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Opinion article

Seasonal fluctuation in the floristic diversity of Prashar alpine pasture, District Mandi, Himachal Pradesh, India

Akshay Kumar

Himalayan Forest Research Institute, Conifer campus, Panthaghati, Shimla 171013, India

Corresponding Author: prasharakshay258@gmail.com

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Abstract: Seasonal fluctuation in plant diversity provides a basis for devising suitable strategies for the management and conservation of plant resources. Accordingly, a study was conducted to understand the plant diversity of Prashar alpine pasture, District Mandi, Himachal Pradesh during the year 2017 between 2550-2750 m elevation ranges. The study was carried out on a seasonal basis. The study was carried out in the summer season in May, the rainy season in August and the winter season in November. A total of 44 plant species belonging to 24 families and 35 genera were recorded in the summer season, a total of 72 plant species belonging to 28 families and 58 genera were recorded in the rainy season and a total of 13 plant species belonging to 6 families and 10 genera were recorded in winter season from the study area. Dominant families were Asteraceae, Lamiaceae, Rosaceae, Poaceae and Polygonaceae. A total of 56 medicinal plant species were recorded from the pasture, out of which two species viz; *Roscoea alpina* and *Selinum vaginatum* fall in the category of threatened plants.

Keywords: Alpine - Dominant family - Growth form - Medicinal plant - Indigenous use.

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INTRODUCTION

The term “alpine” is derived from the Latin word “albus” which means white (or snow-covered) originally referring to the peaks of Alps (Love 1970). Alpine refers to those lands lying above the climatic limit of upright trees *i.e.* region of open vegetation, above the timberline where general environment and the vegetation are extensively different from that of lowland. The low atmospheric pressure, low temperature, and intense insulation, rapid and high ultraviolet radiation along with other correlated effects are the main characteristics feature of the alpine regions. The alpines of Western Himalayan have the most diverse ecological locations, diverse vegetation and provide a wide range of ecosystem services. Himachal Pradesh, a north Indian state, is located in the western part of the Himalayan range. In Himachal Pradesh, important alpine regions are the Dhauladhar and Pir Panjal ranges (Santvan 1993). The alpine plants are generally stunted, spiny, dwarfed and develop a mosaic patch of special plant forms, possessing an early growth initiation with very short vegetative span and life cycle ranging from several days to a few months to develop different plant forms. The alpine pastures are supposed to be the only true grasslands in India and where the grazing intensity is very high. The uncontrolled and unregulated grazing results in the pasture degradation. Due to the high level of this degradation, the present level of production of these alpine pastures is less than that of their possible potential. The pastures in the alpine zone occupy about 1.52 % of the total land area in the country and are chiefly concentrated in the Himalayan states of Arunachal Pradesh, Sikkim, Uttarakhand, Himachal Pradesh and Jammu and Kashmir. The Himalayan land in India is enclosed by alpine pastures usually found at an altitude above 2400 m and where the climate is not useful for the growth of any trees. The alpine pastures in Himachal Pradesh cover around 18.1 % of the total geographical area of the state. These alpine pastures are locally known as *Dhar* in Himachal Pradesh. The flora of these alpine regions represents the total quantity of different types of plants. The floristic study involves periodic observations of the flora of a community for the whole year. Floristic composition is one of the most important components of the community that determines the functioning of an

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ecosystem. The floristic composition of an area varies from place to place according to habitat heterogeneity of the area itself. A different community occurs in every changed habitat. Therefore, floristic studies, provide basic knowledge regarding about the extent of distribution of plant diversity in the pasture. It also helps to assess the plant wealth and the potentiality of any given pastures. Due to lack of proper management practices, a large number of pastures lands have been converted or are in the process of conversion to degraded lands. The present study was carried out to know the status of plant diversity of Prashar alpine pasture, which may provide key devising strategies and action plan for the management of biodiversity-rich alpine pastures through generating baseline data. This baseline data generated on flora can serve as a base for its continuous monitoring for future changes in the pasture.

MATERIALS AND METHODS

The study was conducted in the alpine pasture of Prashar, District Mandi, Himachal Pradesh during the year 2017. The study site lies at 31º 44′ 54.61″ N to 31º 44′ 57.72″ N latitude and 77º 06′ 32.53″ E to 77º 06′ 55.14″ E longitude and 2550–2750 m elevation range. An intensive survey was conducted to assess the seasonal fluctuation in the plant diversity and various growth form of Prashar alpine pasture. The studies of plant diversity in this alpine pasture were done on seasonal basis. The study was carried out in the summer season in May, the rainy season in August and the winter season in November. The Different plant categories viz; grasses, sedges, leguminous and non-leguminous forbs were recognized and then species were assigned to various growth forms i.e. tall forbs (>30 cm height), short forbs (<30 cm height) and cushion and spreading forbs following Santvan (1993). The plants of medicinal value along with threatened category were also documented from the site.

RESULTS

During the summer season at Prashar alpine pasture, total number of herb species was 44 belonging to 24 families and 35 genera. Out of which 3 species were grasses, 1 sedges, 2 leguminous and 38 species were non-leguminous forbs. The species present in the alpine pasture were analyzed for four different plant categories *viz*; grasses, sedges, leguminous and non-leguminous forbs. Tall forbs contributed 20.45% in the present alpine pasture flora. This category comprised of nine species of non-leguminous forbs. Short forbs contributed 63.64% to the present alpine pasture flora and comprised of twenty-four species of non-leguminous forbs, one species of sedges and three species of grasses. Grasses comprised in this category were *Poa alpina* L., *Poa annua* L. and *Polypogon monspeliensis* (L.) Desf. Cushion and spreading forbs comprised of herbaceous or rosette forming prostrate flora of the alpine pasture. It contributed 15.91% to the total alpine pasture flora. The species comprised of five species of non-leguminous forbs and two species of leguminous forbs. The two species included in the leguminous forbs category were *Parochetus communis* D.Don. and *Trifolium repens* L. (Table 1).

Table 1. Presence and absence of the species recorded at the Prashar alpine pasture during the study period from Summer Season, 2017 to Winter Season, 2017.

S.N.	Species	2017			Growth Form
		SS, 2017	RS, 2017	WS, 2017	
	Grasses:				
1	*Agrostis munroana* Aitch. & Hemsl.	-	+	-	SF
2	*Phleum alpinum* L.	-	+	-	SF
3	*Poa alpina* L.	+	+	+	SF
4	*Poa annua* L.	+	+	+	SF
5	*Polypogon monspeliensis* (L.) Desf.	+	+	-	SF
6	*Trisetum spicatum* (L.) K.Richt.	-	+	-	SF
	Sedges:				
1	*Carex nubigena* D.Don ex Tilloch & Taylor	+	+	-	SF
2	*Cyperus squarrosus* L.	-	+	-	SF
	Leguminous Forb:				
1	*Lotus corniculatus* L.	-	+	-	CS
2	*Parochetus communis* D.Don	+	+	+	CS
3	*Trifolium pratense* L.	-	+	-	CS
4	*Trifolium repens* L.	+	+	+	CS
	Non-Leguminous Forb:				
1	*Achillea millefolium* L.	-	+	-	SF
2	*Adiantum edgeworthii* Hook.	+	+	-	SF

3	*Ainsliaea latifolia* (D.Don) Sch.Bip.	+	+	-	SF
4	*Ajuga bracteosa* Wall. ex Benth.	+	+	-	SF
5	*Anaphalis contorta* (D.Don) Hook.f.	-	+	-	SF
6	*Anaphalis margaritacea* (L.) Benth. & Hook.f.	+	+	+	SF
7	*Anaphalis triplinervis* (Sims) Sims ex C.B.Clarke	+	+	+	SF
8	*Anemone obtusiloba* D.Don	+	+	-	SF
9	*Arisaema jacquemontii* Blume	+	+	-	SF
10	*Aster himalaicus* C.B.Clarke	-	+	-	SF
11	*Bergenia ciliata* (Haw.) Sternb.	+	+	-	SF
12	*Chenopodium album* L.	+	+	-	SF
13	*Cirsium falconeri* (Hook.f.) Petr.	+	+	+	TF
14	*Cirsium wallichii* DC	+	+	+	SF
15	*Clinopodium umbrosum* (M.Bieb.) Kuntze	-	+	-	SF
16	*Cynoglossum wallichii* G.Don	+	+	-	TF
17	*Cynoglossum zeylanicum* (Vahl) Brand	+	+	-	TF
18	*Delphinium vestitum* Wall. ex Royle	-	+	+	TF
19	*Diplazium esculentum* (Retz.) Sw.	-	+	-	SF
20	*Fragaria vesca* L.	+	+	+	CS
21	*Gentiana argentea* (Royle ex D.Don) Royle ex D.Don	+	+	-	CS
22	*Gentiana ornata* (D.Don) Wall. ex Griseb.	+	+	-	CS
23	*Geranium wallichianum* D.Don ex Sweet	+	+	-	SF
24	*Gypsophila cerastoides* D.Don	+	+	-	SF
25	*Hackelia uncinata* (Benth.) C.E.C.Fisch.	-	+	-	SF
26	*Impatiens scabrida* DC.	-	+	-	TF
27	*Impatiens sulcata* Wall.	-	+	-	TF
28	*Lactuca macrorhiza* (Royle) Hook.f.	-	+	-	SF
29	*Mazus surculosus* D. Don	+	+	-	CS
30	*Mentha spicata* L.	-	+	-	SF
31	*Myriactis nepalensis* Less	-	+	-	SF
32	*Nepeta elliptica* Royle ex Benth.	-	+	-	TF
33	*Origanum vulgare* L.	-	+	-	SF
34	*Parnassia nubicola* Wall. ex Royle	+	+	-	SF
35	*Pedicularis hoffmeisteri* Klotzsch	-	+	-	TF
36	*Persicaria amplexicaulis* (D.Don) Ronse Decr.	+	+	-	TF
37	*Persicaria nepalensis* (Meisn.) Miyabe	+	+	-	SF
38	*Phlomis bracteosa* Royle ex Benth.	-	+	-	SF
39	*Plantago depressa* Willd.	+	+	-	SF
40	*Polygonum aviculare* L.	-	+	-	SF
41	*Potentilla argyrophylla* Wall. ex Lehm	+	+	-	TF
42	*Potentilla atrosanguinea* G.Lodd. ex D.Don	-	+	-	TF
43	*Potentilla leschenaultiana* Ser.	+	+	-	SF
44	*Potentilla lineata* Trevir.	+	+	-	SF
45	*Potentilla nepalensis* Hook.	-	+	-	TF
46	*Primula denticulata* Sm.	+	+	-	SF
47	*Prunella vulgaris* L.	+	+	-	SF
48	*Roscoea alpina* Royle	+	+	-	SF
49	*Rosularia rosulata* (Edgew.) H. Ohba	+	+	-	CS
50	*Rumex acetosa* L.	+	+	-	TF
51	*Rumex nepalensis* Spreng.	+	+	+	TF
52	*Saxifraga parnassifolia* D. Don	-	+	-	SF
53	*Selinum vaginatum* C.B. Clarke	-	+	-	TF
54	*Senecio laetus* Edgew.	+	+	+	TF
55	*Sibbaldia cuneata* Schouw ex Kunze	+	+	-	SF
56	*Swertia cordata* (Wall. ex G. Don) C.B. Clarke	-	+	-	SF
57	*Taraxacum officinale* (L.) Weber ex F.H.Wigg.	+	+	+	SF
58	*Thymus linearis* Benth.	+	+	-	SF
59	*Verbascum thapsus* L.	+	+	-	TF
60	*Viola biflora* L.	+	+	-	SF

Note: += Presence, -= Absence, TF= Tall Forbs, SF= Short Forbs, CS= Cushion and Spreading Forbs, SS= Summer Season, RS= Rainy Season, WS= Winter Season.

In rainy season total number of herb species was 72 belonging to 28 families and 58 genera. Out of which 6 species were grasses, 2 sedges, 4 leguminous and 60 species were non-leguminous forbs. The species present in the alpine pasture were analyzed for four different plant categories *viz;* grasses, sedges, leguminous and non-leguminous forbs. Tall forbs contributed 23.61% in the present alpine pasture flora. This category comprised of seventeen species of non-leguminous forbs. Short forbs contributed 63.89% to the present alpine pasture flora and comprised of thirty-eight species of non-leguminous forbs, two species of sedges and six species of grasses. Grasses comprised in this category were *Agrostis munroana* Aitch. & Hemsl., *Phleum alpinum* L., *Poa alpina, Poa annua*, *Polypogon monspeliensis* and *Trisetum spicatum* (L.) K.Richt. Cushion and spreading forbs comprised of herbaceous or rosette forming prostrate flora of the alpine pasture. It contributed 12.50% to the total alpine pasture flora. The species comprised of five species of non-leguminous forbs and four species of leguminous forbs. The four species included in the leguminous forbs category were *Lotus corniculatus* L., *Parochetus communis, Trifolium pratense* L. and *Trifolium repens* (Table 1).

While in winter season, total number of herb species was 13 belonging to 6 families and 10 genera. Out of which 2 species were grasses, 2 leguminous and 9 species were non-leguminous forbs. The species present in the alpine pasture were analyzed for four different plant categories *viz;* grasses, sedges, leguminous and non-leguminous forbs. Tall forbs contributed 30.77% in the present alpine pasture flora. This category comprised of four species of non-leguminous forbs. Short forbs contributed 46.15% to the present alpine pasture flora and comprised of four species of non-leguminous forbs and two species of grasses. Grasses comprised in this category were *Poa alpina* and *Poa annua.* Cushion and spreading forbs comprised of herbaceous or rosette forming prostrate flora of the alpine pasture. It contributed 23.08% to the total alpine pasture flora. The species comprised of one species of non-leguminous forbs and two species of leguminous forbs. The two species included in the leguminous forbs category were *Parochetus communis* and *Trifolium repens* (Table 1).

Medicinal and Threatened Plants

The important plants of medicinal value found in alpine pasture of Prashar were compiled following Chopra *et al.* (1956), Kirtikar & Basu (1987), Kala (2002 & 2006), Samant *et al.* (2007), Singh *et al.* (2009), Devi *et al.* (2013); Kumar & Sharma (2013), Kumari *et al.* (2018), Devi *et al.* (2019), Kumar & Verma (2019a & 2019b) and Verma & Chauhan (2022). These include 56 species, out of the total plant species recorded from the alpine pasture, two species i.e. *Roscoea alpina* Royle and *Selinum vaginatum* C.B. Clarke fall in the category of threatened species (Goraya *et al.* 2013) (Table 2).

Table 2. Diversity and indigenous use of medicinal plants of Prashar alpine pasture.

Taxa	Common Name	Part Used	Indigenous Uses
Amaranthaceae			
Chenopodium album L.	Bathu	Lf, Sd	To revive taste, skin diseases, Abdominal pain and diuretic, indigestion, urinary problems
Apiaceae			
Selinum vaginatum C.B. Clarke	Matosal, Bhutkeshi	Rh, AP, Rt	Skin disease, hysteria, liquor, nervine, sedative swelling muscle
Araceae			
Arisaema jacquemontii Blume	Khaprya	Rh, Fr	Poisonous mushroom, snake bite antidote, rhizome paste mixed with oil is applied in sprains and regains muscular strength
Asteraceae			
Achillea millefolium L.	Chabu, Fye	Fl,WP	Carminative, toothache, tonic, cough, cold, antipyretic
Ainsliaea latifolia (D.Don) Sch.Bip.	-	Rt	Decoction of whole plant is given in Colic pain
Anaphalis contorta (D.Don) Hook.f.	Telgang	Fl, WP	Antibacterial, cold, cough, insect repellent
Anaphalis triplinervis (Sims) Sims ex C.B.Clarke	-	WP, Lf	Diuretic, eye infection
Cirsium falconeri (Hook.f.) Petr.	Bhoosh	Rt	High blood pressure
Cirsium wallichii DC	Chawag	St,Lf	Chest pain ,dysentery
Lactuca macrorhiza (Royle) Hook.f.	-	AP	Jaundice, headache
Senecio laetus Edgew.	Parpat	WP	Fever, abdominal pain, inflammation of mouth

Taraxacum officinale (L.) Weber ex F.H.Wigg.	Dudhi, Paranbala	WP	Cuts, headache, fever, kidney, tonic, blood purifier, antibiotic, food poisoning, migraine
Athyriaceae			
Diplazium esculentum (Retz.) Sw.	Lingadu	Frd	Boiled vegetable consumed to relieve Constipation
Balsaminaceae			
Impatiens scabrida DC.	-	Sd, WP	The extract is used to treat intestinal worms
Impatiens sulcata Wall.	-	Sd	Pimples
Boraginaceae			
Cynoglossum wallichii G.Don	-	Rt	Root is used in Dyspepsia and digestive disorders
Cynoglossum zeylanicum (Vahl) Brand	-	Lf, Rt	Infusion taken in Asthma, cough and vomiting
Hackelia uncinata (Benth.) C.E.C.Fisch.	-	Rt	Piles
Caryophyllaceae			
Gypsophila cerastoides D.Don	-	WP	Wounds
Celastraceae			
Parnassia nubicola Wall. ex Royle	-	Tu	Paste of tuber is applied on snake bite
Crassulaceae			
Rosularia rosulata (Edgew.) H. Ohba	-	Lf	Crushed leaves applied to skin ailments for fast healing
Fabaceae			
Lotus corniculatus L.	-	AP	Anti-inflammatory
Parochetus communis D.Don	-	Fl	Used to relieve stomach/intestinal pain due to worm
Trifolium pratense L.	-	AP	Cough, bronchitis
Trifolium repens L.	-	WP	Astringent, health drink, menopause
Gentianaceae			
Gentiana argentea (Royle ex D.Don) Royle ex D.Don	Pungen Karpo	Lf, Fl	Sore throat
Swertia cordata (Wall. ex G. Don) C.B. Clarke	Charaite	WP	Appetite, stomachic, blood diseases
Geraniaceae			
Geranium wallichianum D.Don ex Sweet	-	Rt	Astringent, toothache, ear & eye disease
Lamiaceae			
Ajuga bracteosa Wall. ex Benth.	Neelkanthi	Lf, WP	Malaria, tonic, astringent
Clinopodium umbrosum (M.Bieb.) Kuntze	-	WP	Juice applied to cuts as blood purifier
Mentha spicata L.	Jangali Pudina	Lf	Carminative, stomachache, dysentery
Nepeta elliptica Royle ex Benth.	-	Sd, Lf	Digestive disorder, cold and fever
Origanum vulgare L.	Bantulsi	WP	Antiseptic, cold, mild feverish illness, colic, indigestion, bronchitis, childbirth
Phlomis bracteosa Royle ex Benth.	-	Fl, AP	Eye tonic
Prunella vulgaris L.	Patindu	WP	The whole plant is boiled and filtered and taken against cerebral problems and also during heavy breathing
Thymus linearis Benth.	Ban jira	WP	Antifungal, antibacterial, cold, whooping cough, toothache, stomachic
Mazaceae			
Mazus surculosus D. Don	-	WP	Cuts and wounds
Orobanchaceae			
Pedicularis hoffmeisteri Klotzsch	-	Rt	Cattle flatulence

Plantaginaceae			
Plantago depressa Willd.	Isabgol	WP, St	Dysentery, wounds, piles
Polygonaceae			
Persicaria amplexicaulis (D.Don) Ronse Decr.	-	Lf, Rt	Paste applied on insect sting
Persicaria nepalensis (Meisn.) Miyabe	Nalora	Lf	Paste applied on skin to reduce swelling
Polygonum aviculare L.	-	Sd, Lf, Rt	Tonic, dysentery, stomachache , antipyretic, astringent
Rumex acetosa L.	-	Lf, AP, Fr	Appetizer, stomach diseases
Rumex nepalensis Spreng.	Jangali Palak	Lf, Rt	Cooling, colic, Scurvy, Swelling of muscle, stomach ache, etching
Primulaceae			
Primula denticulata Sm.	-	AP, Fl, Rt	Diabetes, headache, appetizer, muscular pain, pulmonary diseases
Ranunculaceae			
Anemone obtusiloba D.Don	-	Rt, Sd	Cooling, cuts, burns
Delphinium vestitum Wall. ex Royle	Kelulu	WP	Extract of whole plant acts as antidote to snake bite, cuts wound, fever
Rosaceae			
Fragaria vesca L.	Jangali strawberry	Fr, Infl	Earache
Potentilla argyrophylla Wall. ex Lehm	-	Rt, Fl	Toothache, wound
Potentilla atrosanguinea G.Lodd. ex D.Don	-	Lf	Juice used in treating indigestion
Sibbaldia cuneata Schouw ex Kunze	-	Fr, Rt	Juice mixed with salt and taken orally to get relief from bodyache
Saxifragaceae			
Bergenia ciliata (Haw.) Sternb.	-	Rh, Lf,	Kidney stones, ulcer, constipation, cold, cough
Saxifraga parnassifolia D. Don	-	Rt	Root juice used for dissolving stones in the kidney
Scrophulariaceae			
Verbascum thapsus L.	Jangali Tamaku	Fl, Lf, Sd	Smoke of flowers and leaves useful for asthma. Infusion of whole plant is used for snake bite. constipation, cough, dysentery of sheep
Violaceae			
Viola biflora L.	Banaksha	Lf, Fl	Antiseptic, cold, cough, laxative, cure indigestion
Zingiberaceae			
Roscoea alpina Royle	-	Rt	Paste used to heal veterinary cuts and wounds, tonic

Note: AP= Aerial part; Bb= Bulb; Fl= Flower; Fr= Fruit; Infl= Inflorescence; Lf=Leaf; Rh= Rhizome; Rt= Root; Sd= Seed; St= Stem; Tu= Tuber; WP= Whole plant; Frd= Frond in the category of threatened species (Goraya *et al.* 2013).

DISCUSSION

Floristic composition is an important component of the community that determines the functioning of an ecosystem and can vary from place to place according to habitat heterogeneity of the area itself. In the present study, a distinct change in plant diversity of Prashar alpine pasture site were recorded in different seasons. In Prashar alpine pasture, the maximum numbers of species recorded were 72 in the rainy season, 44 in the summer season and 13 were in the winter season during the study period respectively. It may also be that rainy season plants are active in favourable seasons and are controlled by physical conditions. More number of species during the rainy season can be attributed to the optimum climatic conditions for the growth and development of different species. However, drastic reduction in number of species in winter season may be due to environmental severances. Similar findings were observed by Dhaulakhandi *et al*. (2010) and Prakash & Paliwal (2012). In these alpine pastures, the annuals and perennials plant grow, develop flower and fruits by September/October, after that the senescence of aerial parts begin, which found true to the present study sites. This also, accounted for the low number of species in winter season. However, species increase in the summer season as compared to the winter season was recorded during study period because of the availability of water in

summer season due to snow melts which support the growth of the plant. However, in these alpine regions the melting of the snow provided a major trigger for the germination of dormant buds and seeds. Germination started from summer season onwards. Mortality in annuals plants is due to their short life period, poor establishment and lack of competitive power. All these factors directly affect the seasonality of species distribution.

In the present study, tall forbs varied from 20.45% to 30.77%, short forbs varied from 46.15% to 63.89% and cushion-spreading forbs varied from 12.50% to 23.08% were observed during the year in different season. Similar findings were reported by different workers while conducting the study in alpine pastures such as Santvan (1993) for the alpine pasture near Rahla, reported 22.5% tall forbs, 45.0% short forbs and 32.5% cushion and spreading forbs, Verma *et al.* (2006) reported 25.00% tall forbs, 60.52% short forbs and 14.48% cushion and spreading forbs whereas Verma and Chauhan (2022) reported 41.46% tall forbs, 52.44% short forbs and 6.10% cushion and spreading forbs. The short forbs usually have hairy leaves which protect them against frost condition.

The dominant families recorded at Prashar alpine pastures were Asteraceae, Lamiaceae, Rosaceae, Poaceae and Polygonaceae during the year in different season. The dominance of these families in the alpine pasture was due to their phytogeographic origin and specific niches adapted for the alpine climates. Similar findings were reported by several workers while conducting study in alpine pastures and other high-altitude forest ecosystems such as Gaur *et al.* (2005), Singh & Sundriyal (2005), Chawla *et al.* (2008), Dad & Khan (2010), Kaur *et al.* (2010), Sharma *et al*. (2014), Verma & Kapoor (2014), Rawat *et al*. (2016), Kumar & Verma (2019a), Kumar & Verma (2019b) and Verma & Chauhan (2022).

In the present study the occurrence of non-leguminous forbs is more than the grasses, sedges and leguminous forbs in all season may be due to heavy grazing pressure. The dominant non leguminous forbs plant species i.e. *Anemone obtusiloba* D.Don, *Cynoglossum zeylanicum* (Vahl) Brand, *Hackelia uncinata* (Benth.) C.E.C.Fisch., *Impatiens scabrida* DC, *Impatiens sulcata* Wall., *Pedicularis hoffmeisteri* Klotzsch, *Rumex acetosa* L., *Rumex nepalensis* Spreng., *Senecio laetus* Edgew., *Verbascum thapsus* L., etc. are not preferred by the animal to eat. Similar results were reported by Santvan (1993), Verma *et al.* (2006), Verma *et al.* (2008), Verma & Chauhan (2022). Overgrazing does not only alter their botanical compositions but also cause degradation of pasture. Due to higher degradation, the present level of production of these alpine pastures is less than that of their possible potential. If suitable steps are not taken in time, there must be a further decline in the floristic composition and potential of the pasture. It is suggested to suitably deal with the precious and diverse flora of Prashar alpine pasture by regulating the intensity of grazing pressure and controlling the habitat degradation.

CONCLUSION

The present study documented the floristic composition of Prashar alpine pasture and helped to explore the flora of the pasture. The study documented that the highest number of plant species was recorded during the rainy season followed by summer season and the least in winter season with the dominancy of the family Asteraceae, Lamiaceae, Rosaceae, Poaceae and Polygonaceae. In the present study the occurrence of non-leguminous forbs is more than the grasses, sedges and leguminous forbs in all season may be due to heavy grazing pressure. The major threats to floristic diversity, in the Prashar alpine pasture are expansion of overgrazing, uncontrolled and unscientific extraction of important medicinal plant species from their habitats, unregulated tourism and construction of roads. To minimize the impacts on the floristic diversity, there is an urgent need for the conservation of pasture important habitats by implementing scientific conservation measures such as create awareness about the usefulness of the flora, promoting community-based conservation, *in-situ* and *ex-situ* conservation, cultivation of important medicinal plants, restoration of degraded pasture, controlled and rotational grazing, herb collectors should be educated with the sustainable harvest of these species so that there is a continuous regeneration of flora.

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