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A Descriptive Floristic Study of the Asteraceae of Peer-Panchal Range of Kashmir Himalayas, their Ethno-medicinal Importance and Threat Status

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Abstract

The Pir-Panchal Range of Kashmir Himalayas was explored for two years (2017-2019) in different seasons to carry out a preliminary study of the floristic diversity of Asteraceae. A total of 19 species of the family were found in the study area. Ten flowering specimens of each species were photographed in their habitat, uprooted, dried, pressed and mounted on herbarium sheets and stored in the Simnan Herbarium of Department of Botany, Govt. Degree College, Kulgam. Information regarding the species were collected in terms of their ethno-medicinal and folk uses in the range. All 19 species have immense medicinal importance in curing a number of diseases. The study also aimed to assess the origin and the IUCN threat status of the species through different online databases and e-floras. According to IUCN definition of threat categories, the threat status of 10 species is not evaluated, five species are threatened, three species are least concern, and only Calendula officinalis is critically endangered. Similarly, 14 species are exotic and only five species are native to the country. There are nine, seven and three annual, perennial and biennial species, respectively.

Keywords: Asteraceae; Himalayas; Jammu and Kashmir; Medicinal; Threat

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Introduction

The Asteraceae is the largest family of Angiosperms containing 1911 genera and 32913 species [1]. Members of this family are cosmopolitan in distribution and grow in all possible types of habitats except Antarctica [2]. They are also among the largest families of flowering plants in India comprising 1314 species under 204 genera [3]. The majority of members of the family are herbaceous except for some tropical trees and climbers. Many taxa possess a milky juice while in others the juice is watery, resinous and bitter [4].

The Himalaya, recognized as a global biodiversity hotspot, is taxonomically unexplored in the majority of its regions particularly in the North-West [5]. The Indian State of Jammu and Kashmir (J and K) in the Western Himalaya is one such region which has been recognized as floristically under-explored by the Botanical Survey of India [6]. Biogeographically, J and K State comprises three distinct provinces: The subtropical Jammu, the predominantly temperate Kashmir, and the cold-arid Ladakh. Owing to great variety of habitats all along these provinces, the State is very rich in floristic diversity. Its flora has attracted the attention of many foreign and local botanists during the last two centuries but it remains in need of further floristic exploration. Many of its plants are cited in the illustrious works of Hooker (1872-1897) and Stewart (1972) [7,8].

Pir-Panchal is a group of mountains in the inner Himalayan region, running from east-southeast to west-northwest across the state of Himachal Pradesh and Indian Union Territory of J and K and the Pakistani territory of Kashmir **(Figure 1)**, where the average elevation varies from 1400 m.a.s.l to 4100 m.a.s.l. Pir-Panchal is the largest range of Lesser Himalayas and has lush green forests and meadows that harbor a rich diversity of plants.

Members of the Asteraceae are dominant in J and K with a great degree of endemism [9]. The dominance of these elements is because of unique topography, ecosystems and geographic position of the state. In J and K State, Jammu province has the greatest floristic richness. Several taxonomic studies dealing with

floristic diversity of this province have been carried out over the last three decades. The Flora of Jammu and adjacent areas, providing taxonomic details in **Table 1** and studied the medicinal plants belonging to the Asteraceae of district Rajouri district. However, the flora of Kashmir province, particularly in the Pir-Panchal range, is still unexplored and needs immediate attention [6,10,11].

Conservation and management of traditional medicinal plants is an essential concern worldwide, especially in developing countries. The ever-escalating demand for the medicinal plants in pharmaceutical industries and traditional medicinal systems has resulted in overexploitation leading to the reduction of their natural populations. Besides, habitat loss due to anthropogenic activities has further intensified the concern. If overexploitation of these plants continues, many species may decrease in, and ultimately disappear from their natural habitat. Although a number of studies have been carried out to study the diversity and distribution patterns of the medicinal plants in various Himalayan states of India, information on this aspect is scanty in J and K, particularly in Pir-Panchal mountain region. Therefore, it is seeming necessary to study the diversity, distribution and utilization pattern of the medicinal plants, document folklore uses, identify nativity and endemism and suggest suitable conservation and management strategies. Hence, the present preliminary study has been carried out as part of the project 'Exploration, Inventorization and Taxonomic Analysis of the floristic diversity of Pir Panchal Range of Kashmir Himalayas' in order to pave the path for digital documentation of the floristics of the region and to gain an understanding about the sustainable exploitation and conservation of its medicinal plants.-

Materials and Methods

Taxa of the Asteraceae present in the Pir Panchal range of Kashmir Himalayas and its adjoining areas were inventorised for the present study (**Figure 1**). Information regarding the geographical location, habit, local and common names of the species were recorded in **Table 1**. At least ten specimens in the flowering stage of each species were dried and mounted on herbarium sheets **Figures 2 and 3**.

They were identified at the SIMNAN Herbarium of the Department of Botany, Govt. Degree College Kulgam (J and K). A comprehensive and comparative analysis of the specimens was carried out with the already existing specimens in the same herbarium. Identification of the specimens was further confirmed by comparison with the information and pictorial representations available in some online data bases and floras like e-flora of Pakistan, Tropicos, flora of China, the Plant list and World Flora online and the recently developed e-flora of India. Herbarium specimens of each species were kept in the Simnan herbarium.

Information regarding their ethno-medicinal and folk uses in the range were collected from a number of online herbals and databases [12]. Local people were also consulted to find out the ethno-medicinal and other uses of the inventorised taxa.

The species were thoroughly investigated to ascertain their threat status based on the definitions set by the International Union for Conservation of Nature and Natural Resources for the different threat categories (IUCN, 1964) [13].

Results and Discussion

A total of 19 species belonging to 19 genera of the *Asteraceae* were found in the different regions of Pir-Panchal mountain range (**Figures 4 and 5**). The species and their local, English and Hindi names are listed in **Table 1**, together with their localities, ethno-medicinal uses, threat status and origin. The following is a brief

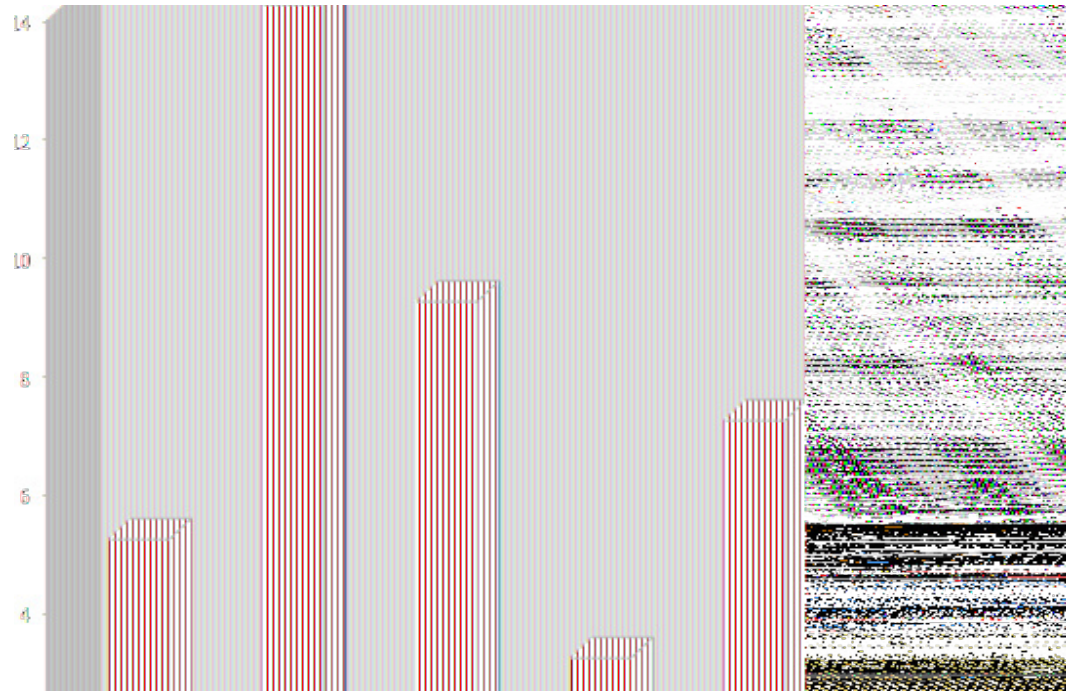

Figure 1 Map showing the collection sites of 19 species of Asteraceae in the Pir-Panchal mountain range of Kashmir in the Western Himalayas, India. Numbers in the map correspond to the serial numbers of the species as given in Table 1.

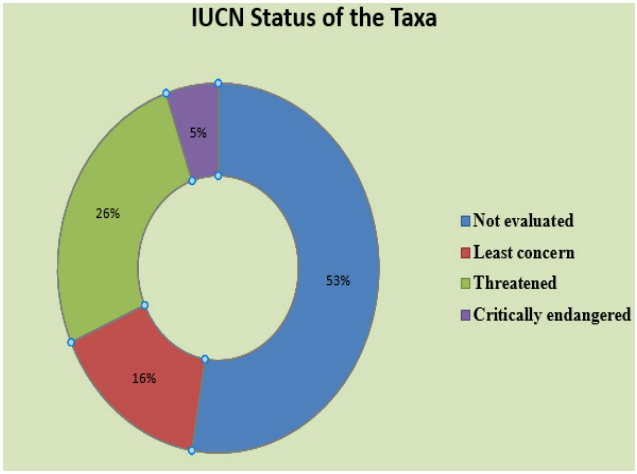

Figure 2 IUCN status of the taxa explored in the present study.

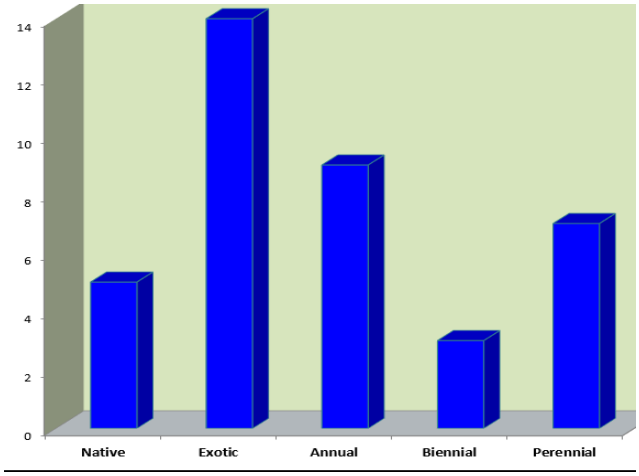

Figure 3 Origin and life form types of the taxa explored in the present study.

Table 1: List of 19 species of *Asteraceae* reported in Peer-Panchal range of Kashmir Himalayas and their localities, uses, threat status and origin. Ce=Critically endangered; Ex=Exotic; Lc=Least concern; Na=Not available; Ne=Not evaluated; Nt=Native; Th=Threatened.

S.No.	Species	Local name	English name	Hindi name	Locality	Uses	Threat status	Origin	Fig
1	*Galinsoga parviflora*	Marczwangunghaas'e	Gallant soldier	Shampakpi	Sangus	To cure itching caused by nettle stings	Th	Ex	2a
2	*Ajania fruticulosa*	Thooelboabrr	Shrubby ajania	Na	Awgaam Road	Antifungal	Lc	Nt	2b
3	*Anthemis cotula*	Fakk'eghaas'e	Stinking chamomile	Na	Campus of Govt. Degree College, Kulgam	Treatment of epilepsy, rheumatism, asthma and colds.	Ne	Ex	2c
4	*Santolina chamaecyparissus*	NA	Lavender cotton	NA	DC Office Kulgam	Vermifuge	Th	Ex	2d
5	*Calendula officinalis*	Maaeinzpoesh	Pot marigold	Genda	DC Office Kulgam	Anti-viral and anti-inflammatory	Ce	Ex	2e
6	*Gazania rigens*	Loatehpoesh	Treasure flower	NA	DC Office Kulgam	Anti-microbial	Lc	Ex	2f
7	*Chrysanthemum indicum*	Mahraazpoesh	Mums	Chandramallika	Sangus	Treatment of Sexually transmitted diseases	Th	Na	2g
8	*Myriactis nepalensis*	NA	Nepal myriactis	Thokephool	Laroo	Roasted fruits are pickled	Ne	Na	2h
9	*Tagetes erecta*	Butt poesh	Maxican marigold	Gaenda	DC Office Kulgam	Treatment of CAD, cataracts and cancers	Ne	Ex	3a
10	*Eclipta prostrata*	NA	False	Bhringarj	Aharba	Treatment of skin and	Th	Ex	3b

Figure 4 Field photographs of nine species of Asteraceae collected in the Pir-Panchal mountain range of Kashmir in the Western Himalayas, India. a=*Galinsoga parviflora* Cav.; b=*Ajania fruticulosa* (Ledeb.) Poljakov; c=*Anthemis cotula* L.; d=*Santolina chamaecyparissus* L.; e=*Calendula officinalis* L.; f=*Gazania rigens* (L.) Gaertn.; g=*Chrysanthemum indicum* L.; h=*Myriactis nepalensis* L.

description of their salient features and periods of flowering.

Galinsoga parviflora Cav. is an herbaceous plant with 0.7 m length. Its stem is branched with opposite stalked leaves, toothed at the margins. The flowers are in small heads and flowers from May to October.

Ajania fruticulosa (Ledeb.) Poljakov is a medicinal herb. It is found in the Sarabi forest, Quetta, Pakistan. The species has been used in popular medicine as expectorant, vermifuge, antiseptic, and spasmolytic.

Anthemis cotula L. is an annual herbaceous bushy plant that grows freely on waste places and has a noticeable and strong odour. The plant has branching upright stems reaching a height of 0.75 m. The stem bears a solitary capitulum with white ray flowers.

Santolina chamaecyparissus L. also known as cotton lavender, is a small evergreen perennial shrub of 0.5 m and grows on dry ground, stony banks and on rocks. It has a dense cover of grey-green aromatic leaves. It flowers from July to August.

Calendula officinalis L. This is an ornamental herbaceous plant with a height of 0.7 m with sparsely branched or erect stem. The leaves are oblong-lanceolate and hairy on both sides with margins entire or occasionally waved. The inflorescences are yellow and the plant is grown for its beautiful flowers in the garden.

Gazania rigens (L.) Gaertn. also known as treasure flower, is a perennial herbaceous plant with 0.5 m height. It has blue grey leaves and brilliant yellow flower heads.

Chrysanthemum indicum L. is a perennial herbaceous plant with 0.6 m in height. Its stem is erect or spreading, branched and sparsely hairy. It bears yellow or whitish flowers from August to October.

Myriactis nepalensis Less. is a perennial herbaceous plant with a height of 1 m. Its stem is erect and branched from middle or from the base. Leaves are cauline, winged and petiolate. Flower heads are spherical or hemi-spherical **Figure 4**.

Tagetes erecta L. this is an annual or perennial herbaceous plant with a height of 0.8 m. Its roots are cylindrical, pivoting with a fibrous and shallow branching system. The stem is straight, herbaceous to woody. This is native of Mexico and is grown as an ornamental plant in gardens. The flowers of the plant are the source of yellow dye which is used to dye cotton.

Eclipta prostrata (L.) L. is an annual herbaceous plant, erect or prostrate with a height of 0.6 m and generally grows in wet and moist places along the paddy fields. It has simple, opposite and oblong leaves and flowers in August.

Sigesbeckia orientalis L. is an annual herbaceous plant with tap roots.

Crisium falconeri (Hook.f.) Petr. is a perennial plant with a height of 0.5 m-1.5 m and is totally covered with white spiny

hairs. Flower heads are spherical and cream colored; flowers in August-September.

Figure 5 Field photographs of 11 species of Asteraceae collected in Pir-Panchal mountain range of Kashmir in the Western Himalayas, India. a=*Tagetes minima L.*; b=*Eclipta prostrate* (L.); c=*Sigesbeckia orientalis L.*; d=*Crisium falconeri (Hook.f.) Petr.*; e=*Carpesium abrotanoides L.;* f=*Jacobaea vulgaris Gaertn.*; g=*Xanthium spinosum L.*; h=*Arctium minus (Hill.) Bernh.;* I=*Centaurea iberica Trevir. ex Spreng.*; j=*Achillea millefolium L.*; k=*Erigeron Canadensis (L.) Cronquist.*

Carpesium abrotanoides L. is a perennial plant with a height of 1m and has a much branched leafy stem. It flowers from

September to November and its seeds ripe from October to November.

Jacobaea vulgaris Gaertn. The plant is biennial or perennial. The stems are erect, straight, have no or few hairs, and reach a height of 0.3 m-2.0 m. The leaves are pinnately lobed and the end lobe is blunt. The hermaphrodite flower heads are 1.5 cm-2.5 cm diameter, and are borne in dense, flat-topped clusters; the flowers are bright yellow. It has a long flowering period lasting from June to November.

Xanthium spinosum L. This is an annual herb producing a slender stem up to a meter tall or slightly taller. It is lined at intervals with very long, sharp, yellowish spines which may exceed three cm in length and may divide into two or three separate spines. The leaves are divided into linear or lance-shaped lobes, the middle much longer than the others, and are arranged alternately all along the stem. Each is up to 10 cm or 12 cm long and dark green or greyish on top with a white underside. The plant produces male and female flower heads.

Arctium minus (Hill.) Bernh. is a biennial bushy plant with a height of 1 m and is profusely branched. Leaves are ovate,

Dark green above and wooly below. Flowers are prickly and pink to lavender in color. Flower heads are about 2 cm wide and flower from July to October.

Centaurea iberica Trevir. ex Spreng. The species is a biennial herbaceous plant with 0.9 m length and appears to be somewhat weedy in its native environment, but is less aggressively invasive elsewhere than other *Centaurea* species. It flowers from July to August.

Achillea millefolium L. is a perennial herbaceous plant with highly fragrant leaves similar to that of Chrysanthemum. Its leaves are having varying degrees of hairiness and its flowers are daisy-like flower heads.

Erigeron Canadensis L. is an annual herbaceous weedy plant with a length of 1.5 m and pubiscent stem. The leaves are 2 cm-10 cm long and up to 1 cm broad with coarsely toothed margins. The flowers are produced in dense inflorescence **Figure 5.**

Discussion

This is the first quantitative floristic study of the Pir-Panchal mountain range of Kashmir Himalayas to assess the taxonomic diversity of Asteraceae in the region. A total of 19 species of the Asteraceae are recorded from the Pir Panchal mountain range of temperate Kashmir Himalayas. All species have immense medicinal importance in curing a number of diseases. These species are used commonly by the local tribes as well as by the 'hakeems' (traditional medical practitioners) for curing different types of disease. Some of these species (e.g. *Gazania rigens (L.) Gaertn.*, *Chrysanthemum indicum L.*, *Tagetes erecta L.*) were found to be cultivated by the local tribes for preparation of folk medicines. However, the species were found growing in the

wild as weeds. In terms of their IUCN threat status, ten, five and three species fall in the "not evaluated," "threatened" and "least concern" categories, respectively, while *Calendula officinalis L.* is the only "critically endangered" species. Of the 19 species, only five are native to the region while the rest are exotic. As regards duration, nine, seven and three species are annual, perennial and biennial, respectively.

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Conflict of Interest

The authors declare that no conflict of interest exist between them.

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