

FLORISTIC COMPOSITION AND ECOLOGICAL CHARACTERISTICS OF PLANT RESOURCES OF LANDI KOTAL, DISTRICT KHYBER, KHYBER PAKHTUNKHWA, PAKISTAN

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ABSTRACT

The study was conducted to assess the ecological resources of Landi Kotal, Khyber during 2016-2017. The floristic diversity consisted of 93 species within 40 families. Based on number of species Asteraceae (10 spp.), Lamiaceae (8 spp.), Brassicaceae, Solanaceae, Poaceae each with 6 species were the leading families. Mimosaceae (5 spp.) Caryophyllaceae (4 spp.) were the next dominant families. The other families had either 3 or less than 3 species. Biological spectrum of flora indicated that therophytes (34 spp., 36.5%), followed by nanophanerophytes (16 spp., 17 %) were the dominant. Similarly, hemicryptophytes (14 spp., 15%), chamaephytes (11 spp., 11.8%), microphanerophytes (10 spp., 10.7%) and geophytes (8 spp., 9%) were the other most prevailing life forms. Leaf size spectra revealed that microphylls (36 spp., 38.7%) followed by leptophylls (23 spp., 24.73%), nanophylls (22 spp., 32.65%), mesophylls (11 spp., 11.82%) were the most prominent leaf classes. *Periploca aphylla* was the only aphyllous species in the area. The investigated rangelands are less productive and need rehabilitation through ecological management. This would be possible with participation of local communities and NGOs to make the plant resources sustainable. There is a dire need to provide an alternate source of energy to overcome the burden on rangeland resources.

Key words: Spectrum, Rangeland, Life form, Leaf size, Ashkhel, Shekhmalkhel

INTRODUCTION

Khyber is named after the world famous Khyber Pass, which has served as the corridor connecting the Asian sub-continent with the Central Asia through Afghanistan. Khyber Agency lies between 33° 45' to 34° 20' N latitude and 70° 27' to 71° 32' E longitude. Khyber Agency is bounded on the North-West by Afghanistan, on the North by Mohmand district, on the East by Peshawar district, on the South by Orakzai district and Tribal Area adjoining Kohat district and on the west by Kurram district. The population, according to the census 2017 of Khyber is 984,246 in which male and female population was 504,502 and 479,669 individuals respectively (Pakistan Bureau of Statistics). The head quarter of the agency is located at Peshawar.

District Khyber is a hilly tract with some narrow strips of valleys. It is the

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meeting place of the series of ranges of the Koh-e-Safaid, off-shoots of the mighty Hindukush mountains starting from the Pamir, the roof of the world. The historic Khyber Pass is situated at a height of 1,180 meters above the sea level, which starts about 5 kilometers beyond Jamrud Fort. The highest peak of the mountain in western side of Khyber Agency is about 1,029 meters with 509 meters at its eastern side. Khyber has an area of 2,576 km². Khyber Agency has extreme climate with severe winter and summer seasons. May, June, July and August are the hot months. The maximum and minimum temperature during the month of June is about 40 and 26 degree Celsius respectively. The winter starts from November and continues till April. December, January and February are the coldest months. The maximum and minimum temperature during the month of January is about 18 and 4 degree Celsius respectively. The average annual rainfall is about 400 mm. Valley of Tirah bearing some patches of forest of *Cedrus deodara*, *Abies*, *Prosopis*, *Pinus wallichiana*, *Ziziphus spp.* *Juglans regia* (walnut). Beside these, *Withania coagulans*, *Olea*, *Dodonea viscosa*, *Periploaca aphylla*, *Acacia spp.* and *Monothea bauxifolia*. Generally the area has variety of fauna bearing Pheasant, Squirrel, Eagles, Dove, Chakur, Jackal, Crow, Snakes and numbers of species of lizards are the common fauna of the area.

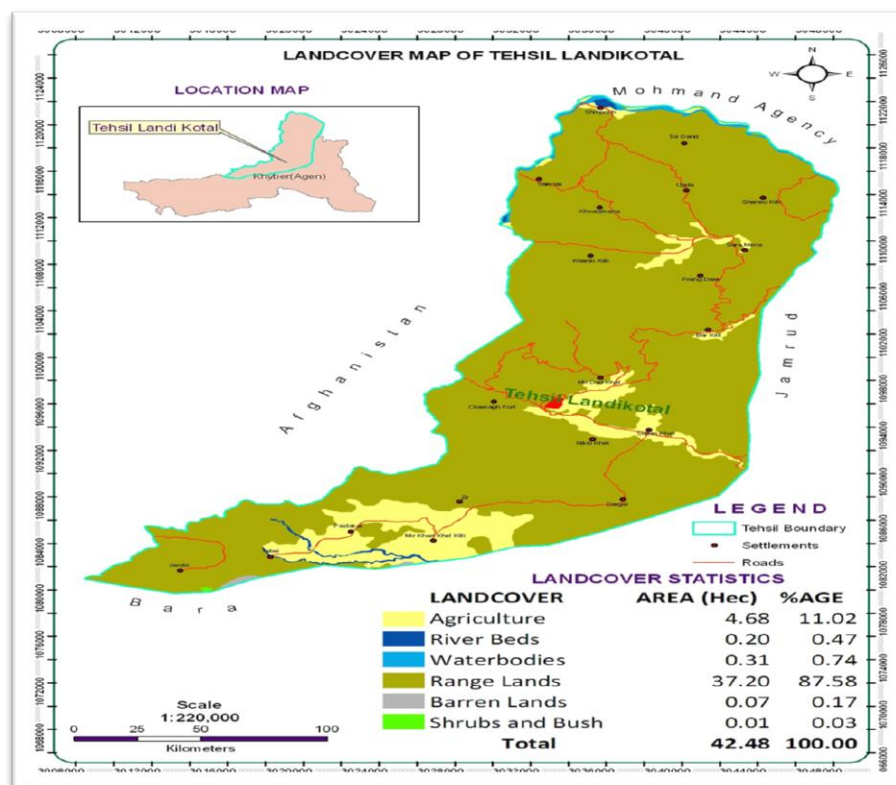


Fig. 1. Map of Study Area.

MATERIALS AND METHODS

Floristic Composition

Frequent visits were made for the collection of plants during spring and summer 2016-2017. Plants were collected from different parts of tehsil LandiKotal which included areas of Sheikmal khel, Ashkhel and Charwazgai. The plants were dried and preserved and mounted on University Herbarium sheets. All plants were identified with the help of Flora of Pakistan (Nasir and Ali 1972-1994; Ali and Qaiser 1995-2010). The identification of plants was further confirmed at Peshawar University Herbarium (PUH).

Ecological Characteristics

The plants were classified into various life form classes following Raunkiaer (1934) and Badshah *et al.* (2013).

RESULTS AND DISCUSSION

Table 1. Floristic check list and biological spectrum of flora of Landi Kotal, Khyber

Division	Family	S.No.	Specie	Life form	Leaf size
Gymnosperm	1. Ephedraceae	1	<i>Ephedra gerardiana</i> Wall. Ex stapf	Ch	L
Monocotyledon	2. Poaceae	2	<i>Cyanodon dactylon</i> (L.) Pers	H	L
		3	<i>Aristida adscensionis</i>	H	Mic
		4	<i>Bromus pectinatus</i> Thunb.	H	Nan
		5	<i>Lamarckia aurea</i>	H	Nan
		6	<i>Tetrapogon villosus</i> Desf.	H	Nan
	3. Liliaceae	7	<i>Gagea</i> sp. Salisb.	G	Mic
Dicotyledon	4. Amaranthaceae	8	<i>Aerva jvanica</i> (Burm. f.) Juss.	Ch	L
		9	<i>Ceratocarpus arenarius</i> L.	Th	L
	5. Asteraceae	10	<i>Calendula arvensis</i> L.	Th	Nan
		11	<i>Carthamus lanatus</i> L.	Th	L
		12	<i>Carthamus oxycantha</i> M. Bieb	Th	Mic
		13	<i>Filago hurdwarica</i> (Wall. Ex DC) Wagenitz.	Th	Mic
		14	<i>Lactuca dissecta</i> D. Don, Prodr.	H	L
		15	<i>Phagnalon niveum</i> Edgew.	Th	L
		16	<i>Saussurea heteromalla</i> (D. Don) Hand-Mazz.	H	Nan
		17	<i>Seriphidium brevifolium</i> (Wall. ex DC.) Y. Ling & Y.-R. Ling	Ch	L
		18	<i>Silybum marrianum</i> (Linn.)	Ch	Mic

Division	Family	S.No.	Specie	Life form	Leaf size
		19	<i>Taraxacum officinale</i> F. H. Wiggers.	Th	Mic
	6. Acanthaceae	20	<i>Justicia adhatoda</i> L.	Np	Mic
	7. Asparagaceae	21	<i>Asparagus capitatus</i>	Np	L
	8. Asclepiadaceae	22	<i>Calatropis procera</i> (Wight) Ali.	Ch	Mes
		23	<i>Periploaca aphylla</i> Decne.	Np	Ap
	9. Apocynaceae	24	<i>Caralluma tuberculata</i>	Th	Nan
		25	<i>Rhazya stricta</i> Dene.	Ch	Nan
	10. Apiaceae	26	<i>Carum carvi</i> L.	H	L
	11. Bignoniaceae	27	<i>Tecumella undulate</i> (Sm.) Seem.	Mp	Mic
	12. Boraginaceae	28	<i>Heliotropium europaeum</i> L.	Th	Mic
		29	<i>Onosma hispida</i> Wall. ex G. Don	H	Mic
Dicotyledon	13. Brassicaceae	30	<i>Alyssum desertorum</i> Stapf.	Th	Nan
		31	<i>Arabidopsis wallichii</i> (Hook. f. & Thomson) N.	Th	Nan
		32	<i>Coronopus didymus</i> Linn.	Th	Mic
		33	<i>Farsetia jacquementii</i> sHook. f. & Thomson.	Np	Mes
		34	<i>Lepidium</i> sp.L	Th	Nan
		35	<i>Malcolmia cabulica</i> (Boiss.) Hook. f. & Thomson.	Th	Nan
Dicotyledon	14. Caryophyllaceae	36	<i>Arenaria serpyllifolia</i> Bourg. Ex Willk. And Lange.	Th	L
		37	<i>Acanthophyllum</i> sp. C. A. Mey	Np	L
		38	<i>Dianthus</i> sp. L.	Ch	Nan
		39	<i>Herniaria hirsuta</i> L.	Th	L
	15. Cactaceae	40	<i>Opuntia dillenii</i> Haw.	Np	L
	16. Celastraceae	41	<i>Maytenus royleanus</i> (Wall. ex Lawson).	Np	Nan
	17. Cucurbitaceae	42	<i>Cucumis prophetarum</i> L.	H	Mes
	18. Euphorbiaceae	43	<i>Euphorbia helioscopia</i> L.	Th	Nan
		44	<i>Euphorbia prostrata</i> Aiton.	Th	L
	19. Geraniaceae	45	<i>Geranium rotundifolium</i> Linn.	Th	Mes
		46	<i>Erodium cicutarium</i> (L.) L'Her. Ex Aiton	Th	Nan
	20. Lamiaceae	47	<i>Ajuga bracteosa</i> Wall. ex Benth.	Th	Mic
		48	<i>Eremostachys superb</i> Royle ex. Benth.	G	L
		49	<i>Isodon rugosus</i> (Wall. Ex Benth.) Codd in Taxon.	Np	Nan
		50	<i>Marrubium vulgare</i> L.	Th	Mic
		51	<i>Otostegia limbata</i> (Benth.) Bioss.	Np	L

Division	Family	S.No.	Specie	Life form	Leaf size
		52	<i>Teucrium stocksianum</i> Boiss.	Th	Mic
		53	<i>Mentha longifolia</i> L.	G	Mic
		54	<i>Stachys parviflora</i> Benth	H	Mic
	21. Malvaceae	55	<i>Malva neglecta</i> Wallr.	Th	Mic
	22. Menispermaceae	56	<i>Cocculus pendulus</i> (J. R. Forst. & G. Frost.) Diels.	Np	Mic
Dicotyledon	23. Mimosaceae	57	<i>Acacia modesta</i> Wall.	Mp	L
		58	<i>Acacia nilotica</i> (L.) Willd. Ex. Delile.	Mp	L
		59	<i>Argyrobolium roseum</i> Jaub	Th	Nan
		60	<i>Prosopis juliflora</i> (Sw.) Dc	Np	L
		61	<i>Trigonella incisa</i> L.	Th	Nan
	24. Moraceae	62	<i>Ficus carica</i> L.	Mp	Mes
		63	<i>Morus alba</i> L.	Mp	Mes
		64	<i>Morus nigra</i> L.	Mp	Mes
	25. Oleaceae	65	<i>Olea ferruginea</i> Wall. ex Aitch.	Mp	Mic
	26. Oxalidaceae	66	<i>Oxalis corniculata</i> L.	Th	Nan
	27. Papavaraceae	67	<i>Papaver dubium</i> L.	Th	Mes
	28. Papilionaceae	68	<i>Astragalus</i> sp. L	Ch	L
	29. Plantaginaceae	69	<i>Plantago loeflingii</i> L.	Th	Mic
		70	<i>Plantago ovata</i> Forssk.	Th	Mic
	30. Plumbaginaceae	71	<i>Limonium macrorhabdus</i> (Boiss.) O.Kuntze.	G	Mic
	31. Polygonaceae	72	<i>Polygonum</i> sp. L.	G	Nan
	32. Ranunculaceae	73	<i>Delphinium uncinatum</i> Hook. f. & Thomson.	G	Mic
Dicotyledon	33. Rhamnaceae	74	<i>Segetetia thea</i> (osbeck) M. C Johnst.	Np	L
		75	<i>Ziziphus mauritiana</i> Lam.	Mp	Mic
		76	<i>Ziziphus nummularia</i> (Burm. F.) Wight & Arn.	Np	Mic
	34. Sapotaceae	77	<i>Monothea buxifolia</i> (Falc.) A. DC.	Mp	Mic
	35. Scrophulariaceae	78	<i>Verbascum thapsis</i> L.	H	Mes
		79	<i>Buddleja crispa</i> Benth	Np	Mic
	36. Simaroubaceae	80	<i>Ailanthus altissima</i> (Mill.) Swingle	Mp	Mic
	37. Solanaceae	81	<i>Datura stramonium</i> L.	Th	Mic
		82	<i>Hyoscyamus insanus</i> Stocks	Ch	Nan
		83	<i>Solanum nigrum</i> L.	Th	Mic
		84	<i>Solanum surattense</i> Burm. f.	Th	Mes
		85	<i>Withania coagulans</i> (stocks) Dunl	Ch	Mic
		86	<i>Withania somnifera</i> (L.) Dunl	Ch	Mes
	38. Spindaceae	87	<i>Dodonaea viscosa</i> Jacq.	Np	Mic
	39. Urticaceae	88	<i>Urtica dioica</i> L.	G	Mic
		89	<i>Urtica pilulifera</i> L.	G	Mic
		90	<i>Forsskaolea tenacissima</i> L.	H	Mic

Division	Family	S.No.	Specie	Life form	Leaf size
	40. Verbinaceae	91	<i>Vitex negundo</i> L.	Np	Nan
	41. Zygophyllaceae	92	<i>Fagonia cretica</i> L.	Th	L
		93	<i>Pegnum harmala</i> L.	H	Mic

Key: Life form, Leaf size
 Th = Therophytes Mic = Microphyll
 Mp = Microphanerophytes Nan = Nanophyll
 Np = Nanophanerophytes Mes = Mesophyll
 G = Geophytes L = Leptophyll
 H = Hemicryptophytes Ap = Aphyllous
 Ch = Chamaeophytes

Table 3. Distribution of life form of flora of Landi Kotal, Khyber (%)

Life form	Number	Percentage
Microphanerophytes	10	10.7
Nanophanerophytes	16	17
Chamaeophytes	11	11.8
Hemicryptophytes	14	15
Geophytes	08	9
Therophytes	34	36.5
Total	93	100

Table. 4. Distribution of leaf size spectra of flora (%)

Leaf size	Number	Percentage
Leptophyll	23	24.73
Nanophyll	22	23.65
Microphyll	36	38.7
Mesophyll	11	11.82
Aphyllous	01	1.07
Total	93	99.98

GENERAL CONCLUSION

- The study was conducted during 2016-2017 to alluminate floristic composition and ecological characteristics of remote rangelands Landi Kotal, Khyber.

- The study stated that the flora of Landi Kotal comprised of 93 species that belonged to 41 families. Of them, 37 families belonged to dicot, 2 families to monocot and a single representative of gymnosperm.
- Based on number of species Asteraceae, Lamiaceae, Brassicaceae, Mimosaceae and Solanaceae were the most prevalent families.
- The flora was dominated by therophytes, nanophanerophytes, hemicryptophytes and microphytes. This is well in accordance with the climate of the area.
- Microphylls, leptophylls, nanophylls and mesophylls were prominent leaf spectrum.

RECOMMENDATIONS

- There is severe deforestation pressure on woody and shrubby species specially *Acacia modesta* and *Monothea buxifolia* for fuel and timber wood extraction. Therefore an alternate source of fuel timber be provided and the area must be protected for a period of at least 12 years to promote vegetation cover.
- There should be more avenues such as exploration of research activities for knowing the germination, seed production and growth pattern for successful propagation and reintroduction of fodder, timber, fuel wood and medicinal plants.
- Ecotourism could be eager in the area as a base camp to whole Khyber. This will be an additional source of income to uplift the socioeconomic situation of the community.
- Rehabilitation of degraded habitats by introducing fast growing fodder species replacement of low yielding livestock, rotational and mix grazing such long term efforts might reduce pressure and allow the flora and fauna to revert to its original state.
- Quantitative study of vegetation and medicinal plants is also recommended.

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