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BIODIVERSITY STATUS, DISTRIBUTION AND USE PATTERN OF SOME ETHNO-MEDICINAL PLANTS

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Abstract

The erosion of plant biodiversity is a matter of global concern. Due to unawareness the building blocks of entire ecosystems are disappearing. Some medicinal plants like Taxus baccata Linn., Thymus serpyllum Linn., Coleus forskohli Will., Oroxylum indicum Linn., Valeriana hardwickii Wall., Malaxis acuminata D.Don, Habenaria edgeworthii Hook. f.ex.Collett., Costus speciosus (Koen.) Sm., Dioscorea deltodea Wall., Gloriosa superba Linn., Polygonatum cirrhifolium Wall. and Polygonatum verticillatum Linn., Thalictrum foliolosum DC., Berberis aristata DC., Baliospermum montanum Will., Bergenia ciliata (Haworth) Sternb., Clerodendrum serratum Linn., Valeriana jatamansii Jones, Celastrus paniculatus Will., Habenaria intermedeia D. Don, and Curculigo orchioides Gaerth are reached on the border of extinction. The 2008 IUCN Red List shows that the number of threatened plant species is increasing gradually (IUCN 2008). Therefore, there is an immediate need for conservation steps to be taken up along with promotion of conservation of medicinal plants.

Keywords: *Threat categorization; Biodiversity; Use pattern; Ethno-medicine.*

Introduction

The erosion of plant biodiversity is a matter of global concern. One by one, the building blocks of entire ecosystems are disappearing. The 2008 IUCN Red List shows that the number of threatened plant species is increasing gradually [1]. The numbers of threatened plants are 8457, out of which 247 plants are found at different biodiversity hotspots in India. Many of them serves as sources of food, fuel, fodder, timber, medicine, etc. and functions as integral parts of local agricultural production systems. The resurgence of public interest in plant-based medicine coupled with rapid expansion of pharmaceutical industries necessitated as an increased demand of medicinal plants, leading to over exploitation that threatened the survival of many of them medicinal plants [2]. Further, the degree of threat to natural population of medicinal plants has increased because more than 90% of the plant raw material for herbal industries in India is drawn from natural habitats. Conservation biologists warn that 25% of all species could become extinct during the next 20 to 30 years [3]. Causes for the loss of species are numerous, but the most important is the loss and fragmentation of natural habitats. The loss, decline or fragmentation of habitat through excessive clearing of native vegetation possesses a significant threat to flora and fauna [4, 5].

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The continuous exploitation of several medicinal plant species from the wild [6] and substantial loss of their habitats during past 15 years have resulted in population decline of many high value medicinal plant species over the years [7]. The primary threats to medicinal plants are those that affect any kind of biodiversity used by humans [8, 9]. The weakening of customary laws, which have regulated the use of natural resources, is among the causes of threatening the medicinal plant species [10, 11]. These customary laws have often proved to be easily diluted by modern socio-economic forces [12]. There are many other potential causes of rarity in medicinal plant species, such as habitat specificity, narrow range of distribution, land use disturbances, introduction of nonnative, habitat alteration, climatic changes, heavy livestock grazing, explosion of human population, fragmentation and degradation of population, population bottleneck, and genetic drift [11, 13-15]. Additionally, natural enemies (i.e., pathogens, herbivores, and seed predators) could substantially limit the abundance of rare medicinal plant species in any given area [16, 17].

In addition to the consumption of medicinal plants by animals, there are physical ailments in humans, which are cured by different species of the same genera. For example, the malarial fever is treated by many species of *Swertia* (e.g. *Swertia chiraiyta, S. angustifolia*, and *S. cordata*). Similarly, different species of *Berberis* (e.g. *Berberis aristata, B. asiatica, B. lycium, B. chitria* and *B. jaeschkeana*) are used as a source of berberidine to cure certain eye diseases. Furthermore, different species of the same genera contain different proportions of chemical quantity, and there is a preference over their demand; however, the degree of threat for their exploitation is relatively lower than those species, which do not have alternatives.

The meager availability of data on the population and quantum of rare species in nature, however, has restricted their categorization to a few species on the basis of herbarium collection and by consultation by a few experts [13]. The present assessments are also questioned for their validity on the assignment of threat categories to the species, including the number of taxa in danger for specific area. The problems in assessing the species is increased in the mountainous region, especially high altitude areas because of tough and inaccessibility of the terrain, inhospitable climatic conditions, and short life cycle of plants. Most of the available data have been collected from the easily accessible areas in these mountains. Indigenous communities and commercial herb gatherers also raid these same areas for collection of medicinal plants. Therefore, the estimated population density of categorized rare medicinal plants is not precise because it differs the areas that never and hardly undergone any collection of such rare medicinal plant species [18].

An area-specific threat categorization of species is very important for short- or long-term management planning. The present study represents such an attempt in this area, using information on different attributes. The occurrence of critically endangered, endangered and vulnerable medicinal plants indicates high anthropogenic pressure on these species. If over-exploitation and habitat degradation of these species continues, they may disappear from the area within a few years. Population assessment of these species using standard ecological methods and notification of key areas as medicinal plants conservation areas (MPCAs) for *in situ* conservation, with the involvement of the Forest Department and tribal communities, are suggested. In addition, mass reproduction using conventional (vegetative and seeds) methods, establishment and maintenance of herbal gardens and medicinal plants nurseries for *ex situ* conservation and ensuring the availability of quality planting material for cultivation, together with education and awareness programmes for large-scale cultivation are suggested [19].

Materials and Methods

The Almora district lies between 29°30'N to 30°20'N latitudes and 79°20' E to 80°20'E longitudes. It is located in the central part of kumaun region of Uttarakhand, India (Fig. 1). The field survey was conducted in thirty-five area of different forest sites of Almora district of

Uttarakhand (India) and the information provided by the secondary sources [20] and available literature [21] three forest stands(500-1200m, 1200-2000 m, 2000-2800 m) were selected as Zone-1, Zone-2 and Zone-3 in the wide elevation range along the gradient of disturbances. Several field trips were undertaken for collection of plants.

Fig. 1. Map of Study site

Collection of medicinal plants from the natural habitat(s) provided information on local names, altitudinal ranges, life forms, habitat(s), part(s) used and use values, including indigenous knowledge and practices. The threat category of a species was identified using six attributes (i.e. habitat preference, distribution ranges, population size, use patterns, extraction trends, native and endemic species) following [19, 20, 22]. Species with a combination of these criteria (serial number 1, 2 and 3) were given marks accordingly. Species with scores > 60 were identified as critically endangered; 56–60 as endangered; 51–55 as vulnerable; 46–50 as near threatened; and < 46 as of least concern (Table 1).

Table 1. Threat Assessment of the Medicinal Plant Diversity using Different Criteria

S.N	Habitat	Distribution	Population (Ind/Location)	Use Pattern	Extraction	Native and Endemic	Score
1	Single	<500	<250/upto 2 locality	4 & > 4	Commercial	Native & Endemic	10
2	2-3	500-1000	250-1000 Ind/ 3-5 locality	2-3	Self Use	Native or Endemic	6
3	>3	>1000	>1000 Ind/ >5 locality	Single	No Use	Non-Native	2

Results and Discussion

The present study deals with a threat analysis of threatened ethno-medicinal plants selected from our study site presented in table 2, from different areas of Almora district of Uttarakhand (India).

In total, 21 species of ethno medicinal plants belonging to 16 families were recorded. Of these, 2 species were trees, 1 shrub, 16 herbs and 2 climbers. The families are Taxaceae, Ranunculaceae, Berberadaceae, Euphorbiaceae, Saxifragaceae, Verbenaceae, Bignonoaceae, Celastraceae, Costaceae, Dioscoreaceae and Hypoxidaceae having single species, Valerianaceae and Lamiaceae, having two species and Orchidaceae, Liliaceae having three species were identified. In terms of altitudinal distribution, the greatest number (17 spp.) of medicinal plants was recorded from 1200-2000m (Zone II), followed by the 2000–2800m (Zone III) (11 spp.), with the lowest number (7 spp.) in the 500-1200m (Zone I) altitudinal zone. The habitat-wise distribution showed maximum diversity of medicinal plants in moist

forest, hill slopes, rocky substrate, forest openings, edges and wastelands, shady forest, shady and moist rocks, road side, moist shady slopes, forest floors, grassy slopes, open grasslands, open marshy slopes, undergrowth in moist shady areas, open shady grassy fields, along forest margins habitat.

Table 2. List of Threatened Ethno-Medicinal Plants with their Life Form, Habitat and Use Pattern

Study Area	Altitudes (m)	Plant Species	Family	Habit	Habitat	Use Pattern
Area 1	1800-2000	*Taxus baccata* Linn.	Taxaceae	Tree	Moist forest	Cold, Fever, Conjunctivitis, Malaria, Typhoid, Leucorrhoea, Boils, Jaundice, Snakebite, Anticancer, Blood Pressure, Cancer
Area 2 Area 3	1350-1900 2250-2800	*Thalictrum foliolosum* DC.	Ranunculaceae	Herb	Open places, Hill slopes	Eye Inflammation, Snake Bite, Jaundice
Area 4 Area 5	1600-1900 2400-2800	*Berberis aristata* DC.	Berberadaceae	Shrub	Open places, Rocky substrate	Eye & Ear disease, Fever, Diabetes.
Area 6 Area 34	700-1000 1200-1500	*Baliospermum montanum* Will.	Euphorbiaceae	Herb	Forest openings, Edges and Wastelands	Constipation, Dropsy, Jaundice, Skin Disease, Asthma,
Area 7	1700-1900	*Thymus serpyllum* Linn.	Lamiaceae	Herb	Shady forest	Digestive Disorders, Vermifuse, Toothache, Antiseptic
Area *8* Area 9	800-1100 1400-1800	*Coleus forskohli* Will.	Lamiaceae	Herb	Rocky substrate	Constipation, Heart tonic, Low Blood Pressure
Area 10 Area 11	1500-1900 2400-2800	*Bergenia ciliata* (Haworth) Sternb.	Saxifragaceae	Herb	Shady and Moist rocks	Constipation, Dysentery, Kidney Stones, Gall Bladder Stones, Painful and Small Urination, Boils, Piles, Urinary trouble, Asthma, Fever
Area 12 Area 13	900-1200 1250-1700	*Clerodendrum serratum* Linn.	Verbenaceae	Herb	Road side, Open places	Cough Asthma, Bronchitis, Hiccough, Chronic Skin Diseases, Headache, and Fevers
Area 14	700-1000	*Oroxylum indicum* Linn .	Bignonoaceae	Tree	Open places	Snake-Bite, Urinary Disorders, Fever, Epilepsy, Indigestion, Pneumonia, Headache
Area 15	2400-2800	*Valeriana hardwickii* Wall.	Valerianaceae	Herb	Moist shady slopes	Wounds, Urinary Disorder, Joint Pain
Area 16 Area 17	1400-2000 2250-2800	*Valeriana jatamansii* Jones.	Valerianaceae	Herb	Moist places, Forest floors	Wounds and Blister
Area 18 Area 19	700-1100 1200-1100	*Celastrus paniculatus* Will.	Celastraceae	Climber	Rocky substrate, Open places	Piles, Gout, Cold, Rheumatism, Dysentery, Diarrhea, Leprosy, Snake-Bite, Wounds.
Area 20 Area 21	1400-2000 2200-2750	*Malaxis acuminata* D. Don	Orchidaceae	Herb	Moist Shady places	Fever, Weakness, Tuberculosis, General Debility
Area 22 Area 35	2400-2800 1500-1950	*Habenaria intermedeia* D. Don	Orchidaceae	Herb	Open grasslands, Grassy slopes	Skin Disease, Tonic, Asthma
Area 23 Area 24	1600-1950 2400-2800	*Habenaria edgeworthii* Hook. f.ex.Collett.	Orchidaceae	Herb	Open grasslands	Burning Sensation, Fever, Cough, Gout and General Debility
Area 25 Area 26	700-1100 1250-1550	*Costus speciosus (*Koenig ex Retz.) Smith.	Costaceae	Herb	Open marshy slopes	Boils, Ventral Disease, Urinary Tract Infection, Diabetes
Area 27	1550-1950	*Dioscorea deltoidea* Wall.	Dioscoreaceae	Climber	Open places	Piles, Dysentery, Jaundice, Applied in hair to kill lice
Area 28 Area 29	1500-1900 900-1200	*Curculigo orchioides* Gaerth	Hypoxidaceae	Herb	Undergrowth in moist shady areas, Open shady grassy fields	Wounds, Asthma, Snake-Bite, Piles, Stomach Disorders, Scorpion bite, Skin Diseases, Itching, Cough.
Area 30 Area 31	700-1100 1200-1500	*Gloriosa superba* Linn.	Liliaceae	Herb	Along forest margins,	Painful Delivery, Skin Diseases, Gonorrhea, Piles, Snake-Bite, Scorpion Stings, Tumors, Rheumatism, Leprosy Intermittent Fever
Area 32	1700-1950	*Polygonatum cirrhifolium* (Wall.) Royl.	Liliaceae	Herb	Moist shady places	Blood purifier, Cold, Cough, Burning sensation, Skin disease, Ulcers, Fever and general debility
Area 33	1700-1950	*Polygonatum verticillatum* Linn.	Liliaceae	Herb	Moist open grasslands	Piles, Bone Fracture, Fever, Appetite, Aphrodisiac, Burning sensation, Weakness

Out of 21 species, *Taxus baccata* Linn., *Thymus serpyllum* Linn., *Coleus forskohli* Will., *Oroxylum indicum* Linn., *Valeriana hardwickii* Wall., *Malaxis acuminata* D.Don, *Habenaria edgeworthii* Hook. f.ex.Collett., *Costus speciosus* (Koen.) Sm., *Dioscorea deltodea* Wall., *Gloriosa superba* Linn., *Polygonatum cirrhifolium* Wall. and *Polygonatum verticillatum* Linn. these 12 species is in single habitat and *Thalictrum foliolosum* DC., *Berberis aristata* DC., *Baliospermum montanum* Will., *Bergenia ciliata* (Haworth) Sternb., *Clerodendrum serratum* Linn., *Valeriana jatamansii* Jones, *Celastrus paniculatus* Will., *Habenaria intermedeia* D. Don, *Curculigo orchioides* Gaerth.

These 9 species is in two to three habitat types but there is no species with more than three habitat types. Among 21 ethno medicinal plants *Taxus baccata* Linn., *Berberis aristata* DC., *Baliospermum montanum* Will., *Coleus forskohli* Will., *Clerodendrum serratum* Linn., *Oroxylum indicum* Linn., *Valeriana jatamansii* Jones, *Celastrus paniculatus* Will., *Malaxis acuminata* D. Don, *Habenaria intermedeia* D. Don, *Habenaria edgeworthii* Hook. f. ex. Collett., *Curculigo orchioides* Gaerth, *Gloriosa superba* Linn., *Polygonatum cirrhifolium* Wall. having trade value where as *Polygonatum verticillatum* Linn, *Thalictrum foliolosum* DC., *Thymus serpyllum* Linn., *Bergenia ciliata* (Haworth) Sternb., *Valeriana hardwickii* Wall, *Costus speciosus* (Koen.) Sm., *Dioscorea deltodea* Wall. having self use extraction.

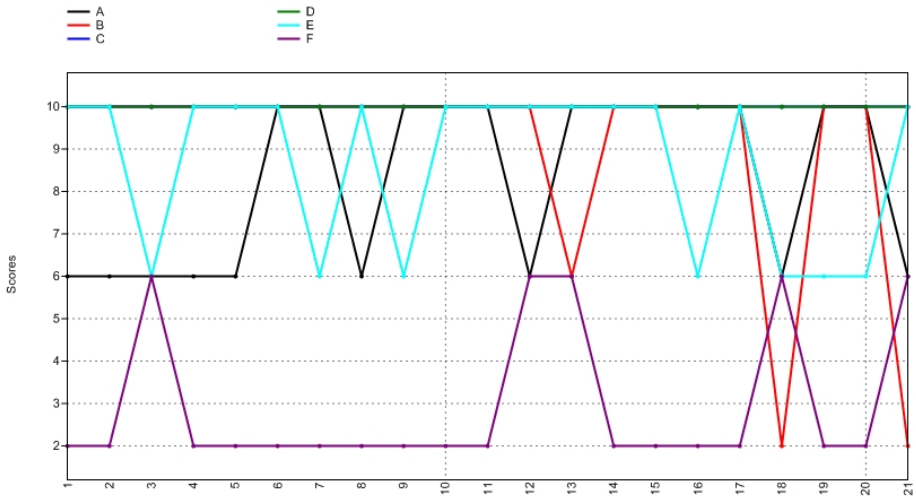

Fig. 2. Scores of Species Using Different Criteria:
A-Habitat, **B**-Distribution, **C**-Population (Ind/Location),
D-Use Pattern, **E**- Extraction, **F**-Native and Endemic.

Of the total 21 species five species were native to Indian Himalayan region and rests of species were non-native. On the basis of above criteria of threat categorization, obtained scores of *Taxus baccata* Linn., *Thalictrum foliolosum* DC., *Berberis aristata* DC., *Baliospermum montanum* Will., *Thymus serpyllum* Linn., *Coleus forskohli* Will., *Bergenia ciliata* (Haworth) Sternb., *Clerodendrum serratum* Linn., *Oroxylum indicum* Linn , *Valeriana hardwickii* Wall, *Valeriana jatamansii* Jones, *Celastrus paniculatus* Willd., *Malaxis acuminata* D. Don, *Habenaria intermedeia* D. Don, *Habenaria edgeworthii* Hook. f. ex. Collett., *Costus speciosus* (Koen.) Sm., *Dioscorea deltoidea* Wall., *Curculigo orchioides* Gaerth, *Gloriosa superba* Linn., *Polygonatum cirrhifolium* Wall., *Polygonatum verticillatum* Linn. are presented in Figure-2.

Almora district has rich biological diversity that is now under threat from rapidly expanding human populations and concomitant environmental degradation occurring at a fast pace. There are major gaps in our knowledge of biological resources and the means by which

biological diversity is maintained [23]. In Almora district, threat assessment of all 21 documented species has been made by the researcher. On the basis of above criteria of threat categorization, obtained scores of *Taxus baccata* Linn., *Thalictrum foliolosum* DC., *Berberis aristata* DC., *Baliospermum montanum* Will., *Thymus serpyllum Linn., Coleus forskohli Will., Bergenia ciliata (Haworth) Sternb., Clerodendrum serratum* Linn., *Oroxylum indicum* Linn , *Valeriana hardwickii* Wall, *Valeriana jatamansii* Jones, *Celastrus paniculatus* Willd., *Malaxis acuminata* D. Don, *Habenaria intermedeia* D. Don, *Habenaria edgeworthii* Hook. f. ex. Collett., *Costus speciosus* (Koen.) Sm., *Dioscorea deltoidea* Wall., *Curculigo orchioides* Gaerth, *Gloriosa superba* Linn., *Polygonatum cirrhifolium* Wall., *Polygonatum verticillatum* Linn. are presented in Table 3.

Table 3. Scores of Species Using Different Criteria

S.N	Name of Species	Habitat	Distribution	Population (Ind/Location)	Use Pattern	Extraction	Native and Endemic	Score
1.	*Baliospermum montanum* Will.	6	10	10	10	10	2	48
2.	*Berberis aristata* DC	6	10	10	10	10	2	48
3.	*Berginia ciliata* Royl.	6	10	10	10	6	6	48
4.	*Celastrus paniculatus* Will.	6	10	10	10	10	2	48
5.	*Clerodendron serratum* Linn.	6	10	10	10	10	2	48
6.	*Coleus forskohli* Will.	10	10	10	10	10	2	52
7.	*Costus speciosus*(Koen.) Sm.	10	10	10	10	6	2	48
8.	*Curculigo orchioides* Gaertn.	6	10	10	10	10	2	48
9.	*Dioscorea deltoidea* Wall.	10	10	10	10	6	2	48
10.	*Gloriosa superb* Linn.	10	10	10	10	10	2	52
11.	*Habenaria edgeworthii Hook. f.ex.Collett.* D. Don Syn. / *Platanthera edgeworthii* (Hook. f. ex Collett)	10	10	10	10	10	2	52
12.	*Habenaria intermedia* D.Don.	6	10	10	10	10	6	52
13.	*Microstylis wallichii* (Lindl.) Kuntz. Syn. / *Malaxis acuminate* D. Don.	10	6	10	10	10	6	52
14.	*Oroxylum indicum* Linn	10	10	10	10	10	2	52
15.	*Polygonatum cirrhifolium* Wall.	10	10	10	10	10	2	52
16.	*Polygonatum verticilatum* Linn.	10	10	10	10	6	2	48
17.	*Taxus baccata* Linn.	10	10	10	10	10	2	52
18.	*Thalictrum foliolosum* DC.	6	2	10	10	6	6	40
19.	*Thymus serphyllum* Benth.	10	10	10	10	6	2	48
20.	*Valeriana hardwickii* Wall	10	10	10	10	6	2	48
21.	*Valeriana wallichii* Jones	6	2	10	10	10	6	44

On the basis of score opted threat categorization has been done. *Taxus baccata* L. fell in vulnerable, *Thalictrum foliolosum* DC. least concern, *Berberis aristata* DC. near threatened, *Baliospermum montanum* Will. near threatened, *Thymus serpyllum* Linn near threatened., *Coleus forskohli* Will. vulnerable, *Bergenia ciliata (Haworth) Sternb.* near threatened,

Clerodendrum serratum Linn. near threatened, *Oroxylum indicum* Linn. vulnerable,. *Valeriana hardwickii Wall* near threatened, *Valeriana jatamansii* Jones. least concern, *Celastrus paniculatus* Will. near threatened, *Malaxis acuminata* D. Don vulnerable, *Habenaria intermedeia* D. Don vulnerable,, *Habenaria edgeworthii Hook. f.ex.Collett.* vulnerable, *Costus speciosus* (Koen.) Sm. near threatened, *Dioscorea deltodea* Wall. near threatened, *Curculigo orchioides* Gaerth near threatened, *Gloriosa superba* Linn. vulnerable, *Polygonatum cirrhifolium* Wall. vulnerable, and *Polygonatum verticillatum* near threatened categories. Attempts have been made at the regional, national and global levels to identify threatened species, including medicinal plants, using various attributes such as biogeographical range, habitat specificity, and population size and use values [24 - 31]. About 10% of the world's vascular plants species are under various degrees of threat as estimated by the International Union for the Conservation of Nature and Natural Resources (IUCN). IUCN status, observed status and threat are to be seen in table 4.

Table 4. Status and Threat of Plant Species

S.N	Name of Species	Family	IUCN Status	Observed Status	Threat
1.	*Baliospermum montanum* Will.	Euphorbiaceae	LRnt	NT	G,HD
2.	*Berberis aristata* DC	Berberadaceae	En	NT	OE,HD
3.	*Berginia ciliata* Royl.	Saxifragaceae	Vu	NT	OE, HD
4.	*Celastrus paniculatus* Will.	Celastraceae	LRnt	NT	HD
5.	*Clerodendron serratum* Linn.	Verbenaceae	Vu	NT	HD
6.	*Coleus forskohli* Will.	Lamiaceae	NE	VU	HD
7.	*Costus speciosus*(Koen.) Sm.	Costaceae	NT	NT	HD,G
8.	*Curculigo orchioides* Gaertn.	Hypoxidaceae	Vu	NT	OE,G
9.	*Dioscorea deltoidea* Wall.	Dioscoreaceae	En	NT	HD
10.	*Gloriosa superb* Linn.	Liliaceae	Vu	VU	HD
11.	*Habenaria edgeworthii Hook. f.ex.Collett.* D. Don Syn. / *Platanthera edgeworthii* (Hook. f. ex Collett)	Orchidaceae	Vu	VU	G,HD
12.	*Habenaria intermedia* D.Don.	Orchidaceae	En	VU	HD
13.	*Microstylis wallichii* (Lindl.) Kuntz. Syn. / *Malaxis acuminate* D. Don.	Orchidaceae	En	VU	OE,HD
14.	*Oroxylum indicum* Linn	Bignonoaceae	NE	VU	HD,OE
15.	*Polygonatum cirrhifolium* Wall.	Liliaceae	Vu	VU	OE, HD
16.	*Polygonatum verticilatum* Linn.	Liliaceae	Vu	NT	OE, HD
17.	*Taxus baccata* Linn.	Taxaceae	En	VU	HD
18.	*Thalictrum foliolosum* DC.	Ranunculaceae	Vu	LC	OE
19.	*Thymus serphyllum* Benth.	Lamiaceae	Vu	NT	OE
20.	*Valeriana hardwickii* Wall	Valerianaceae	Vu	NT	G, HD
21.	*Valeriana wallichii* Jones	Valerianaceae	CR	LC	OE

CR: Critically endangered; En: Endangered; NT: Near threatened; LRnt/ LC: Least concern; HD: Habit degradation; OE: Over exploitation; G: Grazing; Vu: Vulnerable

It is observed that out of 21 documented species, 8 species are in vulnerable category, 11 species are in near threatened and only 2 species are in least concern category. Seen in the light of percentage status of these 21 species, it is clear that least concern is 9.52%, vulnerable is 38.10% and near threatened is 52.38% (Fig. 3).

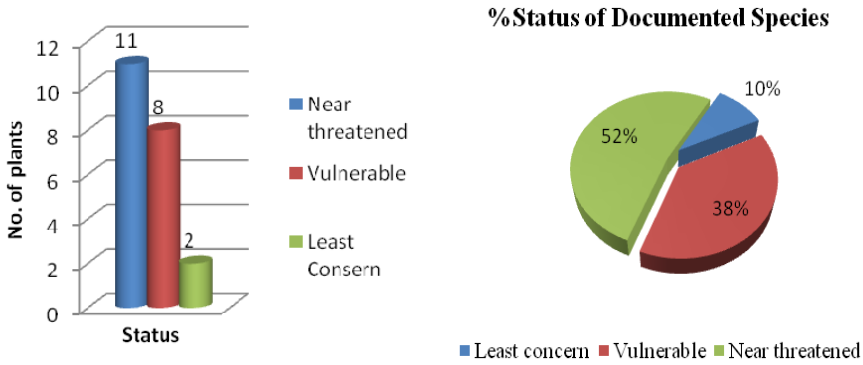

Fig. 3. Status of Documented Species

IUCN criteria were taken into background, it was observed that 121 species have been recorded in the Red Data Book of Indian plants from Indian Himalayan Region, of these 17 rare medicinal plants [32]. Threat categorizations at global and regional levels have been also done in which *Taxus baccata* Linn., *Dioscorea deltoidea* Wall., *Valeriana jatamansi* Jones have been recorded under critically rare categories; *Berberis aristata* DC., *Gloriosa superba* Linn. and *Polygonatum verticillatum* Linn. Endangered categories; *Bergenia ciliata* (Haworth) Sternb., *Clerodendrum serratum* Linn., *Curculigo orchioides* Gaerth, and *Thalictrum foliolosum* DC. under vulnerable category, *Baliospermum montanum* Will. and *Celastrus paniculatus* Will. under near threatened status [33].

Conclusions

The medicinal plants of the IHR are subjected to harsh climatic conditions. Many of them are herbs and prone to cattle grazing and trampling in addition to large-scale and reckless collection. Human interaction with environment is an important ingredient of society and culture. This interaction involves exploitation of natural resources, implying thereby a certain degree of environmental destruction. However, over exploitation of these resources leads to ecosystem destruction and extinction of valuable species. Lack of systematic collection and organized cultivation has resulted in pushing many of these plants into the list of vulnerable, endangered or threatened species. Therefore, there is an immediate need for conservation steps to be taken up along with promotion of conservation of medicinal plants.

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