

Status and Distribution of *Coleus barbatus* Benth. in Tehri Garhwal District, Uttarakhand

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Abstract

Coleus barbatus Benth. (Lamiaceae) is an important medicinal herb in the sub-Himalayan tracts of North India. Four major watersheds, namely Chamba, Ghansali, Lambgaon and Pokhal were identified in Tehri Garhwal District during the present investigation and within each watershed various habitats like pine forest, oak forest, open slopes, arable land and abandoned cultivated areas were selected. Through random quadrat sampling data was collected and the population of *C. barbatus* was calculated. Banj oak and chir pine forests had least population of *C. barbatus* (< 0.1 individual's m⁻² and 0.1 individuals m⁻², respectively). The habitats like open chir pine forest (3.9 individual's m⁻²), open grasslands (2.4 individuals m⁻²), arable lands (3.2 individuals m⁻²) and abandoned cultivated areas (3.3 individuals m⁻²) supported good population of *C. barbatus*. The conservation measures are discussed in the paper.

Keywords: *Coleus*; Patharchur; Mmedicine; Tehri Garhwal; Uttarakhand

Introduction

Coleus barbatus Benth. (Lamiaceae) is an important medicinal herb, commonly distributed in the sub-Himalayan tracts of North India and Deccan Peninsula [1-3]. There are ca. 150 species of *Coleus* in the world, of which 8 species found in India [4,5]. Ethnomedicinally *C. barbatus* is known with the name 'Bander-jadi' in Pauri Garhwal (Figure 1). In Ayurvedic system of medicine, the stem and roots of *Coleus barbatus* (Trade name: Patherchur and Sanskrit name: Pashanbhedhi) used to cure gastric problems, hypertension, glaucoma, inflammation and piles. However, for the treatment of heart diseases, convulsions, spasmodic pain and painful urination the crude drug is mainly used [6].

The extract of root is used as antihelmintic and flowers are known to be good source of nectar for honey bees [2], whereas in Tehri Garhwal the root paste is used to cure external wounds. The stem and roots are known to be used as pickle mixed with mustard in Gujarat and Karnataka [7]. As the root of this plant contains active compounds like carbacrol, thymol, sinialol and ugenol, used as important drug for curing the urinary diseases and cancer, while forskoline is a diterpene used in the treatment of hypertension, heart failure and asthma [8-12]. It is believed that this species is considered to be the wild ancestor of all the tuber varieties, known as kaffir potatoes [13,14]. *Coleus barbatus* harvested unscrupulously by the collectors from the state of Uttarakhand during 2006-2007, which causes drastic decline in its population. The present study deals with its current status and distribution pattern in the wild in Tehri District, Uttarakhand.

Methodology

In Tehri Garhwal district four major watersheds (Chamba, Ghansali, Lambgaon and Pokhal) were identified and various habitats (pine forest, oak forest, open slopes, arable land and abandoned cultivated areas) were selected in each watershed (Figure 2) for the sampling. Ten, 1x1m (one meter square) random quadrats were laid in each habitat following Misra [15] and individuals of *C. barbatus* were recorded for population assessment.



Figure 1: *Coleus barbatus* (a plant, whole Plant, flower and roots).

Results and Discussion

The general vegetation of Tehri District is comprised of mainly Chir pine and Banj oak forests with an altitude range from 500 to 3000 m asl. Among trees *Pinus roxburghii*, *Quercus leucotrichophora*, *Pyrus pashia*, and *Lyonia ovalifolia*, common shrubs like *Berberis coriaria*, *B. asiatica*, *B. lycium*, *Randia tetrasperma*, *Rubus ellipticus*, *R. paniculatus*, *R. niveus*, *Reinwardtia indica*, *Lespedeza stenocarpa*, *Prinsepia utilis*, *Zanthoxylum alatum*, *Euphorbia royleana*, *Daphne papyracea*, *Laptodermis lanceolata*, *Lantana camara*, *Plecteranthus rugosa*, *Wikstroemia canescens*, *Xanthium strumarium*, *Carissa opaca*, *Rhus parviflora*, *Glochidion velutium* and *Caryopteris odorata* with some climbers *Smilex lanata*, *S. parvifolia*, *Rubia cordifolia* and *Hedera nepalensis* are forming the forests.

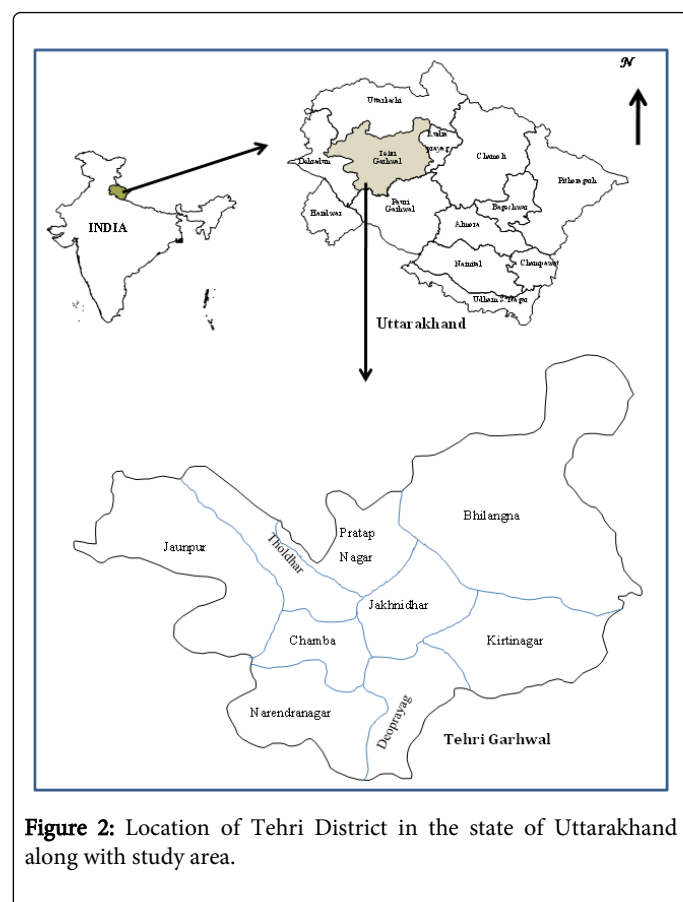


Figure 2: Location of Tehri District in the state of Uttarakhand along with study area.

The *Coleus barbatus* is commonly associated with other herbaceous plant species in these forests, viz. *Bidens biternata*, *Barleria cristata*, *Borreria pusilla*, *Cissus repanda*, *Lucas indica*, *Oxalis corniculata*, *Pimpinella* sp., *Bupleurum falcatum*, *Uria logopus*, *Cassia kleinii*, *Senecio nudicaulis*, *Justisia procumbens*, *Viola biflora*, *Desmodium gangeticum*, *D. triflorum*, *Scutellaria scandens*, *Evolvulus allsinoides*, *Ageratum conyzoides*, *Crotolaria albida*, *Anaphelis contrctus*, *commelina benghalensis*, *Emilia sonchifolia*, *Dicliptera bupleuroides*, *Slvia lanata*, *Polygala* sp., *Crassocephalum crepidioides*, *Ajuga parviflora*, *Eupatorium*, *Ageratum conizonioides*, *Artemisia nilagrica*, *Euphorbia hypericifolia*, *Adiantum* sp., *Origanum vulgare*, *Triumphetta rhomboidea*, *Euphrosia*, *Gerbera*, *Galium*, *Geranium*, *Androsace sarmentosa* and *Pouzolzia* etc.

The density of *Coleus barbatus* was highest in open Chir-Pine forest (3.9 individuals m^{-2}) followed by Abandoned cultivated areas (3.4 individuals m^{-2}), Arable lands (3.38 individuals m^{-2}), Open Slope (2.4 individuals m^{-2}), Chir -Pine forest (0.13 individuals m^{-2}) and Banj oak forests (0.05 individuals m^{-2}). The abundance/frequency (A/F) ratio was examined to see the distribution pattern of *Coleus barbatus* in all selected habitats. The values of A/F ratio suggests that the *Coleus barbatus* was randomly distributed in arable lands, open slopes, open Chir pine forest and abandoned cultivated areas with the value recorded around 5 in these habitats.

Besides this, in Banj oak and Chir pine forests the A/F ratio was 0.20 and 0.50, respectively, which showed that the *Coleus barbatus* had patchy distribution in both habitats (Table 1; Figure 3 and 4).

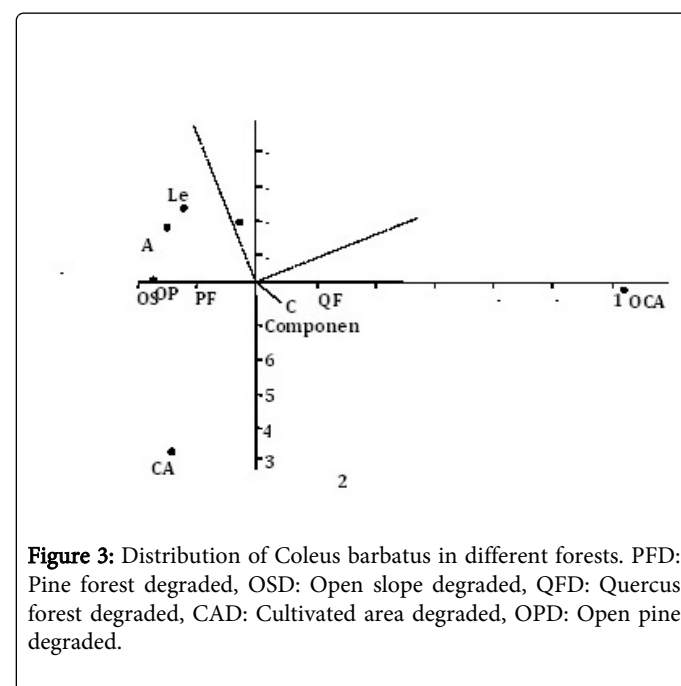


Figure 3: Distribution of *Coleus barbatus* in different forests. PFD: Pine forest degraded, OSD: Open slope degraded, QFD: Quercus forest degraded, CAD: Cultivated area degraded, OPD: Open pine degraded.

The data was analyzed for the analysis of suitable habitat through Past 1.92 (software). *Coleus barbatus* preferred arable lands, open slopes, open Chir pine forest and abandoned cultivated areas among different habitats, whereas the Banj oak and dense canopy pine forests were less preferred habitats. For the conservation point of view these habitat can be conserve. For the assessment of different parameters (aspect, slope, canopy cover, ground cover and human pressure) which affects the growth of *Coleus barbatus*. The data was subjected to PC ORD 4 (software). As the canopy cover increased species population decrease, so it is negatively correlated with the *Coleus barbatus* distribution. This species preferred highly degraded and open canopy cover area and have good population in cultivated land and open pine forest. Other environmental parameters are like slope, ground cover and human pressure were positively correlated.

Monte Carlo simulation considers random sampling of probability distribution functions as model inputs to produce hundreds or thousands of possible outcomes instead of a few discrete scenarios. As, we had check the environmental (Aspect, Slope, human pressure Ground cover and Canopy cover) correlation with species distribution we found that the distribution and abundance of species is highly correlated. Monte Carlo test shows probability (p) = 0.002 i.e. Null

hypothesis is rejected and all the variables are distinct and they play a major role for the species distribution (Table 2; Figure 3).

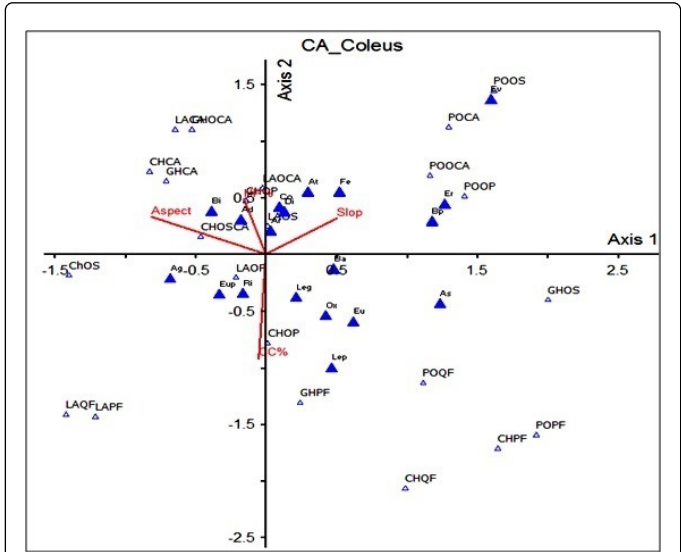


Figure 4: Distribution of *Coleus barbatus* across various habitat types and its relation with abiotic parameters in Tehri Garhwal.

Trade information

The plant, *Coleus* was discussed in all the watersheds with local residents of different villages and their views are as follows:

Chamba

In Chamba region, there is no information regarding the collection of target species at present, even there was no past records of plant trade from the villages, viz., Chamba, Tehri, Pali, Tangala, Kirghani, Kandikhal, Kandisour (Chham), Nagni, Khadi, Gaj and Pokhari etc. The villagers recognised the plant with its local name ‘*Bander-Jadi*’, which commonly grows around the villages, but is not much of importance for them.

Habitat	Density (individuals m ⁻²)	Frequency (%)	A/F ratio
Arable lands	6.3 ± 0.4	82.5	0.048
Open Slopes	4.4 ± 0.3	70	0.049
Abandoned cultivated areas	6.4 ± 0.4	82.5	0.049
Banj oak forests	0.1 ± 0.03	5	0.2
Dense Chir pine forest	0.3 ± 0.1	5	0.5
Open Chir pine forest	6.9 ± 0.4	87.5	0.05

Table 1: Population density of *Coleus barbatus* in different habitat types

Ghansali

In Ghansali region villages viz., Ghansali, Jakhnayali, Muiyal and Chirbatiya were surveyed and no information on plants’ trade is

available. The villagers recognised the plant and mentioned that since last few years no collection was made.

Randomized data					
Real data Monte Carlo test, 499 runs					
Axis	Spp-Envr Corr.	Mean	Minimum	Maximum	p
1	0.649	0.287	0.16	0.519	0.002
2	0.589	0.18	0.075	0.31	
3	0.367	0.109	0.025	0.201	

Table 2: Species-environment correlations through Monte Carlo result

Lambgaon

In Lambgaon region villages, viz., Lambgaon (Sayari, Pokhariyal and Roniya), Ratandhar, Kodar, khambakal (Garhwal), Deen, Ghandiyal, Mukhem, Onal, Patori, Choudhar, Kandakhal villages were surveyed for trade information and no such information regarding the plant collection is available, while the people recognise the plant with same local name ‘*Bander-Jadi*’.

Pokhal

The villages such as Amani, Hindolakhil, Jamnikhal (Kaniyali), Nakhri (Chandrabadani), Anjanisen, Jakhnidhar, Tipari, Gaveli, Petav, Ratoli, Ramnidhar, Kandikhal, Gandiyala, Pokhar, Magro (Khalpali, and Silankar) and Jakand were surveyed for the trade information. Only the Magro (Khalpali) Pokhar and Kandikhal were the villages, where 2 years ago the plant was collected. The price at that time was Rs. 10-15 per kg and through local broker. However, the recent survey showed that the plant was not collected for any source of income.

The market price in Uttarakhand has gone up from Rs. 45/- to Rs. 86/- in last few years (2007 through 2009, respectively; Rawal Medherbs Consultants Pvt. Ltd), while the volume has gone down in these years (72 to 28 t, respectively and of the total market volume (2327 t year-1), Uttarakhand contributes <1%.

Conclusion

Coleus barbatus is a high value medicinal plant traded from the forests of Uttarakhand and other parts of India. In recent past there has been heavy exploitation of this plant from the wild leading to rapid decline of the species. The species has come under cultivation in Central and South India (improved varieties) but the species continues to be exploited from wild in Uttarakhand. The conservation status and properties of the provenance found in Uttarakhand is not known. Maximum density of *Coleus barbatus* was observed in open pine forest and fallow fields. There is rapid decline in demand of *Coleus barbatus* from wild because cultivated strains are said to be better in quality and quantity (economical). Open degraded fields in the Tehri-Garhwal have good potential for cultivation of high yielding varieties of *Coleus barbatus*.

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