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Floristic analysis of Chiktan Valley in Kargil district, Jammu and Kashmir

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Abstract

Floristic analysis has been carried out separately for the plain area on the sides of a small stream (Kangi nallah) and mountainous region flanking the stream on both the sides in Chiktan valley of Kargil district in Ladakh region of J&K. A total of 79 plant species belonging to 65 genera and 36 families were recorded from the whole study area which included 48 species (40 herbs and 8 shrubs) from the plain area and 37 species (18 herbs and 19 shrubs) from the mountainous area. Six species had exhibited their presence in both the plain as well as the mountainous region. There were 23 families which were monotypic i.e. these are represented by single genera and single species in the area. Asteraceae has been found to be the dominant family with 16 species and 14 genera followed by Fabaceae (8 species and 7 genera) and Rosaceae (7 species and 3 genera). Dominant genera present in the area are *Potentilla* with 4 species followed by *Draba* and *Pedicularis* (3 species each). Analysis of floristic composition further revealed that the ratio of family to genera is 0.55, family to species is 0.45 and genera to species is 0.82. Comparison of diversity indices of the two regions showed that species richness and dominance is more in plain region and species diversity is more in mountainous region.

Keywords: Chiktan valley, Diversity indices, Floristic analysis, Kargil, Kanji nallah, Ladakh

Introduction

India - a land of physical, cultural, social and linguistic diversity has enormous biological diversity; as a result it is regarded as one of the seventeen mega biodiversity countries of the world. With only 2.4% of the world's area, India accounts for 7-8% of the world's recorded plant (about 45,000, of which approximately 15,000 are of known medicinal value) and animal species (about 91,000). About 5,150 plant species (33%) and 1,837 animal species are endemic to India (MoEF, 2010). Ladakh, the cold desert, is located between the Greater Himalaya in the south- east and the Karakoram Range in the north. The cold desert of Ladakh is characterised by prolonged sub zero temperature, low annual precipitation mostly in the form of snow, less fertile sandy soil with very low water holding capacity, sparsely distributed plant diversity, high insolation, rugged terrain, low humidity (< 30%), low oxygen, and high wind velocity. The plants of this zone show an adaptation to these conditions and are generally dwarfed, stunted, woolly or spiny and develop a mosaic patch of different forms (Rhoades and Thompson, 1975; Walker *et al.,* 1994). The plants are dominated by herbs followed by shrub and bushes. The plants start to grow towards the end of harsh winter when there is abundant sunlight and moisture. There is a short vegetative span ranging from several days to a few months (Bowman and Damm, 2002). The trans-Himalayan (Western Himalaya and Eastern Himalaya) region are considered as one of the most ecologically fragile bio geographic zones in India as the species there are highly vulnerable (Rodgers and Panwar, 1988). They are potentially under threat of biodiversity loss from global warming and unscientific exploitation (Sharma *et al.,* 2010; La Sorte and Jetz, 2010).The present study has been carried out in Chiktan Valley of Kargil district which constitutes one of the administrative sub division of the district. Chiktan has a population of around 5,500 with a relatively decent literacy rate. The total area of the block is around 12 square kilometer. The whole block consists of six villages namely Khangral, Samrah, Chiktan, Hagnis, Shaker and then Sanjak which are situated at regular intervals

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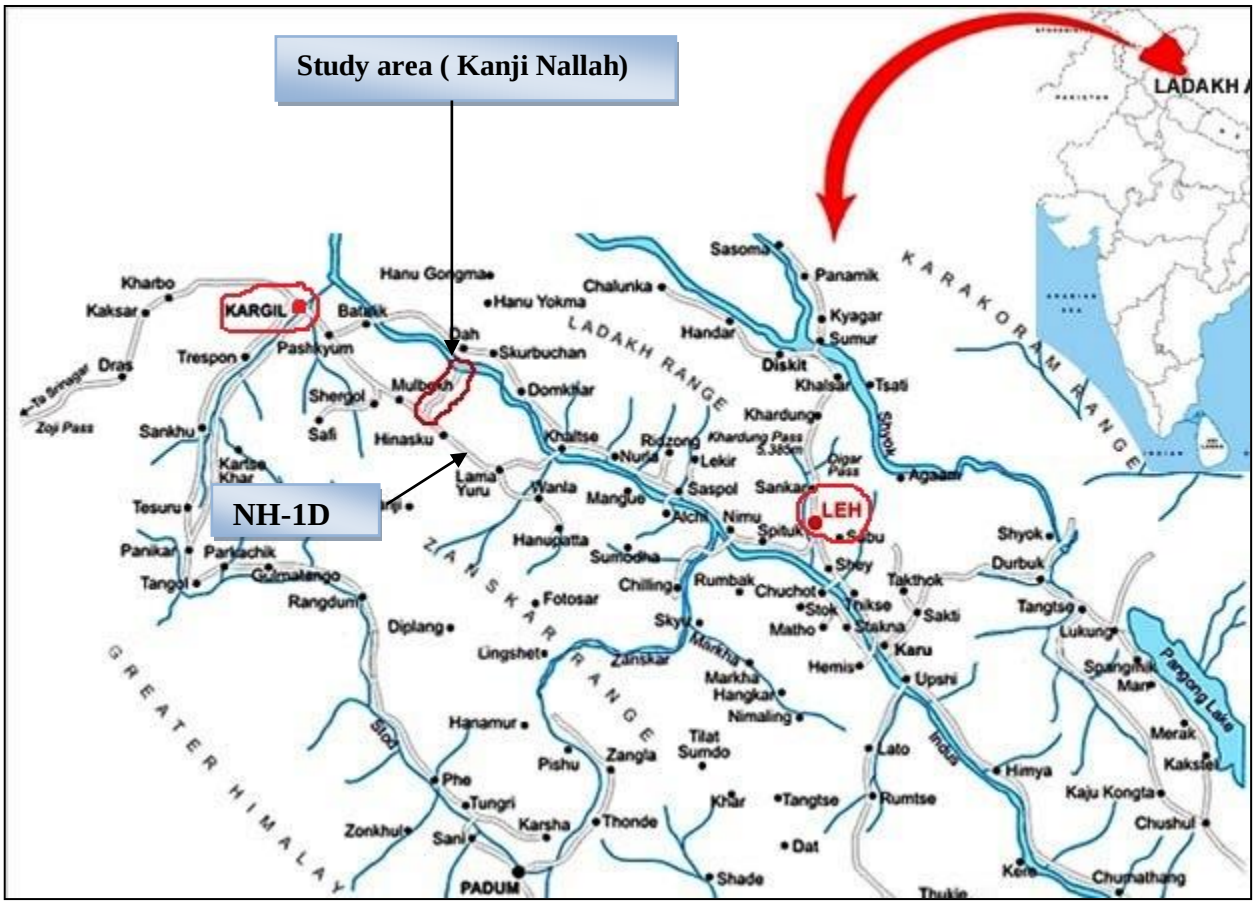
after about every 1 to 1.5 km on the banks of a small stream called Kanji Nallah surrounded on both the sides by medium and large undulating hilly slopes. The stream originates from a small glacier located in Kanji/Hinaskut wild life sanctuary which falls under the jurisdiction of Khangral village on the Kargil- Leh highway NH-1D and after passing through these villages joins river Indus at village Sanjak (Fig. 1).Although the district combines the condition of both arctic and desert climate yet the climate of this valley can be divided into three micro climate viz severe cold and dry climate of Khangral, relatively mild climate of Chiktan, Samrah, Hagnis and Shaker and relatively warm climate of Sanjak with fertile soil. Chiktan valley has not been explored for its floristic elements. However, few studies on phytodiversity have been carried out in other similar region by Srivastava (2010), Shaheen *et al.,* (2011) and Khan *et al.,* (2012). Therefore, present attempt has been made to explore phytodiversity of the area.

Material andMethods

Chiktan Valley (34°22'33.4"-34°34'45.7" N latitude and 76°31'22"-76°31'43.79"E longitude), located on left side of Kargil-Leh highway near Kanji/Hinaskut Wildlife sanctuary, is about half kilometer wide and traversed by Kanji Nallah which is flanked on both sides by medium and large undulating hilly slopes. For studying the floristic composition of the area, a number of field trips were undertaken from July to September 2012 and also repeated in 2013 to cover all the possible habitats. Plant species have been collected and compiled separately for the plain area on the sides of the stream (Kanji nallah) and mountainous region flanking the stream on both the sides of the valley.

Fig. 1: Location map of study area



Plants have also been photographed to depict floral status. Diversity indices which helps in secondary analysis of the vegetation was calculated using Margalef's Index(1968), Menhinick's Index (1964), Simpson's Index (1949) and Shannon and Wiener index (1949). The index of similarity between the two regions has been calculated using Sorenson's index (1948) and Jaccard index (1901). For the purpose of identification of plants, various local, regional and national floras and herbarium were used besides consulting taxonomic experts of the region. Majority of the plants were identified by their vernacular names with the help of village elders.

Results and Discussion

The plant species recorded from the study region has been depicted in Table -1. No tree has been observed in the area. Herb and Shrub species recorded separately for the plain as well as mountainous region of the study area have been depicted in tables 2 to 5 with their vernacular names and family names.The perusal of table 1 revealed the presence of 79 species belonging to 65 genera and 36 families. Asteraceae has been found to be the dominant family with 16 species and 14 genera followed by Fabaceae (8 species and 7 genera) and Rosaceae (7 species and 3 genera).

Table 1: Total number of family, genera and species present in Chiktan valley

S. No	Family	Genera	Species
1.	Alliaceae	1. *Allium*	1. *A. przewalskianum* Regel
2.	Apiaceae	2. *Tetrataenium*	2. *T. pinnatum* (C.B.Clarke) Manden
3.	Asteraceae	3. *Cirsium*	3. *C. arvense*(L.) Scop.
		4. *Taraxacum*	4. *T. officinale* Webb
		5. *Scorzonera*	5. *S. virgata* DC
		6. *Echinops*	6. *E. cornigerus* DC
		7. *Cichorium*	7. *C. intybus* L.
		8. *Aster*	8. *A. flaccidus* Bunge
			9. *A. molliusculus* (Lindl. ex DC.) C.B.Clarke
		9. *Ajania*	10. *A. tibetica* (Hook.f. & Thomson) Tzvelev
		10. *Artemisia*	11. *A. gmelinii* Weber
			12. *A.stracheyi* Hook.f. & Thomson ex C.B.Clarke
		11. *Leontopodium*	13. *L. jacotianum* Beauverd
		12. *Pyrethrum*	14. *P. pyrethroides* (Kar. &Kir.) B.Fedtsch. ex Krasch.
		13. *Inula*	15 *I. racemosa* Hook.f.
		14.*Saussurea*	16. *S. heteromalla* (D.Don) Hand.-Mazz.
		15.*Cousinia*	17. *C. thomsonii* C.B.Clarke
		16 *Anaphalis*	18. *A.triplinervis*(Sims) C.B.Clarke
4.	Boraginaceae	17 *Arnebia*	19. *A. euchroma* (Royle) I.M.Johnst.
		18 *Cynoglossum*	20 *C.wallichii*varglochidiatum
		19. *Lindelofia*	21. *L. stylosa* (Kar. &Kir.) Brand
5.	Brassicaceae	20 *Draba*	22. *D. oreades* Schrenk
			23. *D. amoena* O.E.Schulz
			24. *D. gracillima* Hook.f. & Thomson
6.	Campanulaceae	21.*Codonopsis*	25. *C. clematidea* (Schrenk) C.B.Clarke
7.	Capparaceae	22.*Capparis*	26. *C. spinosa* L
8.	Caprifoliaceae	23.*Morina*	27. *M. longifolia* Wall
9.	Caryophyllaceae	24.*Silene*	28. *S. indi var*. edgeworthii ca
		25.*Arenaria*	29. *A. kashmirica* Edgew
10	Colchicaceae	26.*Colchicum*	30. *C. luteum* Baker
11	Compositae	27.*Anaphalis*	31. *A. royleana* DC
12	Convolvulaceae	28.*Convolvulus*	32. *C. arvensis* L.
13	Crassulaceae	29. *Rhodiola*	33. *R. fastigiata* (Hook. f. & Thomson) S.H. Fu
14	Cupressaceae	30.*Juniperus*	34. *J. macropoda* Boiss
15	Elaeagnaceae	31.*Hippophae*	35. *H. rhamnoides* L.
16	Ephedraceae	32.*Ephedra*	36. *E. gerardiana* Wall. ex Stapf
17.	Fabaceae	33.*Trigonella*	37. *T. emodi* Benth
		34.*Melilotus*	38. *M. officinalis* (L.) Pall.

		35.Lathyrus	*39. L. sativus* L.
		36.Trifolium	*40. T. repens* L.
		37.Astragalus	*41. Astragulussps*
			42. A.rhizanthus Benth.
		38Chesneya	*43. C.cuneata* (Benth.) Ali
		39.Oxytropis	*44. O. lapponica*(Wahlenb.) Gay
18.	Fumariaceae	*40.Corydalis*	*45.C. thyrsiflora* Prain
			46.C. crassisima
19	Gentianaceae	*41.Gentian*	*47.G. kuroo*
20	Geraniaceae	*42.Geranium*	*48.G. wallichianum* D.Don ex Sweet
			49.G. pratense L.
21	Grossulariaceae	*43Ribes*	*50. R. orientale* Desf.
22	Iridaceae	*44.Iris*	*51. I. lactea* Pall
23	Lamiaceae	*45.Nepeta .*	*52. N. floccosa* Benth
		46.Marrubium	*53. M. vulgare* L.
		47.Thymus	*54. T. linearis* Benth
24	Leguminoseae	*48.Ciccer*	*55. C. microphyllum* Benth
25	Onagraceae	*49.Epilobium*	*56. E. latifolium* L.
26	Orchidaceae	*50.Dactylorhiza*	*57. D. hatagirea* (D.Don) Soó
27	Orobanchaceae	*51.Pedicularis*	*58. P. cheilanthifoli*a Schrenk
			59. P. pyramidata
			60. P. scullyana Prain ex Maxim.
28	Plantaginaceae	*52.Plantago*	*61. P. asiatica*
29	Plumbaginaceae	*53.Acantholimon*	*62. Alycopodioides* (Girard) Boiss.
30	Polygonaceae	*54.Polygonum*	*63. P. tortuosum* D. Don
		55.Oxyria	*64. O. digyna* (L.) Hill
		56.Rheum	*65. R. spiciforme* Royle
			66. R. australe D. Don
31	Ranunculaceae	*57.Ranunculus*	67. *R. arvensis* L.
		58.Clematis	*68. C. tibetana Kuntze*
32	Rosaceae	*59.Potentilla*	*69. P. bifurca* L.
			70. P. anserina L.
			71. Potentilla
			72. P. eriocarpa Wall. exLehm.
		60.Rosa	*73. R. webbiana* Wall. ex Royle
			74. R. foetida Herrm.
		61.Cotoneaster	*75. C. microphyllus* Wall. Ex Lindl.
33	Scrophulariaceae	*62.Verbascum*	*76.V thapsus* L
34	Solanaceae	*63.Physochealta*	*77. P. praealta* (Decne.) Miers
35	Tamaricaceae	*64.Myricaria*	*78. M. germanica* (L.) Desv.
36	Urticaceae	*65.Urtica*	*79.U. dioica* L.
Total	**36**	**65**	**79**

Kumar (2009) has also recorded maximum number of species and genera for Asteraceae followed by Fabaceae in Suru Valley but for whole of Ladakh, Kachroo *et al.* (1977) although recorded maximum number of species and genera for Asteracea but it was followed by Brassicaceae rather than Fabaceae. There are 23 families which are monotypic i.e. these are represented by single genera and species in the area. Dominant genera of the study area have been found to be *Potentilla* with 4 species followed by *Draba* and *Pedicularis* (3 species each). Compilation of the herb and shrub species separately for the plain area adjoining the stream (Table 2 & 3) and mountainous slopes (Table 4 & 5) revealed the striking difference in the species distribution. The perusal of tables 2 and 3 revealed the presence of 40 herbs and 8 shrubs from the plain area adjoining the stream while from the mountainous slopes 18 herbs and 19 shrubs have been recorded (Table 4 & 5).Only six species viz *Ajania tibetica, Cirsium arvenses, Echinopsis cornigerus, Physochlaina praealta, Rheum spiciforme and Verbascum thapsus*

Table 2: Herbs of plain region of Chiktan valley

S. No.	Species	Vernacular name	Family
1.	*Allium przewalskianum* Regel		Alliaceae
2.	*Aster flaccidus* Bunge		Asteraceae
3.	*Aster molliusculus* (Lindl. ex DC.) C.B.Clarke		Asteraceae
4.	*Cicer microphyllum* Benth		Leguminosae
5.	*Cichorium intybus* L.	Shantik	Asteraceae
6.	*Cirsium arvense* (L.) Scop.	Zbantser	Asteraceae
7.	*Clematis tibetana* Kuntze	kota	Ranunculaceae
8.	*Codonopsis clematidea* (Schrenk) C.B.Clarke	Faqfaq	Campanulaceae
9.	*Colchicum luteum* Baker		Colchicaceae
10.	*Convolvulus arvensis* L.	Thithimo	Convolvulaceae
11.	*Corydalis thyrsiflora* Prain		Fumariaceae
12.	*Dactylorhiza hatagirea* (D.Don) Soó	Khirgma	Orchidaceae
13.	*Draba amoena* O.E.Schulz		Brassicaceae
14.	*Draba gracillima* Hook.f. & Thomson		Brassicaceae
15.	*Draba oreades* Schrenk		Brassicaceae
16.	*Echinops cornigerus* DC	Kaqtsaymaq	Asteraceae
17.	*Gentian kuroo*L.	Huchung	Gentianaceae
18.	*Geranium pratense* L.		Geraniaceae
19.	*Geranium wallichianum* D.Don ex Sweet	Spoldo	Geraniaceae
20.	*Iris lactea* Pall	Tesma	Iridaceae
21.	*Lathyrus sativus* L.	Garaz	Fabaceae
22.	*Melilotus officinalis* (L.) Pall.	Dannga	Fabaceae
23.	*Oxyria digyna* (L.) Hill	Shoma	Polygonaceae
24.	*Pedicularispyramidata*Royle ex Benth.	Logorgot	Orobanchaceae
25.	*Pedicularisscullyana*		Orobanchaceae
26.	*Pedicularis cheilanthifolia* Schrenk		Orobanchaceae
27.	*Physochlaina praealta* (Decne.) Miers	Lantang	Solanaceae
28.	*Plantagoasiatica*	Biazanma	Plantaginaceae
29.	*Polygonum tortuosum* D. Don	Tsanalo	Polygonaceae
30.	*Potentilla anserina* L.	Totoma	Rosaceae
31.	*Potentilla bifurca* L.	Spanktsemik	Rosaceae
32.	*Ranunculus arvensis* L.	Isman	Ranunculaceae
33.	*Rheum spiciforme* Royle	Latchu	Polygonaceae
34.	*Scorzonera virgata* DC	Tsarchan	Asteraceae
35.	*Sileneindi var.* edgeworthii ca		Caryophyllaceae
36.	*Taraxacum officinale* Webb	Khorkhorma	Asteraceae
37.	*Tetrataenium pinnatum* (C.B.Clarke) Manden	Spisho	Apiaceae
38.	*Trifolium repens* L.		Fabaceae
39.	*Trigonella emodi* Benth	Bugsug	Fabaceae
40.	*Verbascum thapsus* L.		Scrophulariaceae

Table 3: Shrubs of plain region of Chiktan Valley

S. No.	Species	Vernacular name	Family
1.	*Arenaria kashmirica* Edgew.		Caryophyllaceae
2.	*Arnebia euchroma* (Royle) I.M.Johnst.	Demok	Boraginaceae
3.	*Capparis spinosa* L.	Kabra	Capparaceae
4.	*Epilobium latifolium* L.		Onagraceae
5.	*Hippophae rhamnoides* L.	Tsokskure	Elaeagnaceae
6.	*Myricaria germanica* (L.) Desv.	Umbu	Tamaricaceae
7.	*Rosa foetida* Herrm.	Siasirpo	Rosaceae
8.	*Rosa webbiana* Wall. ex Royle	Siamarpo	Rosaceae

Table 4: Herbs of mountain region of Chiktan valley

S. No.	Species	Vernacular name	Family
1.	*Ajania tibetica* (Hook.f. & Thomson) Tzvelev	Phasbursey	Asteraceae
2.	*Artemisia gmelinii* Weber		Asteraceae
3.	*Astragulussps.*	Dayrkal	Fabaceae
4.	*Chesneya cuneata* (Benth.) Ali	Bigangbo	Fabaceae
5.	*Corydalis crassisima*L.	Shapur	Fumariaceae
6.	*Cynoglossumwallichii*varglochidiatum		Boraginaceae
7.	*Inula racemosa* Hook.f.	Shorokmorok	Asteraceae
8.	*Leontopodiumjacotianum* Beauverd.		Asteraceae
9.	*Lindelofia stylosa* (Kar. &Kir.) Brand	Makpen	Boraginaceae
10.	*Nepeta floccosa* Benth.	Shamalolo	Lamiaceae
11.	*Oxytropislapponica* (Wahlenb.) Gay	Rkamindok	Fabaceae
12.	*Potentilla spp.*	Tian	Rosaceae
13.	*Potentilla eriocarpa* Wall. exLehm.		Rosaceae
14.	*Pyrethrum pyrethroides* (Kar. &Kir.) B.Fedtsch. ex Krasch.	Serpen	Asteraceae
15.	*Rheum australe* D. Don	Khakhol	Polygonaceae
16.	*Rheum spiciforme* Royle	Latchu	Polygonaceae
17.	*Saussurea heteromalla* (D.Don) Hand.-Mazz.		Asteraceae
18.	*Verbascum thapsus* L.	Shondok	Scrophulariaceae

Table 5: Shrubs of mountain region of Chiktan valley

S. No.	Species	Vernacular name	Family
1.	*Acantholimon lycopodioides* (Girard) Boiss.	Longze	Plumbaginaceae
2.	*Ajania tibetica* (Hook.f. & Thomson) Tzvelev	Phasbursey	Asteraceae
3.	*Anaphalistriplinervis* (Sims) C.B.Clarke		Asteraceae
4.	*Anaphalis royleana* DC.	kasboor	Compositae
5.	*Artemisia stracheyi* Hook.f. & Thomson ex C.B.Clarke	nagsbur	Asteraceae
6.	*Astragalus rhizanthus* Benth.	Zbitchu	Fabaceae
7.	*Cirsiumarvense* (L.) Scop.	Zbantzer	Asteraceae
8.	*Cotoneaster microphyllus* Wall. exL indl.	Tsato	Rosaceae
9.	*Cousinia thomsonii* C.B.Clarke	pizum	Asteraceae
10.	*Echinops cornigerus* DC.	kaqtsaymaq	Asteraceae
11.	*Ephedra gerardiana* Wall. ex Stapf	Chappat	Ephedraceae
12.	*Juniperus macropoda* Boiss	Shukpa	Cupressaceae
13.	*Marrubium vulgare* L.	yakzas	Lamiaceae
14.	*Morina longifolia* Wall.		Caprifoliaceae
15.	*Physochlaina praealta* (Decne.) Miers	Lantang	Solanaceae
16.	*Rhodiola fastigiata* (Hook. f. & Thomson) S.H. Fu	rtatrolo	Crassulaceae
17.	*Ribes orientale* Desf.	Askuta	Grossulariaceae
18.	*Thymus linearis* Benth		Lamiaceae
19.	*Urtica dioica* L.	Rdoastat	Urticaceae

have registered their appearance both in the plain areas as well as in the mountainous region leading to high species dissimilarity index. Analysis of floristic composition further revealed that the ratio of family to genera is 0.55, family to species is 0.45 and genera to species is 0.82. Kumar (2009) recorded ratio of family to genera, family to species and genera to species to be 0.35, 0.19 and 0.53 respectively whereas the ratio of family to genera, family to species and genera to species recorded by Kachroo *et al.* (1977) for whole of Ladakh was 0.26, 0.08 and 0.31, respectively. The overall finding shows that the number of species with respect to genera and family and the number of genera with respect to family increases with the increase in the area resulting in larger ratios in smaller areas and vice versa (Table 6). Besides primary analysis of vegetation using IVI**,** species can also be analyzed at secondary level which involves the use of, total species number and the total number of individuals. Shannon index tells about the species diversity which involves species richness and species evenness in a delineated community, Simpson index is used to find the dominance (increases with decrease in evenness) of species whereas Margalef's Index and Menhinick's Index is used to find out simply the richness of the species in the community which generally increases with increase in number of individuals. Secondary analysis of the plants using these four indices have been carried out for herbs, shrubs and the total (herbs+shrubs) plant species both in the plain as well as mountainous regions and are depicted in tables 7 and 8. Diversity indices of the plants (herbs+shrubs) of plain and mountainous regions have also been compared to find out the difference in species richness, evenness and dominance between the two communities (Table 9, Fig. 2).

Table 6: Comparison of Floristic Diversity of Chiktan valley with other areas

Work done	F	G	S	Ratio (F:G)	Ratio (F:S)	Ratio (G:S)
Kachroo *et al.* (1977) (Ladakh)	51	190	611	0.26	0.08	0.31
Kumar (2009) (Kargil)	55	153	285	0.35	0.19	0.53
Author (2013) (Chiktan)	36	65	79	0.55	0.45	0.82
F = Family; G = Genera; S = Species						

Table 7: Diversity indices of plain areas of Chiktan valley.

Parameters	Total species	Herbs	Shrubs
Total number of Species	48	40	8
Total number of individuals (N)	5194	4766	428
Margalef's Index (Da)	5.49	4.64	1.15
Menhinick's Index (Db)	0.71	0.57	0.38
Simpson's Index (Ds)	0.97	0.96	0.85
Shannon-Weiner's Index (H')	3.67	3.52	1.98

Table 8: Diversity indices of mountainous area of Chiktan valley.

Parameters	Total Species	herbs	Shrubs
Total number of Species	37	18	19
Total number of individuals (N)	2652	1182	1470
Margalef's Index (Da)	4.56	2.40	2.46
Menhinick's Index (Db)	0.67	0.52	0.49
Simpson's Index (Ds)	0.96	0.93	0.92
Shannon-Weiner's Index (H')	6.93	2.81	2.74

Table 9: Comparison of diversity indices of plants of plain areas with that of mountainous areas.

Parameter	Species of plain region	Species of mountainous region
Margalef's Index (Da)	5.49	4.56
Menhinick's Index (Db)	0.71	0.67
Simpson's Index (Ds)	0.97	0.96
Shannon-Weiner's Index (H')	3.67	6.93

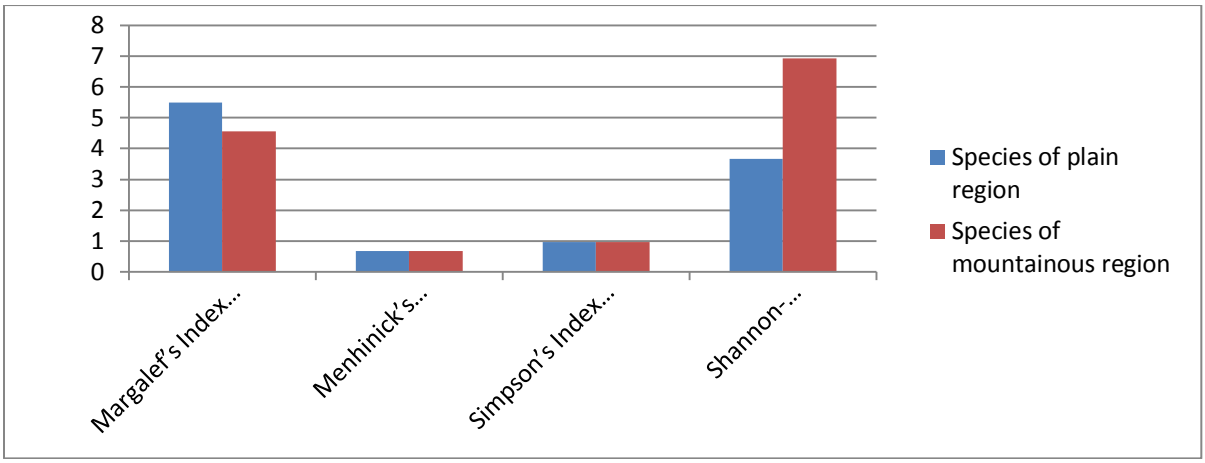


Fig. 2.Bar digram showing comparison of diversity indices of Species (herbs and shrubs) of plain region with species (herbs and shrubs) of Mountainous region.

Comparison of the values of diversity indices of the plain and mountain areas revealed that the overall species richness (Margalef's Index, Menhinick's Index) as well as dominance (Simpsons Index) is more in plain region than in mountainous region. Plain area is characterized by the presence of a large number of species (richness) in which some species have been found to be having a large number of individuals as compared to the rest of the species (dominance). In mountainous areas, the number of species is although small but each species have been found to be having more or less the same number of individuals (high evenness) as shown by the high value of Shannon index. Although when individual values for the Simpsons Index are observed, the species tend to show more dominance then evenness (values for Simpson index lies between zero and one and approaches one in the limit of a monoculture). The decrease in number of species with increasing altitude for various Himalayan ranges is a recognized pattern with certain variations in pattern (Korner, 2003). Severity of climatic conditions, trampling by humans and livestock grazing can be the factors behind the declined species richness on the mountains (Buntaine *et al.*, 2007). However high evenness in the mountains can be attributed to the well demarcated and non-overlapping home range formed by the livestock and other grazing population over the years. Further on the slopes presence of a number of shrub species indicate their better tolerance to dry conditions. Since the study has been carried out in two adjoining but different communities, Jaccard's index and Sorenson's index have been used to find out the similarity index between the two regions. These two indices helps us to examine species variation with respect to distance or environmental differences between the sites. The value of these two indices varies from 0-1, complete community overlap is equal to 1 and complete community dissimilarity is equal to 0. The small values for these two indices (Table 10) show the high dissimilarity (low similarity) index between the two regions which may be due to the wide variation in climatic conditions between the two regions.

Table 10: Index of similarity (Sorenson's index and Jaccard's index) between the plain and the mountainous region

No. of species in Plain region	No. of species in mountainous region	Species common to both regions	Sorenson's index	Jaccard's index
48	37	6	0.14	0.06

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