-1000m. Fabaceae, Moraceae, Rosaceae, Salicaceae, Malvaceae, Anacardiaceae, Lauraceae, Sapindaceae, Apocynaceae, Combretaceae, Euphorbiaceae, and Myrtaceae were the dominant families. For each species, botanical and vernacular names, multipurpose uses (Fuel, fodder, edible, medicinal, timber, agricultural tools, religious, ornamental, avenue, and fiber) were provided. For the conservation of economically viable plant species prioritization, reforestation, and forest rehabilitation is required.

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I. INTRODUCTION

Vegetation is the most precious gift of nature which provided all kinds of essential requirements of the humans in the form of food, fodder, fuel, medicine, timber and oil, etc. (Anderson, 1986; Gaur, 1999). Species diversity is a component of biological communities and different methods are utilized to quantify it (Krebs, 1988). Floristic studies have required utmost importance in recent years in response to the need of developing and under developing countries to assess their plant wealth (Vediya and Kharadi, 2011; Patel et al., 2014). In the dry regions, trees play a role in maintaining an ecological balance and to enhance the life style of peoples. If we see the role of trees in rural landscape in a functional and expanded form then we can understand its importance (FAO, 1989a; Chavda and Mehta, 2015).

In the world, trees have always been associated with wisdom and immortality. Some trees also play a role in many of the world's mythologies. Woody vegetation

plays an important role in prevention of soil erosion and increasing the water holding capacity, improving and securing the soil (Chavda and Mehta, 2015). Woody vegetation is used as fuel wood, food for humans and animals, medicine, dyes, fiber, and forage for livestock. Maximum wood of the forests is used as fuel in the world. Reduction of this resource can have negative effect on the prosperity of some populations (Chavda and Mehta, 2015). Forest is also very important in absorption of carbon, maintaining the oxygen balance in environment and losing of excess of water in the form of water vapours through transpiration (Sandhyarani et al., 2007; Mulia et al., 2010; Chavda and Mehta, 2015).

Uttarakhand is a part of Indian Himalayan Region (IHR) situated at latitudes 28°43'45"-31°8'10" N and longitudes 77°35'5"-81°2'25" E (Uniyal et al., 2007). Many workers have worked in this region ethnobotanically and floristically; i.e., Osmaston, 1927; Gupta, 1968; Kalakoti, 1983; Pandey, 1985; Pant, 1986; Pangtey and Rawat, 1987; Pangtey et al., 1988b; Gaur, 1999; Joshi and Joshi, 2001; Tewari et al., 2010; Kumari et al., 2011; Rawat and Vishvakarma, 2011; Sharma et al., 2011; Gangwar and Gangwar, 2011; Yadav and Bisht, 2013; Kanwal and Joshi, 2015; Pande et al., 2016; Pandey et al., 2016, 2017; Singh et al., 2017; Arya et al., 2018; Joshi et al., 2018. In recent years, documentation of traditional knowledge on floral diversity becomes a prerequisite to preserve traditional system of a region. Therefore, in the present study, a contribution has been made for diversity, distribution and utilization pattern of trees of Betalghat Block of Nainital district (Western Himalaya) with botanical name, vernacular name, and family and ethnobotanical uses for further research.

II. MATERIALS AND METHODS

a) Geographical description of the study area

The study was conducted in twelve sites of Betalghat block (Nainital District) viz. Chimariya, Dhari-Khemi, Digthari, Simtaya, Phalyani, Padli, Bhowali, Kainchi, Dhunikhal, Kanda, Pankatara and Bhatrojkan of Nainital district (during year 2016-2018) lies between 29°38'925" North latitude and 79°49'465" East longitude, covering an area of 256.33 Km² an altitudinal range varies from 700 to 1800 m asl (Fig. 1). The study area is

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bounded by Tarikhet, Bhikyasain, and Sult block of Almora district and Kotabag and Ramgarh block of Nainital district. The vegetation mainly comprises of the tropical, sub-tropical and temperate forest.

b) Climate

Long snowy winter and summer season is the characterized features of the climate of Nainital District. It is temperate and monsoon type (Singh and Singh, 1992) having four distinct seasons viz., monsoon (July to September), post-monsoon (October to November), winter (December to January) and summer (April to mid-June). Standard instrument was used to obtain the climatic data. The average rainfall is 1800 mm. The maximum temperature in the Nainital district is 42.2°C and, the maximum is -5.4°C.

c) Data collection and sample identification

Primary as well as secondary sources were used to collect the information on species diversity of

trees and their economic uses and dependency of community on species. Participatory Rural Appraisal (PRA) tools (Silverman, 2005) were used to carry out the study. The study is based on the identification of tree species with the help of local/rural peoples, farmers, traditional knowledge holders to know the local names and multipurpose uses of the collected plants. The plant's specimens were collected and identified with the help of different floras and manuscripts, standard literature (Osmaston, 1927; Gupta, 1968; Gaur, 1999, Joshi et al., 2018) and matched with the herbarium specimen of Regional Ayurvedic Research Institute, (RARI) CCRAS, Ranikhet. The well-preserved plant specimens were deposited in the Department of Botany, Kumaun University, Nainital.

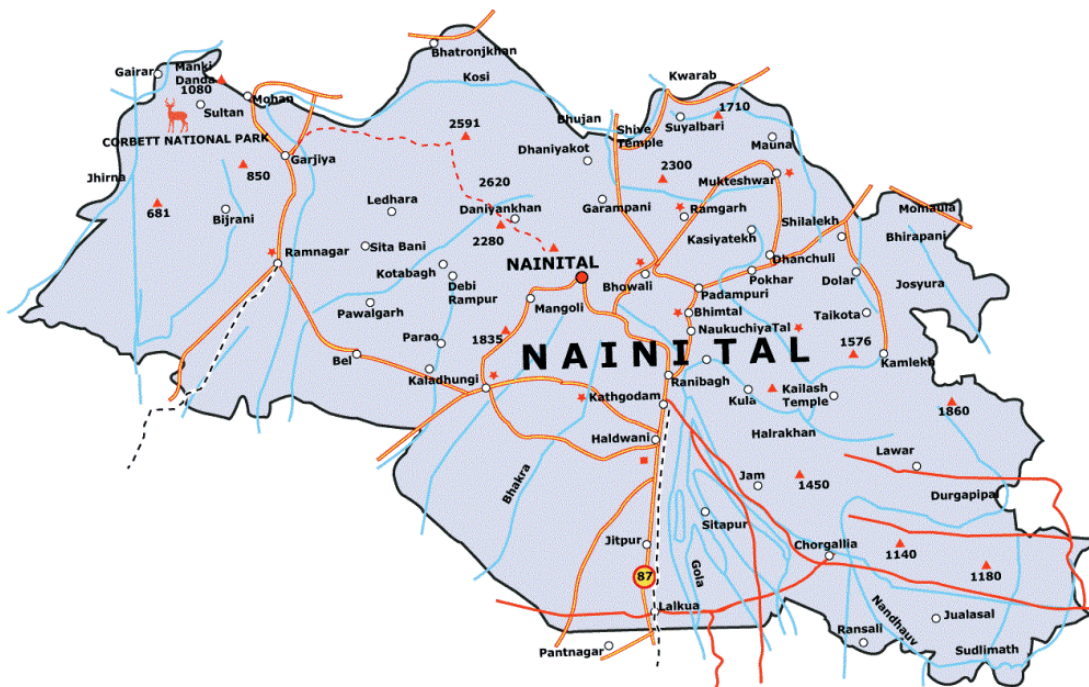


Fig. 1: Map of the study area

(Source- <http://www.uttaranchal.org.uk>)

III. RESULTS AND DISCUSSIONS

a) Diversity

The people living in this region are totally dependent on the biological resources. The integral part of their economy and their livelihood are agriculture and livestock. The local inhabitants of the study area have a long tradition of using the plant resource for their various daily basic needs such as medicine, fodder, fuel, timber, agricultural implements, edible, religious and other uses. In present study, 148 species of trees were recorded i.e., Angiosperms (46 families, 103 genera and, 141

species) and Gymnosperms (four families, six genera and, seven species). Out of 50 families recorded Fabaceae (17 species) is the most diverse family, followed by Moraceae (14 species), Rosaceae (8 species), Salicaceae (7 species), Malvaceae (6 species), Anacardiaceae, Lauraceae, and Sapindaceae (5 species each), Apocynaceae, Combretaceae, Euphorbiaceae and Myrtaceae (4 species each) (Fig. 2). Total 148 species were recorded, out of which 30 Angiosperms, 4 Gymnosperms were recorded as cultivated and 111 Angiosperms, 3 Gymnosperms occurred in wild

conditions (Fig. 3). All the families are arranged in alphabetical order and updated with Tropicos (www.tropicos.org) (Table 1.)

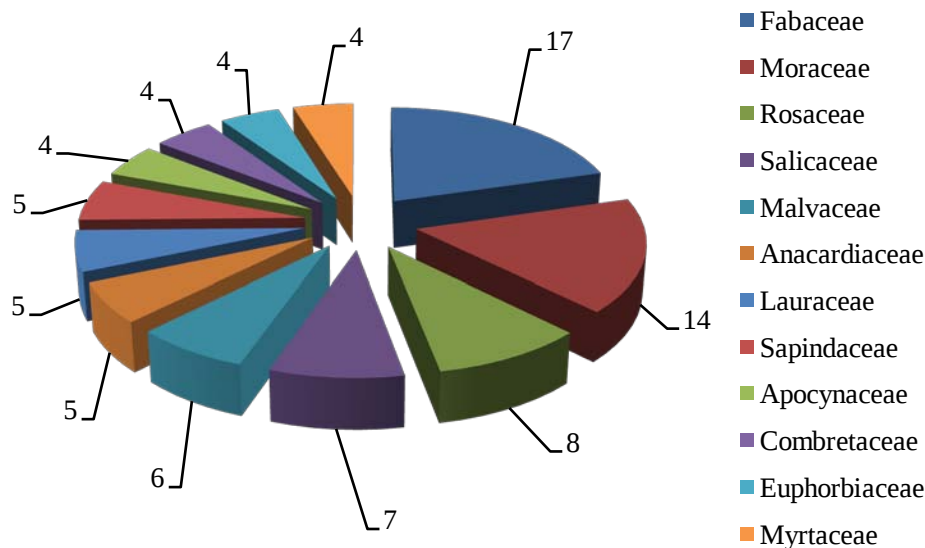


Fig. 2: Families representing the highest number of tree species

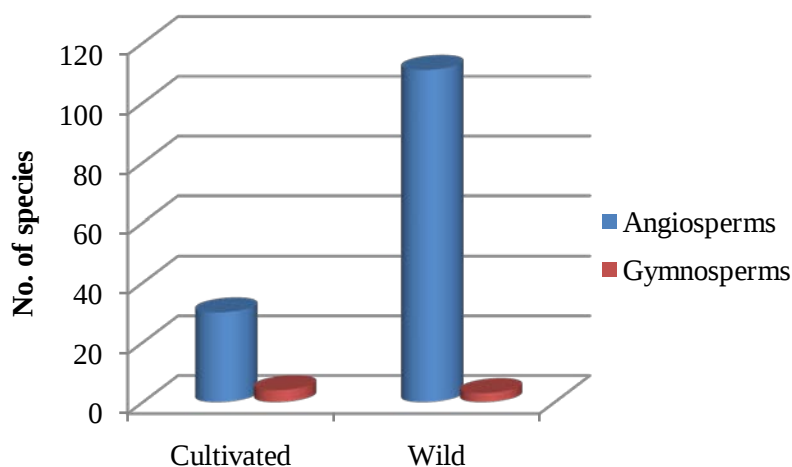


Fig. 3: Representation of cultivated & wild tree species

b) Altitudinal distribution

Along with an altitudinal gradient, altitudinal zone 1001-1500m showed the maximum number of species (Deciduous: 86, Evergreen: 45 spp.), followed by the zone, 500-1000m (Deciduous: 76, Evergreen: 33 spp.), 1501-2000m (Deciduous: 46, Evergreen: 38 spp.). Altitudinal zone, 1001-1500m considered as relatively a potential zone due to the representation of the maximum number of species. Overlapping of the species within the altitudinal zones were observed. Species distribution in different zones is presented (Fig. 4).

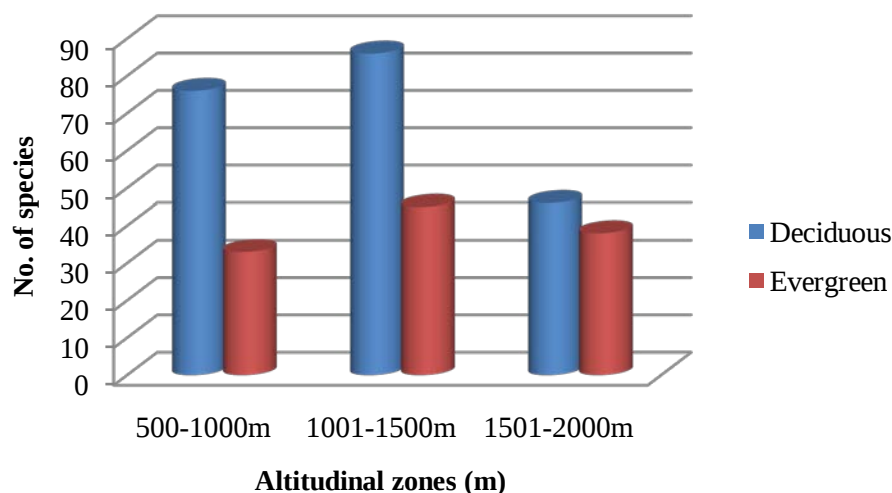


Fig. 4: Distribution of deciduous/evergreen trees along altitudinal zones

c) Economic importance

Of the total species, 26% species were used as fuel, 23% as fodder, 15% as edible, 12% as medicinal, 8% as timber, 6% as agricultural implements, 3% as ornamental, and religious, 2% as avenue, and fiber

(Table 1 and Fig. 5). In the percent distribution of plant part of different species being used leaf were most commonly used part (34%) followed by wood (32%), fruit (16%), bark (9%), seed (3%), flower (2%) and root, latex, resin, and whole plant (1% each) (Fig. 6).

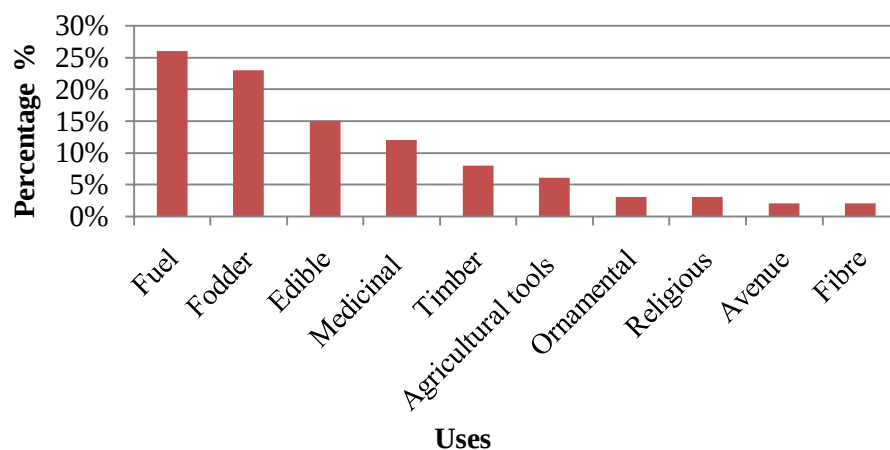


Fig. 5: Uses of tree species

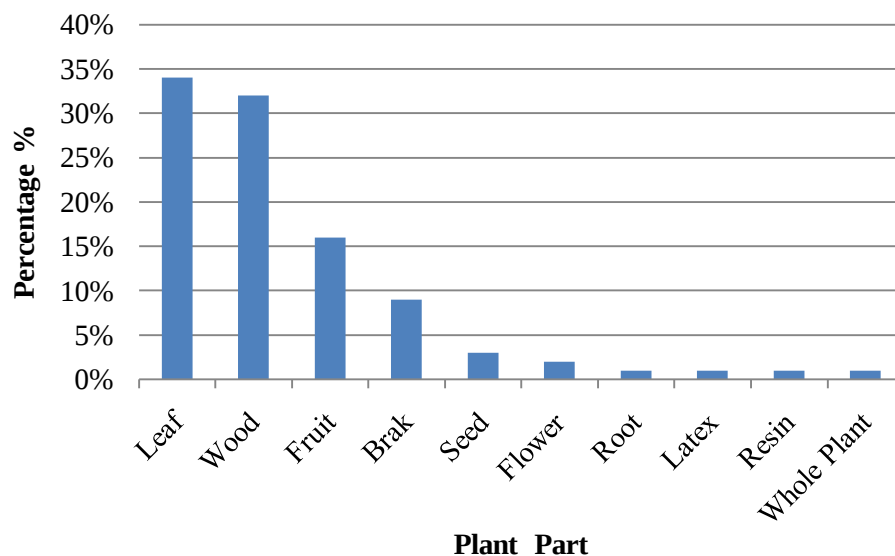


Fig. 6: Representation of plant part used

The present study recorded 148 species of trees from Betalghat Block, Western Himalaya. Various studies has been made i.e., Osmaston, (1927) reported 290 species of trees from Kumaon, Pant and Samant, (2010) recorded 97 species from Mornaula Reserve forest in Kumaun, Western Himalaya, Kumari, (2011) recorded 152 species from Almora district, Uttarakhand, Ballabha et al., (2014) recorded 73 species in Alaknanda valley, Garhwal Himalaya, Kishor, (2015) recorded 56 species in Munsyari Region, Kumaun Himalaya. Rawat et al., (2016) recorded 92 species from Montane zone, Western Ramganga valley, Uttarakhand, India and Bhatt et al., (2016) recorded 490 tree species from Western Himalaya, Pandey et al., (2017) reported 73 species of fodder trees in Betalghat Block, Nainital District, Kumaun Himalaya, Chauhan et al., (2017) recorded 39 species in District Tehri Garhwal (Western Himalaya) and Joshi et al., (2018) recorded 934 species from Ranikhet, West Himalaya.

IV. CONCLUSION

For the human existence and economic well being, ecosystem services and stability biodiversity is essential (Singh, 2002). The present study concluded that this region is a reservoir of an enormous natural floral diversity. The local inhabitants of this area living in the vicinity of the forests possess vast practical knowledge of biological resources and ethnobotanical uses. Most of the tree species were used as multipurpose species. The present study, concluded 148 tree species which belongs to 109 genera and 50 families. In the present study the species of *Pittosporum eriocarpum* Royle, *Oroxylum indicum* (L.) Kurz, and *Cinnamomum tamala* (Buch.-Ham.) Nees. & Eberm. are recorded under various threat categories by (IUCN, CAMP). This information is useful in developing strategies for the conservation and management of the species.

V. ACKNOWLEDGEMENTS

The authors are thankful to local people, informants for their immense help during the tenure of the study. We are also thankful to Director, Regional Ayurvedic Research Institute (RARI), CCRAS, Thapla, Ranikhet and Head, Department of Botany, Kumaun University, Nainital for providing infrastructure, facilities and encouragement. We are also thankful to IERP, GBPNIHESD, Kosi Katarmal, Almora.

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Table 1: Diversity, distribution and utilization of Trees of Betalghat Block, Kumaun Himalaya

Family/Species	Local Name	Altitudinal Range (m)	Fl & Fr time	Part Use	Uses	TH	SO
Anacardiaceae							
<i>Lannea coromandelica</i> (Houtt) Merr.	Jhingan	400-1200	Mar-Jul	Lf, Br, Wd	M, Fo, Fu	D	W
<i>Mangifera indica</i> L.	Am	200-1400	Mar-Jul	Fr, Lf, Wd	Ed, Re, Fu	E	C
<i>Pistacia integerima</i> Sw.	Kakar	600-1800	Mar-May	Lf, Fr, Wd	Fo, M, Fu, Ti	D	W
<i>Rhus wallichii</i> Hk. f.	Akoria	1000-2400	May-Oct	Wd	Fu, At	D	W
<i>Semecarpus anacrdium</i> L.f.	Bhilwa	400-1100	Jan-Apr	Lf, Fr,Wd	Fo, Ed, Fu	D	W

Annonaceae							
<i>Annona squamosa</i> L.	Sarifa	400-1000	May-Jan	Fr, Lf, Br	Ed, M	E	C
<i>Polyalthia longifolia</i> (Sonn.) Thw.	Ashoka	300-1000	Mar-Sep	-	A, O	E	C
Apocynaceae							
<i>Alstonia scholaris</i> (L.) R.Br.	Chatun	400-1200	Dec-Jun	Br, Lf	M	E	W
<i>Holarrhena pubescens</i> Wall. ex G. Don	Kwera	400-1300	Apr-Feb	Lf, Wd, Br, Lt	M, Fo, Fu	D	W
<i>Thevetia peruviana</i> (Pers.) Schum.	Pili kaner	200-1200	Jan-Dec	-	O	E	C
<i>Wrightia arborea</i> (Dennst.) Mabb.	Dudhi	400-1400	May-Mar	Fr, Lf	Fo, Ed	D	W
Aquifoliaceae							
<i>Ilex diplyrena</i> Wall.	Kandela	1500-3200	Apr-Feb	Lf, Wd	Fo, Fu	E	W
Araucariaceae							
<i>Araucaria bidwilli</i> Hook.	Bunya tree	1200-2800	Sep-Nov	-	O	E	C
<i>Araucaria columnaris</i> (J.R. Forst.) Hook.	Bunya tree	1000-2000	Sep-Nov	-	O	E	C
Arecaceae							
<i>Phoenix humilis</i> Royle	Thakal	200-1400	Dec-Jun	Lf, Fr	Fo, Ed	E	W
Betulaceae							
<i>Alnus nepalensis</i> D. Don	Utees	1200-2900	Oct-Jan	Lf, Wd	Fo, Fu, At	D	W
Bignoniaceae							
<i>Jacaranda mimosifolia</i> D. Don.	Jacrandia	500-2000	Mar-Oct	-	A, O	D	C
<i>Oroxylum indicum</i> (L.) Kurz	Tarulu	300-1200	Jun-Dec	Br, Lf, Fr, Wd	M, Fo, Fu	D	W
Boraginaceae							
<i>Cordia obliqua</i> Willd.	Bairala	600-1300	Mar-Jul	Lf, Fr, Wd	Fo, Ed, Fu, Ti	D	W
<i>Ehretia acuminata</i> R.Br.	Pudila	800-2000	Mar-Dec	Lf, Fr, Wd	Fo, Ed, Fu, Ti	D	W
<i>Ehretia laevis</i> Roxb.	Chamror	600-1500	Mar-May	Lf, Fr, Wd	Fo, Ed, Fu, At	D	W
Cannabaceae							
<i>Celtis australis</i> L.	Kharik	1300-2500	Mar-Oct	Lf, Fr, Wd	Fo, Ed, Fu, Ti	D	W
<i>Celtis tetrandra</i> Roxb.	Kharik	300-1800	Feb-Oct	Lf, Fr, Wd	Fo, Ed, Fu	D	W
Caricaceae							
<i>Carica papaya</i> L.	Papita	300-1200	Apr-Sep	Lf, Fr	Ed, M	D	C
Celastraceae							
<i>Cassine glauca</i> Kuntze	Dhebari	600-1500	Jun-Apr	Wd	Fu	D	W
<i>Euonymus pendulus</i> Wall. ex Roxb.	Bhambeli	1500-2800	May-Feb	Lf, Wd	Fo, Fu	D	W
Cephalotaxaceae							
<i>Cephalotaxus griffithii</i> Hook.f.	Cow tail pin	1300-3700	Sep-Nov	Fr, Lf, Sd	Ed, M	D	C
Combretaceae							
<i>Anogeissus latifolia</i> Wall.	Bakla	600-1400	May-Mar	Lf, Br, Wd	Fo, M, Fu, Ti	D	W
<i>Terminalia alata</i> Roth	Saij	350-1200	Jun-Apr	Lf, Wd	Fo, Fu, Ti	D	W
<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Bahera	350-1200	Apr-Feb	Lf, Fr, Wd	Ed, Fo, M, Fu	D	W
<i>Terminalia chebula</i> Retz.	Harar	350-1400	Apr-Mar	Lf, Fr, Wd	Ed, Fo, M, Fu	D	W
Cornaceae							
<i>Swida macrophylla</i> (Wall.) Sojak	Khagsi	1300-2500	Apr-Feb	Lf, Wd	Fo, Fu	D	W
<i>Swida oblonga</i> (Wall.) Sojak	Gauntia	1400-2500	Sep-May	Lf, Wd	Fo, Fu	D	W
Cupressaceae							
<i>Cupressus torulosa</i> D. Don	Surai	900-3000	Jan-Nov	Wd	Fu, A, O	D	W
<i>Thuja orientalis</i> L.	Mor-pankhi	900-2800	Jul-Aug	-	A, O, Re	D	C
Daphniphyllaceae							
<i>Daphniphyllum himalayense</i> (Benth.) Müll. Arg.	Ratnali	1600-2800	Mar-Aug	Lf, Wd	Fo, Fu, At	D	W

Dipterocarpaceae							
<i>Shorea robusta</i> Gaertn. f.	Sal	300-1300	Mar-Jul	Rs, Lf, Wd	Fo, M, Fu, Ti	D	W
Ebenaceae							
<i>Diospyros kaki</i> L.	Kaku	1500-2500	May-Nov	Fr	Ed	D	C
<i>Diospyros montana</i> Roxb.	Tendu	200-1200	Apr-Dec	Wd	At	D	W
Ericaceae							
<i>Lyonia ovalifolia</i> (Wall.) Drude.	Anyar	1300-3500	Apr-Sep	Lf, Wd	Fo, Fu	D	W
<i>Rhododendron arboreum</i> Sm.	Burans	1200-3300	Mar-Nov	Fl, Lf, Wd	M, Ed, Fu, Re	D	W
Euphorbiaceae							
<i>Bridelia retusa</i> (L.) Spreng.	Kagroli	300-1000	Apr-Feb	Lf, Fr, Wd	Fo, Ed, Fu	D	W
<i>Mallotus philippinensis</i> (Lamk) Muell.-Arg.	Riyoni	300-1500	Sep-May	Lf, Fr, Sd, Rt, Wd	Fo, M, Fu, Ti	D	W
<i>Sapium insigne</i> (Royle) Benth.ex Hook. f.	Khina	300-2000	Feb-Mar	Lt	M	D	W
<i>Sapium sebiferum</i> (L.) Dum. Cours.	Charbi	800-2000	Jun-Dec	Lf, Wd	Fo, Fu	D	W
Fabaceae							
<i>Acacia catechu</i> (L. f.) Willd.	Khair	300-1300	May-Jan	Br, Lf, Wd	M, Fo, Ti, Fu	D	W
<i>Acacia dealbata</i> L.	Acacia	1200-2000	Feb-Aug	Wd	A, O, Fu	D	W
<i>Albizia chinensis</i> (Osbeck) Merr.	Siris	300-1500	Apr-Mar	Lf, Wd	Fo, Fu, Ti	D	W
<i>Albizia julibrissin</i> Durazz.	Kuneri	1200-2500	Apr-Dec	Lf, Wd	Fo, Fu, Ti	D	W
<i>Albizia lebbeck</i> (L.) Benth.	Siris	400-1500	Apr-Nov	Lf, Br, Wd	Fo, M, Fu, Ti	D	W
<i>Bauhinia purpurea</i> L.	Kwieyal	300-1600	Sep-Mar	Lf, Fl, Wd	Ed, Fo, Fu, At	D	W
<i>Bauhinia semla</i> Wunder.	Kandela	300-1700	Sep-Apr	Lf, Wd	Fo, Fu, At	D	W
<i>Bauhinia variegata</i> L.	Kanchnar	300-1700	Feb-Aug	Lf, Fl, Br, Wd	Ed, M, Fu, At	D	W
<i>Cassia fistula</i> L.	Amaltas	300-1400	Apr-Jan	Fr, Br, Lf, Wd	M, Fu, Ed, At	D	W
<i>Cassia surattensis</i> Burm. f.	-	300-1500	Apr-Sep	Lf	Fo	D	W
<i>Dalbergia sericea</i> G. Don	Ghogra	300-1650	Mar-Aug	Lf, Wd	Fo, Fu	D	W
<i>Dalbergia sissoo</i> Roxb.	Sisham	300-1500	Mar-Jun	Lf, Fl, Wd	M, Fo, Fu, Ti, At	D	W
<i>Erythrina suberosa</i> Roxb.	Rungar	300-1500	Mar-Jun	Lf, Br, Lf, Wd	M, Fu	D	W
<i>Leucaena leucocephala</i> (Lam.) De Wit.	Vilaiti baval	300-1200	Sep-Dec	Lf, Wd	Fo, Fu	D	C
<i>Ougeinia oojeinensis</i> (Roxb) Hochst.	Sandan	300-1600	Mar-Jun	Lf, Br, Wd	Fo, M, Fu, Ti, At	D	W
<i>Robinia pseudocasia</i> L.	Robinia	1200-2400	May-Oct	Lf, Wd	Fo, Fu, Ti	D	C
<i>Tamarindus indica</i> L.	Imali	200-1100	May-Apr	Fr, Lf, Wd	Ed, Fo, Fu, At	D	C
Fagaceae							
<i>Castanea sativa</i> Mill.	Chesnut	1500-2500	Mar-Aug	Fr, Wd	Ed, Fu	D	C
<i>Quercus glauca</i> Thunb.	Phalyant	800-2000	May-Aug	Lf, Wd	Fu	D	W
<i>Quercus leucotrichophora</i> A. Camus.	Banj	1200-2500	Apr-Oct	Lf, Wd	Fo, Fu, At	D	W
Juglandaceae							
<i>Engelhardtia spicata</i> Blume.	Garmahwa	600-1600	Mar-Jun	Lf, Wd	Fu, Fo	D	W
<i>Juglans regia</i> L.	Akhrot	1300-2800	Feb-Sep	Fr, Br, Lf, Wd	M, Ed, Ti, Fu	D	C

Lamiaceae							
<i>Premna barbata</i> Wall. ex Schaner.	Agiu	600-1300	Mar-Jul	Lf, Br, Wd	Fo, M, Fu	D	W
<i>Tectona grandis</i> L. f.	Sagon	300-1000	Apr-Aug	Wd	Ti, Fu	D	W
Lauraceae							
<i>Cinnamomum tamala</i> (Buch.-Ham.) Nees. & Eberm.	Tejpat	400-2100	Feb-Oct	Lf, Br	M	D	W
<i>Neolitsea pallens</i> (D. Don) Momiy. & Hara.	Chirar	1400-2500	Mar-Nov	Lf, Wd	Fo, Fu, Ti	D	W
<i>Persea duthiei</i> (King) Kosterm.	Kaula	1500-2800	Feb-Sep	Lf, Wd	Fo, Fu	D	W
<i>Persea gamblei</i> (King ex Hook.f.) Kosterm.	Kaula	500-1700	Mar-Aug	Lf, Wd	Fo, Fu	D	W
<i>Persea odoratissima</i> (Nees) Kosterm.	Kaula	700-2000	Feb-Jun	Lf, Wd	Fo, Fu	D	W
Lythraceae							
<i>Lagerstroemia indica</i> L.	Dhaura	500-1800	Mar-Oct	-	O, A	D	C
<i>Lagerstroemia parviflora</i> Roxb.	Dhauri	350-1200	Apr-Jan	Lf, Wd	Fo, Fu, At	D	W
Magnoliaceae							
<i>Magnolia grandiflora</i> L.	-	300-2000	May-Oct	-	O	D	C
<i>Michelia champaca</i> L.	Champa	300-1600	Jun-Nov	-	O, Re	D	C
Malvaceae							
<i>Bombax ceiba</i> L.	Semal	300-1500	Jan-May	Lf, Fl, Fr, Wd	Ed, Fo, Ti, Fu, Fb	D	W
<i>Firmiana fulgens</i> (Wall. ex Masters) Corner	Budella	350-1300	Mar-Jun	Br, Lf, Sd	Fo, M, Ed, Fb	D	W
<i>Grewia asiatica</i> L.	Pharsniya	400-1500	Apr-Nov	Lf, Wd	Fo, Fu, Ed	D	W
<i>Grewia optiva</i> J. R. Drumm. ex Burret.	Bhimal	300-1400	Apr-Nov	Lf, Br, Wd	Fo, Ed, Fu, Fb	D	W
<i>Kydia calycina</i> Roxb.	Patha	300-1200	Jul-Feb	Lf, Wd	Fo, Fu, At	D	W
<i>Sterculia villosa</i> Roxb.	Budella	300-1400	Feb-Jul	Br, Lf, Sd	M, Ed	D	W
Meliaceae							
<i>Azadirachta indica</i> A. Juss.	Neem	350-1000	Mar-Jul	Br, Lf, Fr, Sd, Wd	M, A, Ti, At, A	D	C
<i>Melia azedarach</i> L.	Batain	300-1500	Mar-Feb	Lf, Br, Fl, Sd, Wd	M, Fo, Fu, Ti, At	D	W
<i>Toona ciliata</i> M. Roem.	Toon	600-1800	Mar-Jul	Lf, Wd	Fo, Fu, Ti, At	D	W
Menispermaceae							
<i>Cocculus laurifolius</i> DC.	Til phokar	300-1600	Apr-Jun	Lf, Wd	Fo, Fu	D	W
Moraceae							
<i>Artocarpus heterophyllus</i> Lam.	Kathal	300-1200	Feb-Jul	Fr	Ed	D	C
<i>Ficus auriculata</i> Lour.	Timil	500-1800	Feb-Jul	Lf, Fr, Wd	Ed, Fo, M, Fu, Re	D	W
<i>Ficus benghalensis</i> L.	Bargad	300-1400	Feb-Nov	Wp	Re, Ed, Fo	D	W
<i>Ficus elastica</i> Roxb.	-	400-1700	Apr-Sep	-	O	D	C
<i>Ficus hispida</i> L.f.	Totmila	300-1400	Mar-Jun	Lf, Fr, Br, Wd	Ed, Fo, Fu, Fb	D	W
<i>Ficus neriifolia</i> Sm.	Dhudhi	1200-2500	Mar-Sep	Lf, Fr, Wd	Fo, Ed, Fu	D	W
<i>Ficus palmata</i> Forsk.	Bedu	800-2000	May-Aug	Lf, Fr, Lt, Wd	Ed, Fo, M, Fu	D	W

<i>Ficus racemosa</i> L.	Gular	300-1400	Mar-Aug	Lf, Fr, Wd	Ed, Fo, Fu	D	W
<i>Ficus religiosa</i> L.	Pipal	300-1600	Oct- May	Wp	Re, M, Fo, Ed	D	W
<i>Ficus semicordata</i> Buch.-Ham. ex Sm.	Khunia	700-1500	May-Oct	Lf, Fr, Br, Wd	Ed, Fo, Fu, Fb	D	W
<i>Ficus subincisa</i> Buch.-Ham. ex Sm.	Chanchari	500-1600	Mar-Jun	Lf, Fr, Wd	Ed, Fo, Fu	D	W
<i>Ficus virens</i> Aiton	Pilkhan	500-1300	Feb-May	Lf, Br, Wd	Fo, Fu, Fb	D	W
<i>Morus alba</i> L.	Shatoot	300-2200	Mar-Jun	Fr, Lf, Wd	Ed, Fo, Fu	D	W
<i>Morus serrata</i> Roxb.	Kimu	1000-2800	Mar-May	Fr, Lf, Wd	Ed, Fo, Fu	D	W
Moringaceae							
<i>Moringa oleifera</i> L.	Sehjan	300-1200	Oct-Jun	Lf, Fr, Fl, Br, Rt, Wd	Fo, Ed, M, Fu	D	W
Myricaceae							
<i>Myrica esculenta</i> Buch.-Ham. ex D. Don	Kaphal	1500-2500	Oct-Jun	Lf, Fr, Br, Wd	Ed, M, Fo, Fu	D	W
Myrtaceae							
<i>Callistemon citrinus</i> (Curtis) Skeels.	Bottle brush	300-2500	Mar-Dec	-	O	D	C
<i>Eucalyptus globulus</i> Labill.	Eucalyptus	600-1600	Feb-Jun	Wd	A, Fu	D	W
<i>Psidium guajava</i> L.	Amrud	350-1600	May-Jun	Fr, Lf, Wd	Ed, M, Fu	D	C
<i>Syzygium cumini</i> (L.) Skeel.	Jamun	350-1400	May-Jul	Lf, Sd, Fr, Wd	M, Fu, Ti, Ed.	D	W
Oleaceae							
<i>Fraxinus micrantha</i> L.	Angu	1500-2800	Mar-Sep	Lf, Wd	Fo, Fu, At	D	W
<i>Olea grandiflora</i> Wall. ex G. Don	Garur	600-1800	Mar-Feb	Lf, Wd	Fo, Fu, Ti, At	D	W
Phyllanthaceae							
<i>Glochidion assamicum</i> (Mull. Arg.) Hook. f.	-	600-1100	Mar-Dec	Lf, Wd	Fo, Fu	D	W
<i>Phyllanthus emblica</i> L.	Amla	500-1600	Mar-Jan	Lf, Fr, Wd	Ed, M, Fu, Re	D	W
Pinaceae							
<i>Cedrus deodara</i> Loud.	Deodar	1500-3700	Sep-Dec	Wd	M, Fu, Ti, Re	D	W
<i>Pinus roxburghii</i> Sarg.	Chir	700-2500	Feb-Jun	Rs, Lf, Wd,	M, Fu, Ti, At,	D	W
				Sd	Ed, Re		
Pittospraceae							
<i>Pittosporum eriocarpum</i> Royle.	Agni	1000-2200	Mar-Nov	Lf, Br, Rt	M, Fo	D	W
Proteaceae							
<i>Grevillea robusta</i> A. Cunn. ex R. Br.	Silver oak	400-2000	Mar-Aug	Lf, Wd	O, Fo, Fu, Ti	D	W
Rosaceae							
<i>Prunus armeniaca</i> L.	Khubani	1200-2500	Mar-Jun	Fr, Lf	Ed	D	C
<i>Prunus cerasoides</i> Buch.-Ham. ex D. Don	Padam	600-2600	Oct-May	Lf, Br, Sd, Fl, Wd	Fo, M, Ed, Fu, Re	D	W
<i>Prunus domestica</i> L.	Pulam	1200-2500	Mar-Jun	Fr, Lf	Ed, Fo	D	C
<i>Prunus persica</i> (L.) Batsch.	Aru	600-3000	Mar-Jul	Fr, Lf	Ed, Fo, M	D	C
<i>Pyrus communis</i> L.	Nashpati	600-2500	Mar-Sep	Fr, Lf	Ed, Fo	D	C

<i>Pyrus malus</i> L.	Seb	1400-2500	Mar-Jan	Fr, Lf	Ed, Fo	D	C
<i>Pyrus pashia</i> Buch-Ham.ex D. Don	Jangli mehal	700-2600	Feb-Dec	Lf, Fr, Wd	Fo, Fu, Ed, At	D	W
<i>Stranvaesia nussia</i> (D. Don) Decne.	Jangli garhmehal	1200-2200	Apr-Sep	Lf, Wd	Fo, Fu	D	W
Rubiaceae							
<i>Haldina cordifolia</i> (Roxb.) Ridsdale	Haldu	500-1100	Jun-Jul	Lf, Br, Rt, Wd	Fo, M, Fu, Ti, At	D	W
<i>Wendlandia heynei</i> (Roemer & Schultes) Santapau & Merchant.	Tirchunia	700-1600	Mar-Jun	Lf, Wd	Fo, Fu	D	W
Rutaceae							
<i>Aegle marmelos</i> (L.) Correa	Bel	300-1200	Feb-Aug	Fr, Lf, Rt, Wd	M, Ed, Re	D	W
<i>Citrus jambhiri</i> Lushington.	Jamir	1000-1800	Mar-Jun	Fr	M, Ed	D	C
<i>Citrus medica</i> L.	Nimboo	1000-2000	Apr-Dec	Fr	M, Ed	D	C
<i>Citrus sinensis</i> (L.) Osbeck	Santara	1200-2000	Apr-Feb	Fr	Ed	D	C
Sabiaceae							
<i>Meliosma simplicifolia</i> (Roxb.) Walp.	Coghsa	1200-2000	Apr-Nov	Lf, Wd	Fo, Fu	D	W
Salicaceae							
<i>Casearia elliptica</i> Willd.	Chilla	600-1200	Apr-Jul	Wd	Fu	D	W
<i>Casearia graveolens</i> Dalzel	Chilla	250-1600	May-Jul	Wd	Fu	D	W
<i>Flacourtia indica</i> (Burm.f.) Merr.	Kangu	600-1800	Jul-Dec	Lf, Fr, Wd	Fo, Ed, Fu	D	W
<i>Populus ciliata</i> Wall. ex Royal	Pahari papal	800-3200	Mar-Jun	Lf, Br, Wd	Fo, Fu, Ti, Fb	D	W
<i>Salix babylonica</i> L.	Majnu	1000-2200	Feb-Jul	Lf, Wd	Fo, Fu	D	W
<i>Salix tetrasperma</i> Roxb.	Gad-bhains	900-1200	Sep-Dec	Lf, Wd	Fo, Fu	D	W
<i>Xylosma longifolia</i> Clos.	Gardar	600-1500	Nov-May	Lf, Wd	Fo, Fu	D	W
Sapindaceae							
<i>Acer oblongum</i> Wall.ex DC.	Putli	1300-2100	Feb-Aug	Lf, Wd	Fu, Fo, Ti, At	D	W
<i>Aesculus indica</i> (Wall. ex Cambess.) Hook.	Jangli Pangar	1400-3200	May-Nov	Lf, Fr, Wd	Fo, M, Fu, A, O	D	W
<i>Litchi chinensis</i> Sonn.	Litchi	300-1200	Feb-Jul	Fr, Wd	Ed, Fu	D	C
<i>Sapindus mukorossi</i> Gaertn.	Ritha	600-1500	May-Feb	Lf, Sd, Wd	Fo, M, Fu	D	C
<i>Schleichera oleosa</i> (Lour.) Oken.	Kusum	300-1000	Mar-Aug	Lf, Fr, Sd, Wd	Ed, M, Fo, Fu, Ti	D	W
Sapotaceae							
<i>Aesandra butyracea</i> (Roxb.) Baehni	Chiura	900-1500	Nov-Jul	Fr, Sd, Lf, Wd	Ed, M, Fo, Fu	D	C
<i>Madhuca longifolia</i> (J. Koenig ex L.) J.F. Macbr.	Mahwa	300-1000	Mar-Jul	Fr, Wd	Ed, Ti	D	W
Symplocaceae							
<i>Symplocos paniculata</i> (Thunb.) Miq.	Lodh	1300-3000	Mar-Dec	Lf, Br, Wd	Fo, M, Fu	D	W

Ulmaceae							
<i>Holoptelea integrifolia</i> Planch.	Kanju	300-1000	Feb-May	Br, Lf, Wd	M, Fo, Ti, Fu	D	W
Urticaceae							
<i>Boehmeria rugulosa</i> Wedd.	Gheti	300-1700	Jul-Nov	Lf, Br, Wd	Fo, M, Fu	E	W

Abbreviation Used- Lf- Leaf; Fr- Fruit; Fl- Flower; Br- Bark; Rt- Root; Sd- Seed; Lt- Latex; Res-Resin; Wd Wood; WP- Whole plant; Fl & Fr- Flowering and Fruiting; Ed- Edible; Fo- Fodder; Fu- Fuel; M- Medicinal; Ti- Timber; Re- Religious; At- Agricultural tools; O- Ornamental; A- Avenue; Fb- Fibre; TH- Tree Habit; So- Source; D-Deciduous; E- Evergreen; C- Cultivated; W- Wild.

