

“Study of Relative Dominance of Certain Trees in Panyali Range of Kotdwara Region”

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Abstract

Present study embodies the analysis of ecological parameters of some trees of Panyali Range of Kotdwara Region, Uttarakhand, India. Since this area lies in Himalayan region, it is very rich in plant diversity. The aim of the present investigation was to determine the basal area and relative dominance of some tree species of Panyali forest area. During our present work, a total of 30 trees were identified belonging to 18 families. Shorea robusta was the most dominant tree species in the area under study having high relative dominance and basal area. These studies are helpful in determining the ecological significance of species in the community.

Key words: basal area, relative dominance, forest, ecological significance.

Introduction:

Trees in India are very important part of the cultural heritage of the country. They are renowned for their splendid and magnificent appearance and have been associated with wisdom and immortality. Some of the plants like Peepal, Banyan, Banana, Tulsi, etc. have been considered sacred for their special cultural and religious significance in India. Most trees found are native to India and some have been brought from other countries and

cultivated in India. These tree species have been a source of food, fodder, timber, firewood, traditional medicines, etc. and thus play a crucial role in the economic and social development of the country such as employment, forest products and protection of sites of cultural value (1-2). Some of these economically important trees are Neem, Tamarind, Dhak, Mango, Rohini, Haldu, Semul, Jamun, Toon, etc.). Use of plants in traditional medicines is also well known in India (3-4) where traditional knowledge has been used by poor people such as farmers, people of small villages and tribal communities for the treatment of common diseases (5).

India ranks 10th among the most forested nations in the world, the forest and tree cover is estimated to be about 23.4% of the total geographical area of the country with 76.87 million hectare of forest and tree cover (6). These forest ecosystems have been facing increased threats of degradation and fragmentation due to the rapid increase in human population near to these ecosystems (1). In the Himalayas of Uttarakhand,

conservation of biodiversity outside the protected area system is rich due to close association between religious, socio-cultural perspectives and conservation (7-8). The protected areas are important from the conservation point of view and include sacred groves displaying affluent floral and faunal diversity with some rare and threatened plant species specifying an ecosystem with different life forms (9-10). Present study was therefore aimed to analyse various ecological parameters for some trees of Paniyali range of Kotdwara.

Materials and Method:

Table 1: Matereological data of Kotdwara collected from Forest Division Kotdwara

Months	Temperature (°C)		Rainfall (cm)	Humidity (%)
	Min.	Max.		
Jan.	4	17	4	78
Feb	6	22	8	75
Mar.	15	26	11	55
Apr.	21	31	6	32
May	28	39	11	35
June	35	41	38	40
July	26	33	55	98
Aug.	20	26	34	55
Sep.	16	28	29	60
Oct.	19	25	7	55
Nov.	11	21	4	65
Dec.	7	18	5	80
Mean	17.33	27.25	212	

Methods and formulae used

The main materials required for the experiment were measuring tape, meter scale, note pad, pen, pencil, etc. To calculate the basal area of trees, firstly the average circumference of three individuals of each

Site Description

Kotdwara has sub-tropical to temperate climate which remains pleasant through out the year, but may vary from sever hot day in summer to sever cold day in winter. The region has around 28°C and 16°C maximum and minimum annual mean temperature respectively. The average annual rainfall in Kotdwara is around 210cm maximum of which is concentrated during the monsoon (Table 1). The vegetation of this area is of sub-tropical rain forest type and includes herbs, shrubs and tree having broad deciduous leaves.

tree species was measured at 1.3m up the trunk from ground level or by DBH method (diameter at breast height) by wrapping the measuring tape. The following formulae were applied to calculate the basal area of tree species;

Circumference, $C=2\pi r$

where, c = circumference, $\pi =22/7$ or 3.14 and
 r = radius

The value of circumference was used to find
out the diameter at breast height (DBH);

$$DBH = \frac{c}{\pi}$$

For calculating the radius of tree trunk,

$$r = \frac{c}{2\pi}$$

Basal area represents the actual cover or
dominance of plant species and was
determined by using the formula;

$$\text{Basal area} = \pi r^2$$

Finally relative dominance was calculated by
the following formula using the value of
basal area.

Relative dominance = $\frac{\text{Basal area of the species}}{\text{Total basal area of all the species}} \times 100$

Results and discussion:

During present study, a total of 30 tree species were identified and selected for ecological analysis that belonged to 18 families including Fabaceae (7 species and 6 genera), Moraceae (3 species and 2 genera), Meliaceae (3 genera and 3 species), Myrtaceae (3 genera and 3 species) and rest all other families were represented by single species each (Table 2).

Table 2: Ecological parameters of 30 tree species of Paniyali range of Kotdwara.

S. No	Botanical name	Common name	Family	Av.C (cm)	Av.BA (cm ²)	Av.R.D (%)
1.	<i>Azadirachta indica</i> A. Juss.	Neem	Meliaceae	100	795.8	1.67
2.	<i>Grevillea robusta</i> A. Cunn. ex R.Br.	Silver oak	Proteaceae	145	1672.6	3.50
3.	<i>Callistemon viminalis</i> (Sol. Ex Gaertn) G. Don.	Bottle brush	Myrtaceae	95	718.8	1.50
4.	<i>Crateva religiosa</i> G.Forst.	Serat	Capparaceae	116	1071.2	2.25
5.	<i>Mangifera indica</i> L.	Mango	Anacardiaceae	150	1790.6	3.76
6.	<i>Holoptelea integrifolia</i> Planch.	Papari	Ulmaceae	65	336.4	0.70
7.	<i>Bambusa bamboos</i> (L.) Voss	Bans	Poaceae	28	62.5	0.14
8.	<i>Mallotus philippensis</i> (Lam.)Muell. Arg.	Rohini	Euphorbiaceae	130	1345.5	2.83
9.	<i>Shorea robusta</i> Roth.	Sal	Dipterocarpaceae	380	11496.9	24.08
10.	<i>Tectona grandis</i> L.f.	Teak	Verbinaceae	132	1387.4	2.90
11.	<i>Saraca asoca</i> (Roxb.) Willd.	Ashoka	Fabaceae	60	286.4	0.60
12.	<i>Ficus religiosa</i> L.	Peepal	Moraceae	110	962.7	2.03
13.	<i>Artocarpus heterophyllus</i> Lam.	Kathal	Moraceae	140	1560.1	3.27
14.	<i>Melia azedarach</i> L.	Bakain	Meliaceae	178	2521.9	5.28

15.	<i>Acacia catechu</i> (L.f.) Willd.	Khair	Mimosaceae	200	3185.3	6.67
16.	<i>Aegle marmelos</i> (L.) Correa	Bael	Rutaceae	127	1283.7	2.68
17.	<i>Cassia fistula</i> L.	Amaltas	Fabaceae	138	1515.6	3.17
18.	<i>Dalbergia sisso</i> Roxb.	Seesham	Fabaceae	125	1244.7	2.60
19.	<i>Eucalyptus</i> sp.	Lyptis	Myrtaceae	166	2193.4	4.59
20.	<i>Albizia lebbek</i> (L.) Benth.	Sires	Fabaceae	138	1515.6	3.17
21.	<i>Adina cordifolia</i> (Roxb.) Hook. f.	Haldu	Rubiaceae	97	749.5	1.56
22.	<i>Bombax ceiba</i> L.	Semul	Bombaceae	175	2437.2	5.10
23.	<i>Phyllanthus emblica</i> L.	Amla	Phyllanthaceae	65	336.4	0.70
24.	<i>Syzygium cumini</i> (L.) Skeels.	Jamun	Myrtaceae	136	1471.8	3.10
25.	<i>Tamarindus indica</i> L.	Imli	Fabaceae	118	1108.6	2.33
26.	<i>Albizia odoratissima</i> (L.f.) Benth.	Black sires	Fabaceae	117	1089.8	2.28
27.	<i>Ficus racemosa</i> L.	Gular	Moraceae	98	764.2	1.60
28.	<i>Ziziphus mauritiana</i> Lam.	Ber	Rhamnaceae	85	574.8	1.20
29.	<i>Toona ciliata</i> M. Roem.	Toon	Meliaceae	132	1387.4	2.90
30.	<i>Butea monosperma</i> (Lam.) Taub.	Dhak	Fabaceae	105	877.8	1.84
Total basal area (cover) =					47744.6	100%

As indicated in table 2, *Shorea robusta* was having maximum basal area (11496.9) whereas it was found to be minimum in *Bambusa bamboos* (62.5). As expected from basal area, relative dominance was found to be highest in *Shorea robusta* (24.08 %) and

minimum in *Bambusa bamboos* (0.14%). These plants were also important with respect to their ethnomedicinal importance. Traditional healers or vaidas of this area had vast knowledge on the medicinal uses of these trees and the plant parts used. Some of these used are enlisted below in Table 3.

Table 3: Ethnomedicinal uses and plant parts used by traditional healers of Paniyali.

S. No	Plant species	Parts used	Ethnomedicinal uses
1.	<i>Azadirachta indica</i> A. Juss.	Leaves, bark	Skin diseases, fever, antimicrobial diuretic, antidote
2.	<i>Grevillea robusta</i> A. Cunn. ex R.Br.	Flower, fruit	For treatment of dermatitis
3.	<i>Crateva religiosa</i> G.Forst.	Dried leaves	Used for wound healing
4.	<i>Holoptelea integrifolia</i> Planch.	Bark, leaves	Diabetes, leprosy, skin diseases, oedema
5.	<i>Mangifera indica</i> L.	leaves, bark	Digestion and acidity etc.
6.	<i>Bambusa bamboos</i> (L.) Voss	Leaves	Vomiting of blood, leachy of the childbeds
7.	<i>Mallotus philippensis</i> (Lam.) Muell. Arg.	Fruit, leaves	Skin diseases, worm infestation, constipation, ulcer cough, renal
8.	<i>Shorea robusta</i> Roth.	Bark, resin	Infection, wounds, fever, haemorrhoid, skin diseases
9.	<i>Tectona grandis</i> L. f.	All parts	Piles, dysentery
10.	<i>Saraca asoca</i> (Roxb.) Willd.	Bark	Menorrhagia, dysentery, leucorrhoea, hemorrhages.
11.	<i>Ficus religiosa</i> L.	Leaf, fruit,	Gum diseases, boils, palpitation, cardiac weakness,

		seed, bark	gonorrhoea, haemorrhoids, diarrhoea, etc
12.	<i>Aegle marmelos</i> (L.) Correa	Leaves, fruit, root	Diabetes, cholesterol control, antimicrobial properties, constipation, dysentery, diarrheal.
13.	<i>Acacia catechu</i> (L.f.) Willd.	Bark, stem, flower	Digestive system, mitigate skin rashes, antifungal, antimicrobial.
14.	<i>Cassia fistula</i> L.	Whole	Diarrhoea, epilepsy, tumour, stomach.
15.	<i>Adina cordifolia</i> (Roxb.) Hook. f.	Bark, root	Aphrodisiac, skin diseases, biliousness, dysentery.
16.	<i>Bombax ceiba</i> L.	Root, flower	Diarrhoea, dysentery, styptic, skin troubles.
17.	<i>Phyllanthus emblica</i> L.	Whole	Inflammation, cancer, diabetes
18.	<i>Tamarindus indica</i> L.	Whole	Microbial activity, malaria, fever.
19.	<i>Albizia odoratissima</i> (L.f.) Benth.	Bark	Ulcer, leprosy, skin diseases, cough, diabetes.
20.	<i>Ficus racemosa</i> L.	Stem, bark, root	Hydrophobia, gynaecological disorder, urinary discharge, leprosy.
21.	<i>Toona ciliata</i> M. Roem.	Bark	Astringent and tonic to treat dysentery.
22.	<i>Syzygium cumini</i> (L.) Skeels.	bark, root	Dysentery and control of hyperglycaemia,
23.	<i>Butea monosperma</i> (Lam.) Taub.	Flower, fruit	Antiasthma tic agent in estrogenic activity mice.
24.	<i>Eucalyptus</i> sp.	Bark	Fever
25.	<i>Callistemon viminalis</i> (Sol. Ex Gaertn) G. Don.	Leaves, flowers	Dysentery, fever
26.	<i>Artocarpus heterophyllus</i> Lam.	Fruits, leaves, root	fever, boils, skin-diseases, eye-problems, ulcer, antitode to snake bites
27.	<i>Melia azedarach</i> L.	Whole	Eye disorders, ulcers, haemorrhoids, diabetes, fever, wounds, urinary diseases
28.	<i>Dalbergia sisso</i> Roxb.	Bark, Leaves	Inflammation, anti-microbial
29.	<i>Albizia lebeck</i> (L.) Benth.	Whole	Cancer, tumour, joint-pains
30.	<i>Ziziphus mauritiana</i> Lam.	Leaves, bark	Urinary problems

Conclusion:

The trees with high relative dominance are the most prominent species in the area under study. These dominating tree species are very important as far as their economic and social benefit is concerned and therefore, their conservation and management is required at the earliest. Forests are very important land use areas not only for increasing soil carbon store but also as a good tool for increasing carbon sink. Forests have the potential to protect the native tree by

providing alternatives for fuel, fodder and timber.

In our case, high relative dominance and basal area of *Shorea robusta* indicating it as the dominant and most important species of Paniyali range of Kotdwara as compared to the other tree species.

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