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Ecological Significance of floristic structure and Biological Spectrum of alpine floral biodiversity of Khunjerab National Park Gilgit-Baltistan Pakistan

Original Article

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The current study was conducted in Khunjerab National Park which is situated in the subalpine zone. The study area was thoroughly surveyed to ensure the maximum collection of flowering plants diversity. The work aimed to investigate the ecological significance of floral structure and the biological spectrum of prevailing flowering plants' biodiversity in the study area. For this purpose, we recognized four ecological zones based on altitude in the park namely the subalpine zone (3000m to 3500m), alpine zone (3600m to 4000m), super alpine zone (4100-4500m), and sub naval zone was started from (4600-4800m) altitude. The collected specimens comprised (155) plant species that belong to 97 genera and 36 families. The life forms of the collected species were 72% Hemicryptophyte (H), 13% Therophytes, 10% Chaemephyte, and 5% Phanerophyte. While the habit categories of the flora were analyzed with the help of Theophrastus classification. The breakup of the habit categories shows that the herbs with 137 species held the highest percentage to contribute the flora of the study area was with 88%, followed by shrubs with 14 species which contributed to the flora of the area was 9.03%. Similarly, subshrubs and trees contained the same number of 2 spices. We observed the phenological status of each species, i.e., flowering and fruiting conditions, and of the species that were infrequent.

Keywords: biodiversity, flora, phenology, life-form, habit categories

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CONFLICT OF INTEREST:

There exists no conflict of interest for publishing this manuscript in IJIST.

Author's Contribution. Miss Nasiba designed and performed the experiments and also helped to write the manuscript, helped in the mounting of plants for the identification, and also helped out in the reviewing of the manuscript reading, till approval of the final version.

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Introduction

The life form is an important physiognomic attributes that have been widely used in vegetation studies and also it indicates micro and macroclimate as well as human disturbance of a particular area [1]. The life forms of species point out the adjustment of perennating buds to environmental conditions [2]. Raunkiær described the biological spectrum in [3]. Climate determines the type of plants that can exist in each ecosystem and the general appearance of vegetation is referred to as physiognomy or structure. It constitutes the general structure, shape and life forms of the species comprising the vegetation and actually the classification of vegetation type has been done based on physiognomy [4]. Raunkiaer designed his life-form system to define what he called phytoclimates. The theoretical basis was familiar in plant geography [5] and may be expressed as follows: (1) Plants are limited in their capacity to endure different environmental complexes. (2) There is usually a correlation between the morphology (growth-form, life-form) of an organism and its environment, i.e., there is a morphological basis for adaptation in many if not all cases. (3) A plant, in its successful existence, represents what may be called an automatic physiological integration of all the factors of its environment. If these are general truths, it follows that the life-forms of the plants of an area are a measure of the environmental conditions, especially climate. It remains only to find the key to the plant-climate interrelations.

Raunkiaer decided that the significant relationship was to be looked. for in the seasonal climates. When growth is slowed or dormancy forced upon a plant by cold or drought the most critical tissues are meristematic. Therefore, the amount of protection provided embryonic growing tissues and their success in enduring the unfavorable period represent a critical adaptation [1].

The five principal classes of the life-form system of Raunkiaer (based, on the protection the perennating buds during the unfavorable season) are arranged according to increasing protection: Phanerophyte (trees and shrubs), chamaephytes (low perennials with buds close to the ground surface or semi-woody plant), Hemicryptophytes (buds at the soil surface), cryptophytes (buds beneath the soil or underwater), and Therophytes (annuals, herbaceous plant which produces seeds). These classes are subject to subdivision. The chamaephytes are so few in number that no breakdown was made. My information concerning the hemi cryptophytes is inadequate for the detailed treatment of subclasses. The geophytes (the major group 0 (cryptophytes) were c1assified according to whether the subterranean organs bearing the perennating buds are rhizomes, bulbs, stem tubers, root tubers, or roots, but the various groups seen to have little significance for present purposes. The Phanerophyte, however, were easily treated according to four Subclasses based 0n height. Megaphanerophytes exceed 30 meters; Mesophanerophytes are between 8 and 30 meters; Mesophanerophytes are between 2 and 8 meters; and Nanophytes are less tall than 2 meters and taller than chamaephytes (about 25 cm.) [1]. The geological and Ecological varieties zones of the world support various types of floristic composition [6].

Material and Methods

Investigation site

The study area lies between latitude 36° 45.5' N and 74° 49.7' E longitude. The entire area comprises three vallies and constituting the national park falls in the former Hunza state, which, together with neighboring Nagar, is an independent district. The KNP comprises mostly difficult and terrain mountains snow-covered peaks which provide heterogeneous diversity to the ecosystem. The biodiversity pattern in mountains depends upon the physical environmental conditions such as solar radiation, precipitation, soil, wind, and biotic pressure. The physical complexity of the alpine environment encourages rapid speciation, especially because of flora and fauna [7]. Researches in alpine regions demonstrate enormous intra-specific variation even within a small area, for example, in flowering rhythms [8], [9].The alpine mountain system provides distinct altitudinal zones which enhance the local, regional and global biodiversity.

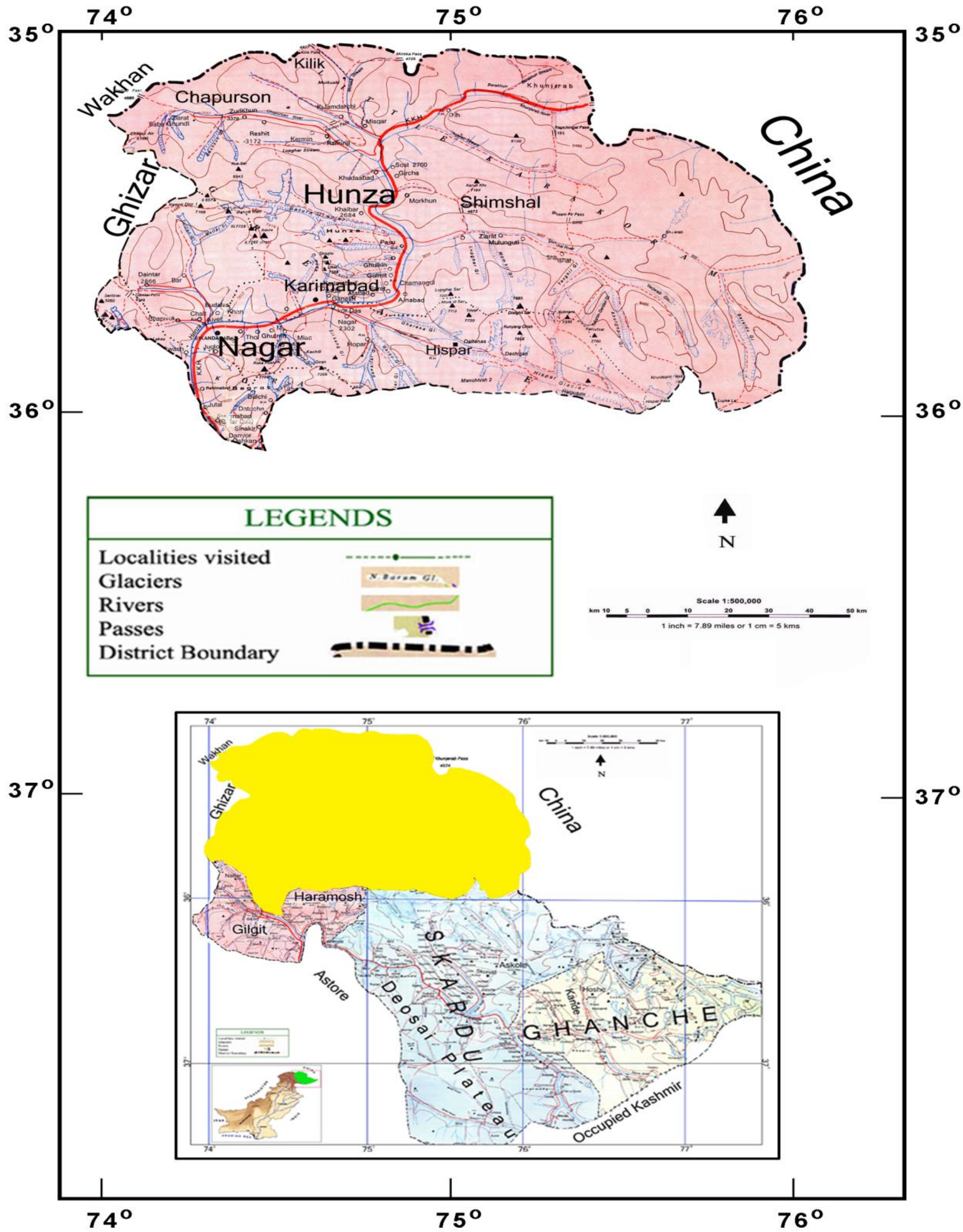


Figure 1- Map of the study area

Collection of field data

The reconnaissance study was conducted in the Khunjerab National Park (KNP), situated in the district of Hunza Nagar Gilgit-Baltistan. Field trips in different seasons thoroughly surveyed the study area. It provides an opportunity to make plant collection observations. During the field survey and the collection of plant specimens, we observed each species' phenological and ecological parameters.

Identification and analysis

The collected specimens were identified with the help of Flora of Pakistan [10], [11] using available literature and a comparison of specimens at Karachi University Herbarium. The study area was thoroughly surveyed to collect the plant specimens with the help of a presser and ecological data was collected with the help of an altimeter and Raunkiaer classification system [3].

Habit categories and life cycle was categorized with the help of the Theophrastus system of classification [12]. While for the data analysis simple statistics and tabulation format was used.

Results

The Khunjerab National Park in the district Hunza Nagar of Gilgit-Baltistan comprises 2,269 square kilometers in the Hunza, Gojal on either side of the Karakoram Highway from Dih to the Pak- China border at the Khunjerab pass. Based on altitude and Phytoclimatic conditions, we recognized four ecological zones: subalpine zone, Alpine zone, super alpine zone, and sub naval zone detail is given in (Figure-2). The distribution of plant taxa (Subalpine zone) from 3000m to 3500m altitude was 55 belonging to 20 families with 42 genera, followed the next alpine zone from 3600m to 4000m altitude 54 species were belonging to 19 families with 39 genera. While the super-alpine zone was started from 4100-4500m altitudes where 26 genera followed 33 species with 13 families, the sub naval zone was started from 4600-4800m only 13 species with 8 genera belonging with 6 families. Here it was noticed that the number of species was decreased with the higher altitude.

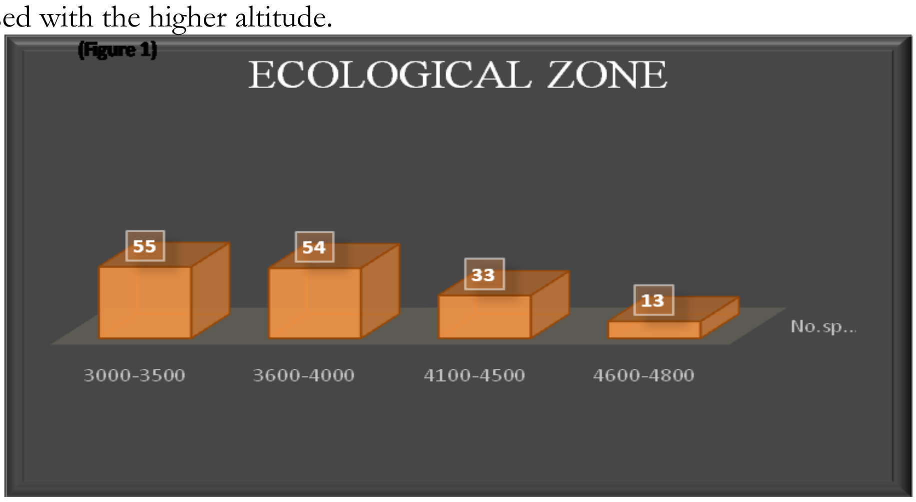
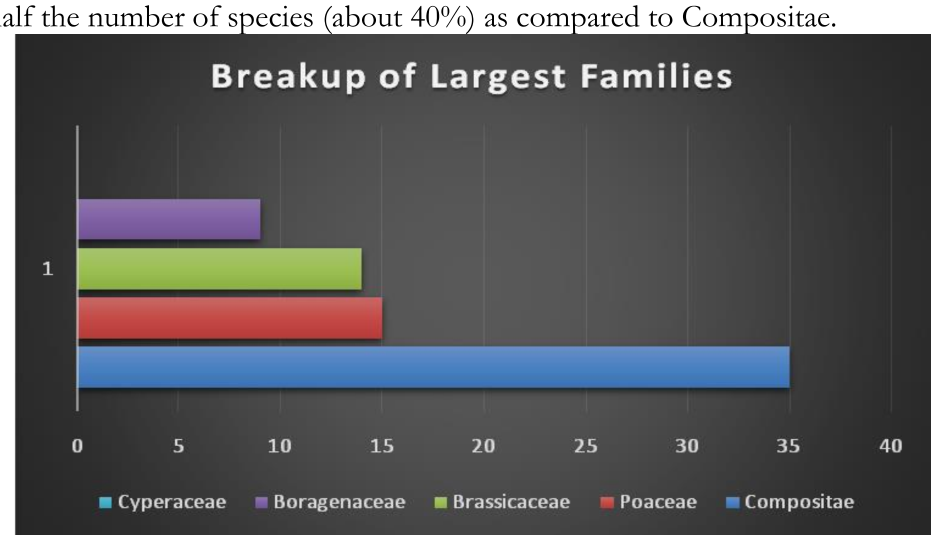


Figure-2 Distribution of taxa in Ecological zone

During the inventory of alpine vegetation survey, 155 plant species were recorded belonging to 97 genera and 36 families (Table-1). The taxonomic breakup of the inventorying shows that the Gymnosperms comprised 2 families followed by 2 genera and 2 species. Among gymnosperms, only one family and one species belonged to the subgroup conifers, while one family and three species belonged to the subgroup Gnetophyte. The Angiosperms were 29 families belonging to 80 genera followed with 128 species and monocots were 23 species followed by 2 families and 15 genera. Based on the highest number of species, the Compositae family was disproportionately higher than other families. The second-largest family Poaceae had less than half the number of species (about 40%) as compared to Compositae.



3Figure 3 Larger families in the study area

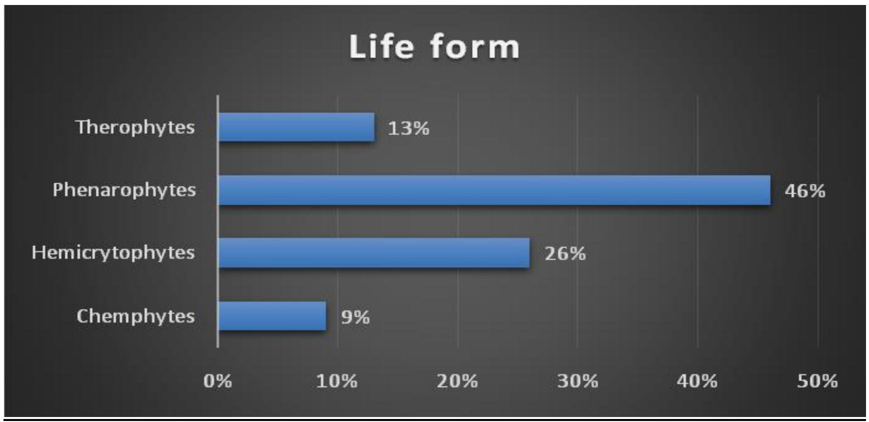


Figure 4 Life-form of the study area

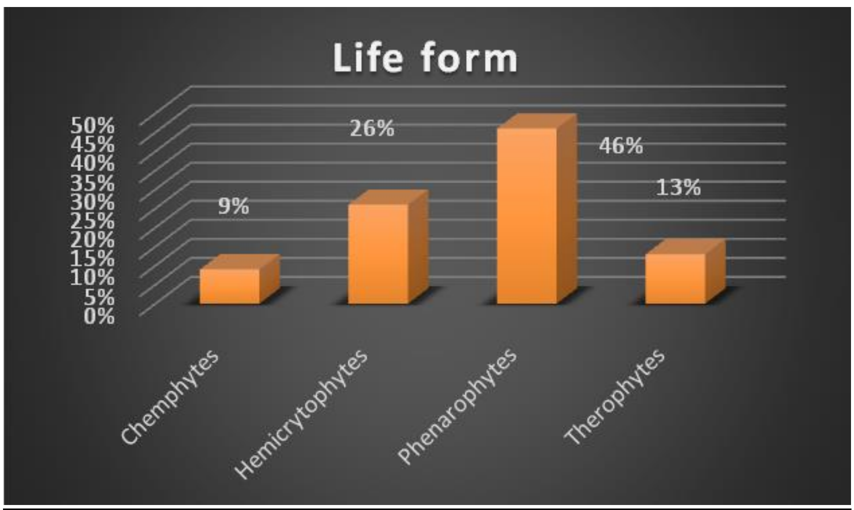


Figure 5 Raunkaeir's Life forms normal spectrum

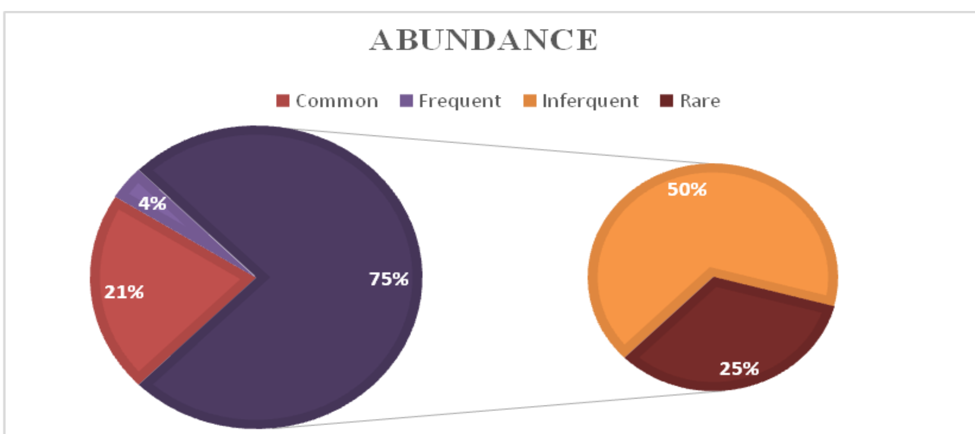


Figure 6 percentage distribution of abundance of the taxa

The collected data show that only 5species are rare, 7 species are common and 141 species are infrequent in the study area (Figure-6).

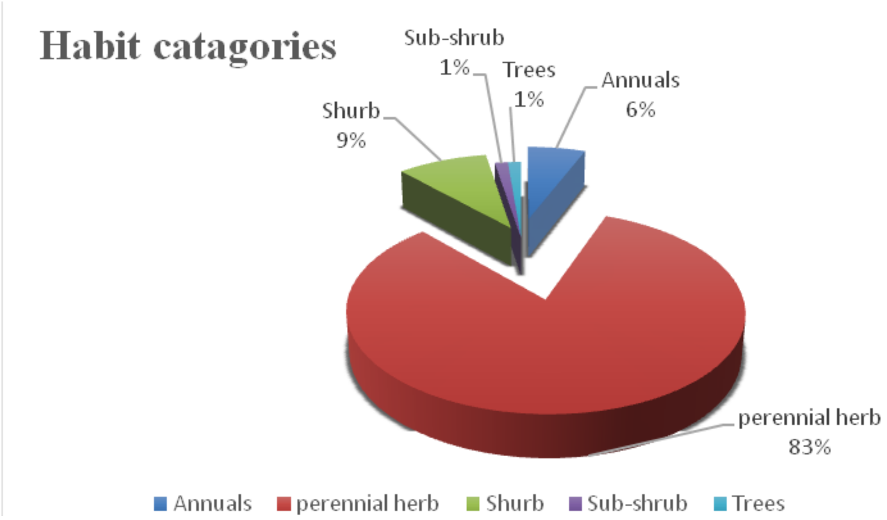


Figure 7 Breakup of the habit categories and their percentage.

The breakup of the habit categories shows that the herbs were with 137 species holding the highest percentage to contribute to the flora of the study area was herbs with 88% followed by shrubs with 14 species which contributed to the flora of the area was 9.03%. Similarly, subshrubs and trees contained the same number of spices (Figure-7).

Table-1: Cumulative check list the of species with observed ecological parameters on the study area

S.No.	Family	Species	Habit	Life form	Altitude	Abun.	Phenological status	
							Flo.	Fruiting.
	GYMNOSPERMS							
	CONIFERS							
1.	Cupressaceae	*Juniperusturkestanica*Komarov	Tree	Ph	3500m	In	-	+
	GNETOPHYTES							
2.	Ephedraceae	*Ephedra gerardiana*Wall.exStapf	Shrub	Ph	3500m	In	+	-
3.	Ephedraceae	*Ephedra intermedia* schrank& Mayer	Shrub	Ph	3600m	In	-	-
4.	Ephedraceae	*Ephedra regeliana*Florin	Shrub	Ph	4000m	In	-	-
	ANGOSPERMS-DICOTS							
5.	Apocynaceae	*Trachomitumvenetum*(L.) Woodson	Perennial	Ch	3000m	In	-	+
6.	Berberidaceae	*Berberisbrevissima*Jafri	Shrub	Ph	3500m	In	-	+
7.	Berberidaceae	*Berberisulicina*Hook,f&Thoms.	Shrub	Ph	3500m	C	-	+
8.	Betulaceae	*Betulautilis*D.Don	Tree	Ph	3000m	In	+	-
9.	Boraginaceae	*Arnebiaguttata*Bunge	Perennial	H	3300m	In	+	-
10.	Boraginaceae	*Cynoglossumglochidiatum*Wall.exBenth.	Perennial	H	3600m	In	-	+
11.	Boraginaceae	*Eritrichiumcanum* (Benth. in Royle)	Perennial	H	4000m	In	+	-
12.	Boraginaceae	*Lappulaconsanguinea*(F. &C.A. Meyer)Gurke	Perennial	H	4200m	In	+	-
13.	Boraginaceae	*Lindelofiaanchusoides*(Lindl.)Lehm.	Perennial	H	4000m	In	+	-
14.	Boraginaceae	*Myosotisalpestis*F.W.Schmidt	Perennial	H	4300m	In	+	-
15.	Boraginaceae	*Myosotisarvensis*(L.)Hill	Perennial	H	4000m	In	+	-
16.	Boraginaceae	*Onosmahispida*Wall. ex G.Don	Perennial	H	3600m	R	-	+
17.	Boraginaceae	*Pseudomertensiaechioides*(Benth.) Riedl	Perennial	H	3600m	In	+	-
18.	Brassicaceae	*Brayarosea*(Turcz.)Bunge	Perennial	H	4300m	In	+	-
19.	Brassicaceae	*Capsella bursa-pastoris*(L.) Medik.	Perennial	H	3500m	In	+	-
20.	Brassicaceae	*Christoleacrassifolia*Camb.	Perennial	H	4400m	In	+	-
21.	Brassicaceae	*Christoleahimalayensis*(Camb.)Jafri	Perennial	H	4200m	In	+	-

22.	Brassicaceae	*Descurainiasophia*(L.)Webb & Berth.	Perennial	H	3500m	In	+	-
23.	Brassicaceae	*Hediniatibetica*(Thoms.) Ostenf.	Perennial	H	4500m	R	+	-
24.	Brassicaceae	*Lepidiumapetalum*Willd.	Annual herb	Th	3700m	In	+	-
25.	Brassicaceae	*Lepidiumlatifolium*L.	Annual herb	Th	3600m	In	+	-
26.	Brassicaceae	*Lepidiumsativum*L.	Annual herb	Th	3800m	In	+	-
27.	Brassicaceae	*Parryaexscapa*Ledeb.	Perennial	H	4300m	In	+	-
28.	Brassicaceae	*Sisymbriumheteromallum*C.A.Mey	Annual herb	Th	3300m	In	+	-
29.	Brassicaceae	*Sisymbriumbrassiciforme*C.A.Mey.	Annual herb	Th	3500m	In	-	+
30.	Brassicaceae	*Smelowskia alba* (Pall) Regel	Perennial	H	4500m	R	-	+
31.	Brassicaceae	*Smelowskiacalycina*(Steph. ex Willd.)C.AMey.	Perennial herb	H	4500m	R	-	+
32.	Campanulaceae	*Campanula pallida*Wall. var.*tibetica*(Hook.f.et Thoms.)Hara	Perennial herb	H	3800m	In	+	-
33.	Capparidaceae	*Capparishimalayensis*Jafri	Sub shrub	Ch	3700m	In	-	+
34.	Caprifoliaceae	*Lonicera microphylla*Willd.exRoem. &Schultes	Shrub	Ph	3700m	In	+	-
35.	Caprifoliaceae	*Lonicerasemenovii*Regel	Shrub	Ph	3600m	In	+	-
36.	Caryophyllacea	*Cerastiumpusillum*Ser	Perennial	H	3800m	In	+	-
37.	Caryophyllacea	*Silenegonosperma*(Rupr.)Bocquet	Perennial	H	4200m	In	+	-
38.	Caryophyllacea	*Silenekunawarensis*Benth.	Perennial	H	3700m	In	+	-
39.	Chenopodiacea	*Chenopodium album* L.	Annual herb	Th	3500m	In	+	-
40.	Chenopodiacea	*Chenopodiumbotrys*L.	Annual herb	Th	3500	In	+	-
41.	Chenopodiacea	*Chenopodiumfoliosum*Asch.	Annual herb	Th	3600m	In	-	+
42.	Chenopodiacea	*Halogetontibeticus*Bunge	Perennial	H	3500m	In	-	+
43.	Chenopodiacea	*Kochiaprostrata*(L.)Schrad.	Perennial	H	3000m	In	+	-
44.	Chenopodiacea	*Krascheninnikoviaceratoides*(L.) Guldenst.	Sub shrub	Ch	3300m	In	+	-
45.	Compositae	*Acroptilonrepens*(L.) DC.	Perennial	H	3600m	In	+	-
46.	Compositae	*Ajaniafruticulosa*(Ledeb.)Poljakov	Perennial	Ch	4000m	C	+	-
47.	Compositae	*Anaphalisnepalensis*(Spreng.)Hand.-Mazz.	Perennial	H	4200m	In	+	-
48.	Compositae	*Artemisia absinthium*L.	Perennial	Ch	3600m	In	+	-
49.	Compositae	*Artemisia biennis*Willd.	Perennial	Ch	3500m	In	+	-
50.	Compositae	*Artemisia capillaris* Thunb.	Perennial	Ch	3600m	In	+	-

51.	Compositae	*Artemisia dracunculus*L.	Perennial	Ch	3500m	In	+	-
52.	Compositae	*Artemisia elegantissima*Pamp.	Perennial	Ch	3800m	In	+	-
53.	Compositae	*Artemisia macrocephala*Jacquem. ex Besser	Perennial	Ch	3300m	In	+	-
54.	Compositae	*Artemisia persica*Boiss.	Perennial	Ch	3300m	In	-	+
55.	Compositae	*Artemisia rupestris*L.	Perennial	Ch	4500m	In	+	-
56.	Compositae	*Artemisia rutifolia*Spreng.	Perennial	Ch	3300m	In	+	-
57.	Compositae	*Artemisia roxburghiana*Wall.exBesser	Perennial	Ch	3200m	In	+	-
58.	Compositae	*Artemisia santolinifolia*Turcz.exKrasch.	Perennial	Ch	3300m	In	+	-
59.	Compositae	*Artemisia vulgaris* L.	Perennial	Ch	3500m	C	+	-
60.	Compositae	*Seneciokraschenninikovii*Schischkin	Perennial	H	3500m	In	+	-
61.	Compositae	*Crepisflexuosa*(DC.) Bth.&Hk.f.	Perennial	H	4000m	C	+	-
62.	Compositae	*Echinopscornigerus*DC.	Annual herb	Th	3500m	In	+	-
63.	Compositae	*Hieraciumumbellatum*L.	Perennial	H	3000m	In	+	-
64.	Compositae	*Hieraciumvirosum*Pall.	Perennial	H	3300m	In	+	-
65.	Compositae	*Hieraciumvulgatum*Fries	Perennial	H	3400m	In	+	-
66.	Compositae	*Leontopodiumbrachyactis*Gandoger	Perennial	H	3600m	In	+	-
67.	Compositae	*Leontopodiumleontopodinum*(DC.)Hand.-Mazz	Perennial	H	4000m	In	+	-
68.	Compositae	*Leontopodiumnanum*(Hook.f. & Thomson ex C. B.	Perennial	H	3800m	In	+	-
69.	Compositae	*Saussureagnaphalodes*(Royle) Sch.-Bip.	Perennial	H	4700m	R	+	-
70.	Compositae	*Saussureajacea*(Klotzsch) Clarke	Perennial	H	3000m	In	+	-
71.	Compositae	*Saussureaobvellata* (DC.) Sch.	Perennial	H	4400m	R	+	-
72.	Compositae	*Saussureasimpsoniana* (Field &Garden)Lipschitz	Perennial	H	4800m	R	+	-
73.	Compositae	*Seriphidiumbrevifolium*(Wall. ex DC.) Ling & Y.R. Ling	Perennial	Ch	4000m	C	+	-
74.	Compositae	*Tanacetumartemisioides*Schultz-Bip.exHook.f.	Perennial	H	4000m	In	+	-
75.	Compositae	*Tanacetumbaltistanicum*Podlech	Perennial	Ch	3600m	In	+	-
76.	Compositae	*Taraxacumafficinale*L.	Perennial	H	3500m	In	+	-
77.	Compositae	*Taraxacumlati-base* v.S.	Perennial	H	4300m	In	+	-
78.	Compositae	*Taraxacumnasiri*v. S.	Perennial	H	4700m	In	+	-
79.	Compositae	*Tricholepistibetica*Hook.f.& Thomson	Perennial	H	3100m	In	+	-
80.	Crassulaceae	*Hylotelephiumewersii* (Ledeb.) H.Ohba	Perennial	H	3300m	In	+	-
81.	Crassulaceae	*Orostachysthyrsiflora*(Fisch.)D.C.	Perennial	H	4200m	In	+	-

82.	Crassulaceae	*Rhodiolawallichiana*(Hook) S.H.Fu	Perennial	H	4000m	In	+	-
83.	Elaeagnaceae	*Hippophaerhamnoides*L.	Shrub	Ph	3500m	In	+	-
84.	Fumariaceae	*Corydalis adiantifolia*Hook f. &Thoms.	Perennial	H	3600m	In	+	-
85.	Gentianaceae	*Aloitismoorcroftiana* (wall.ex G Don) Omer, Qaiser&	Perennial	H	4200m	In	+	-
86.	Gentianaceae	*Ciminalisaquatica*(L.)Zuyev	Perennial	H	4300m	In	+	-
87.	Gentianaceae	*Ciminaliskarelinii*(Griseb.) Omer	Perennial	H	4000m	In	+	-
88.	Gentianaceae	*Comastomafalcatum*(Turcz.exKar. &Kir) T	Perennial	H	4100m	In	+	-
89.	Gentianaceae	*Comastomapulmonarium*(Turcz) Toyok.	Perennial	H	4400m	In	+	-
90.	Gentianaceae	*GentianopsisPaludosa*(Munro ex Hook.f.) Ma	Perennial herb	H	3300m	In	+	-
91.	Labiatae	*Dracocephalumstamineum*Kar. &Kir.	Perennial	H	4000m	In	+	-
92.	Labiatae	*Mentharoyleana*Benth.	Perennial	H	3500m	F	+	-
93.	Labiatae	*NepetalongibracteataBenth.*	Perennial	H	3700m	In	+	-
94.	Labiatae	*Perovskiaabrotanoides*Karel.	Perennial	H	4000m	C	+	-
95.	Papaveraceae	*Papavernudicaule*L.	Perennial	H	4500m	In	+	-
96.	Papilionaceae	*Astragalusfalconeri*Bunge	Perennial	H	4600m	In	+	-
97.	Papilionaceae	*Oxytropismicrophylla*(Pallas) DC.	Perennial	H	4000m	In	+	-
98.	Papilionaceae	*Oxytropissavellanica*Bunge ex Boiss.	Perennial	H	4600m	In	+	-
99.	Papilionaceae	*Oxytropisstaintoniana*Ali	Perennial	H	3300m	In	+	-
100.	Plantaginaceae	*Plantagogentianoides*Sibth.& Sm. subsp.*gentianoides*	Perennial	H	3900m	In	+	-
101.	Polygonaceae	*Rheum tibeticum*Maxim. ex Hook. f.	Perennial	H	4200m	In	+	-
102.	Primulaceae	*Primulanutans*J.G.Georgi	Perennial	H	4300m	In	+	-
103.	Ranunculaceae	*Delphinium pyramidale*Royle	Perennial	H	4200m	In	+	-
104.	Ranunculaceae	*Pulsatillawallichiana*(Royle) Ulbr.	Perennial	H	4100m	In	+	-
105.	Ranunculaceae	*Delphinium vestitum*Wall.exRoyle	Perennial	H	4300m	In	+	-
106.	Ranunculaceae	*Ranunculus pulchellus*C.A.Mey.	Perennial	H	4700m	In	+	-
107.	Rosaceae	*Potentilladryadanthoides*(Juz.) Viroshilov	Shrub	Ph	4000m	In	+	-
108.	Rosaceae	*Potentillapamirica*Th. Wolf var.*pamirica*	Perennial	H	3600m	In	+	-
109.	Rosaceae	*Potentillasalesoviana*Steph.	Shrub	Ph	4000m	In	+	-
110.	Rosaceae	*Rosa microphylla*Lindl.	Shrub	Ph	3500m	In	+	-

111.	Rosaceae	*Sibbaldiapurpurea*Royle	Perennial	H	4200m	In	+	-
112.	Rubiaceae	*Galiumceratophylloides*Hook.f.	Perennial	H	3900m	In	+	-
113.	Rubiaceae	*Galiumverum*L.	Perennial	H	4000m	In	+	-
114.	Rubiaceae	*Rubiatibetica*Hook.f.Rubia	Perennial	H	3100m	In	+	-
115.	Saxifragaceae	*Saxifragaflagellaris*Willd ex Sternb.	Perennial	H	4500m	In	+	-
116.	Saxifragaceae	*Saxifragapulvinaria*H.Smith	Perennial	H	4000m	In	+	-
117.	Saxifragaceae	*Saxifragaflagellaris*willd ex	Perennial	H	4000m	In	+	-
118.	Saxifragaceae	*Saxifragaflagellaris*Willd ex Sternb.	Perennial	H	4200m	In	+	-
119.	Saxifragaceae	*Saxifragaflagellaris*Willd ex Sternb.	Perennial	H	4300m	In	+	-
120.	Saxifragaceae	*Saxifragahirculus*L.	Perennial	H	4800m	In	+	-
121.	Scrophulariacea	*Pedicularisalbida*Penn.	Perennial	H	4000m	In	+	-
122.	Scrophulariacea	*Pedicularisoederi*Vahl	Perennial	H	3800m	In	+	-
123.	Scrophulariacea	*Pedicularispurpurea*Pennell	Perennial	H	4700m	In	+	-
124.	Scrophulariacea	*PedicularisrhinanthoidesSchrenk ex* Fisch. &Mey.	Perennial	H	4600m	In	+	-
125.	Scrophulariacea	*Pedicularisroylei Maxim.*	Perennial	H	4600m	In	+	-
126.	Tamaricaceae	*Myricariasquamosa*Desv.	Shrub	Ph	4000m	In	+	-
127.	Tamaricaceae	*Tamarixgallica*L.	Shrub	Ph	3000m	In	+	-
128.	Tamaricaceae	*Muricariaelegans*Royle	Shrub	Ph	3500m	In	+	-
129.	Umbelliferae	*Trachydiumroylei*Lindl.	Perennial	H	3300m	In	+	-
130.	Umbelliferae	*Vicatiawolffiana*Wolff.exFedde	Perennial	H	3500	In	+	-
131.	Violaceae	*Viola rupestris*F.W.Schm	Perennial	H	4000m	In	+	-
132.	Zygophyllaceae	*Peganumharmala*L.	Perennial	H	3500m	In		+
	ANGOSPERMS- MONOCOTS							
133.	Cyperaceae	*Carexpsychrophila*Nees	Perennial	H	4600m	In	-	+
134.	Cyperaceae	*Carexdiluta*M.Bieb.	Perennial	H	4300m	In	-	+
135.	Cyperaceae	*Carexdivisa*Hudson	Perennial	H	4500m	In	-	+
136.	Cyperaceae	*Carexpseudobicolor*Boeck	Perennial	H	4600m	In	-	-
137.	Cyperaceae	*Carexstenophylla*Wahlenb *subsp.*	Perennial	H	4700m	In	-	-
138.	Cyperaceae	*Kobresiacapillifolia*(Decne.) C.B.Clarke	Perennial	H	4200m	In		-
139.	Cyperaceae	*Kobresianitens*C.B.Clarke	Perennial	H	4200m	In	-	+
140.	Cyperaceae	*Kobresiaschoenoides*(C.A.Mey.) Steud.	Perennial	H	3500m	In	+	-

141.	Poaceae	*Saccharumfilifolium*Nees ex Steud.	Perennial	H	3500m	In	+	-
142.	Poaceae	*Agrostis stolonifera*L.	Perennial	H	3700m	In	+	-
143.	Poaceae	*Agrostis vinealis*Schreb.	Perennial	H	4000m	In	+	-
144.	Poaceae	*Aristidacyantha*Nees ex Steud.	Perennial	H	3700m	In	+	-
145.	Poaceae	*Bothriochloabladhii*(Retz.) S.T. blake	Perennial	H	3600m	In	+	-
146.	Poaceae	*Calamagrostispseudophragmites*(Hall.f.) Koel.	Perennial	H	3200m	In	+	-
147.	Poaceae	*Cymbopogonpospischilii*(K.Schum.) C.E. Hubb.	Perennial	H	3000m	In	+	-
148.	Poaceae	*Elymuscaninus*(L.) L.	Perennial	H	3500m	In	+	-
149.	Poaceae	*Elymuslongearistatus*(Boiss.) Tzvelev	Perennial	H	3300m	In	+	-
150.	Poaceae	*Pennisetumlanatum*Klotzsch	Perennial	H	3300m	In	+	-
151.	Poaceae	*Phragmiteskarka*(Retz.) Trin. ex Steud.	Perennial	H	3000m	In	+	-
152.	Poaceae	*Poaalpina*L.	Perennial	H	3700m	In	+	-
153.	Poaceae	*Polypogonfugax*Nees ex Steud.	Perennial	H	3000m	In	+	--
154.	Poaceae	*Saccharumspontaneum*L.	Perennial	H	3200m	In	+	-
155.	Poaceae	*Sorghum halepense*(L.) Pers.	Perennial	H	3500m	In	+	-

Discussion

The families ranging from 1st to 5th position were: Compositae (35), Poaceae (15), Brassicaceae (14), Boraginaceae (9), and Cyperaceous with (8) species (Figure-3), results of the current study are quite similar to [13], [14], [15].The Asteraceae family is the largest and most widespread family of flowering plants globally [16], [17].The wide ecological range of Asteraceae and Poaceae can be attributed to their adaptation to harsh conditions and effective wind dispersal strategies of their diasporas [18]. Besides inventory, we observed the phenological condition of each species; only 18 species were collected in fruiting conditions most of them belonging to the family Brassicaceae (Table-1).

The biological spectrum is developed when all the species of higher plants of a community are classified into life-forms and the ratio is expressed in several percentages [19]. The life forms of the collected species were 72% Hemicryptophytes (H), 13% Therophytes, 10% Chamaephytes, and 5% Phanerophyte. The life form and distribution of the flora interlinks with the altitude and soil characteristics of the area (Figure-4). The life forms of the current study were compared with the Raunkiaer normal spectrum,1918 (Figure-5). The normal spectrum showed that Phanerophyte (46%), Chamaephytes (9%), Hemicryptophytes were (26%) and Therophytes were (13%).

Interestingly our life-form spectrum is closely similar to Rainier's normal spectrum with Therophytes and Chaemephyte, while the remaining values were quite different. The life form of the community composition is the aspect of adaptations of its constituent species to the climatic condition [20]. Therefore, the climates and the major linked soil types can be reflected by life forms [5]. Raunchier [3] acknowledged that the necessary patterns of climates are characterized by the fact that one or few life forms are, relatively or absolutely, dominant. A high percentage of Hemicryptophytes in any specific region indicate that the mid-latitude includes needle-leaved forest and moisture Steppes (moist temperate region) [21]. Cain Castro and Shimwell [22], [23] reported that hemicryptophyte indicates the temperate zone.

On the other hand, the second-largest life form was chamaephytes, indicating temperate phytoclimates [24]. It shows that the Khunjerab National park is laying in different Phytoclimatic zones due to its topography and altitude. The biological spectrum is also regarded as an indicator of the prevailing environment and the occurrence of a similar biological spectrum in different regions indicates similar environmental conditions [19].

The collected data show that only 5species are rare, 7 species are common and 141 species are infrequent in the study area (Figure-6). A significant number is considered globally threatened because of habitat decline and over [1] exploitation. In this study, we recorded only 7 species as being threatened [25].

The habit categories of the flora were analyzed with the help of the Theophrastus (250-370 B.C) system of classification. Habit in woody plants – lianas, shrubs, and trees – is typically an intrinsic trait [26], [27], and [28]. The breakup of the habit categories shows that the herbs were with 137 species holding the highest percentage to contribute the flora of the study area was herbs with 88% followed by shrubs with 14 species which contributed the flora of the area was 9.03%. Similarly, sub shrubs and trees contained the same number of species (Figure-5). According to Hazrat et al.,[29], [6] they recorded (11%) shrubs, (16%) grasses,(01%) climbers, and 70% herbs, our current results are closely similar to their results. I will enclose my observations on the ecological significance of the herbaceous layer in ecosystems by highlighting five aspects of herb-layer ecology: (1) the contributions of the herb layer to forest biodiversity; (2) the importance of the herb layer as the site of initial competitive interactions for the regeneration phases of dominant canopy species; (3) the ability of the herb layer to form linkages with the overstory; (4) the influence of the herb layer on ecosystem functions, such as energy flow and nutrient cycling; and (5) the multifaceted responses of the herb layer to various disturbances of both natural and anthropogenic origin [30]. Rare plants of the herbaceous layer can be used as indicators of biodiversity [31].Most of the plant biodiversity in ecosystems are found in the herbaceous layer [32], [33], and [34]. This is ironic because herbaceous species have higher natural extinction rates than plant species in other strata [30]. Levin and Wilson [35] estimated that extinction rates in herbs are more than three times that of hardwood tree species and approximately five times that of gymnosperms. Therefore, threats to the floral biodiversity are most often a function of threats to herbaceous-layer species [36].One of the most important ecological benefits of woody plants (Shrubs and trees) for human health is the interception and reduction of air pollution [37].Trees can mitigate temperatures in built environments. Not only do trees provide shade through intercepting and absorbing light, but through evapotranspiration trees actively cool the air of cities [38], [39], [40]. An analysis of 94 urban areas around the world indicates that trees have a significant impact on the temperature and are responsible for, on average, 1.9°C (SD 2.3) of cooling in a city, one of the key ways to limit the impacts of climate change is to reduce the amount of carbon released into the atmosphere [33]. Trees are beneficial to storing carbon, which is a major contributor to climate change [41]. Trees, specifically mature ones, perform a keystone role in terrestrial ecosystems [42].Trees are critically important, especially in urban areas, as they provide food and habitat for birds, invertebrates, mammals, and plants [43], [40], and [44]. Trees provide economic benefits; they can also provide resources, such as food, to a community. Tree cover is strongly linked to student academic performance, [45], [46], and [47]. Trees and shrubs at schools, as opposed to grass, were strongly related to future education plans and graduation rates [47]. The authors of this study classify the benefits of trees into five categories: (a) health and social well-being; (b) cognitive development and education; (c) economy and resources; (d) climate change mitigation and habitat; and (e) green infrastructure [37].

The increasing biotic pressure in the park is creating a threat to all-natural resources; therefore, it needs to explore thoroughly before losing any natural resources and document the data for the future. Intensive animal grazing alters vegetation patterns. Additionally, grazing people digging valuable medicinal herbs at Pak-China border area and abrupt cutting of shrubs by people increase variation within vegetation. As a result, the habitats of species are being changed.

CONCLUSION The Khunjerab National Park (research area) is rich floristically. This area contains most important medicinal plants which are growing on high altitudes, one of the most important factor is that it is dire need to thorough study of ecological significance of these flora in the fergile ecosystem.

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