BIOLOGICAL SPECTRA OF LALA KALAY AREA DISTRIST PESHAWAR KHYBER PAKHTUNKHWA PROVINCE PAKISTAN

Mehreen Samad[1], Lal Badshah[1] and Shujaul Mulk Khan[2]

https://doi.org/10.28941/24-4(2018)-4

ABSTRACT

A study was conducted to assess the floristic composition of Lala Kalay District Peshawar during 2016-17. The floristic diversity consisted of 80 species belonging to 45 families. Asteraceae and Solanaceae were the dominant families each comprised 6 species, followed by Poaceae and Euphorbiaceae (5 species each), Moraceae and Rosaceae (each with 4 species). The rest of the families contributed 1-2 species. Biological spectrum reflected that Therophytes was the dominated life form that contributed 30 species (37.5%), followed by Microphenrophytes (16 species, 20%), nanophanerophytes (14 species, 17.5%) and Caemephytes (8 species, 10%), geophytes (7 species, 8.75%), Phanerophytes (3 species, 3.75%) and Hemicryptophytes (1 species, 1.25%). The leaf spectrum revealed that Microphyll was dominated in the area with 33 species (41.25%), followed by Mesophylls (20 species, 25%) and Nanophyll (18 species, 22.25%),while Leptophylls and Megaphyll were less important (each with 4 species, 5%). Data on biological spectra can be utilized for management of the studied habitat and further assessment for carbon footprint and many other studies.

Keywords: Flora, ecological characteristics, Lala Kalay, plant diversity, Peshawar.

Citation: Samad, M., L. Badshah and S. M. Khan. 2018. Biological spectra of Lala Kalay area district Peshawar Khyber Pakhtunkhwa Province Pakistan. Pak. J. Weed Sci. Res. 24 (4): 353-262.

[1]Phytoecology Lab., Department of Botany University of Peshawar, Pakistan.
[2] Plant Ecology and Conservation Lab., Department of Plant Sciences, Quaid-i-Azam University Islamabad, Pakistan
Corresponding author's e-mail: mehreensamad69@gmail.com

INTRODUCTION

Lala Kalay is a small agricultural heritage village located in the east of Peshawar city. It lies between 34° 1' 21" North Latitude and 71° 41' 54" East longitude. The estimated terrain elevation above sea level is 307 meters. It is situated in semi-arid climatic region (hot during summer and cold during winter) (Khan et al., 2015).

Flora refers to all the plant species found in a particular locality. It differs from vegetation, which refers to the population, distribution, size and relative importance of plant species (Ali, 2008). Plants have different life forms in different regions and communities (Zarezade et al., 2007). Floristic list of an area is ecologically important as it give information about natural resources and relation of plants with each other as well as their interaction with biotic and abiotic factors. Floristic diversity depends upon the climatic conditions, altitudinal gradient and habitat conditions (Saima et al., 2009). Raunkiaer (1934) proposed the term 'biological spectra' for the determination of life form. It explains distribution of a flora as well as climatic conditions under which the prevailing life form evolved. The knowledge of leaf sized spectra also help to provide the information about the physiological process of individual plants species as well as plants association (Oosting, 1956). It is noted that studies on flora of the Lala Kalay have not been carried out in the past therefore; the present study was aimed to explore the floristic composition

MATERIALS AND METHODS

The study was carried out to collect data of floristic composition of Lala Kalay, Peshawar during 2016-2017. The plant specimens were collected and preserved and tagged along with localities, habitat, etc. The same were mounted on herbarium sheets. These were identified with help of flora of Pakistan (Ali & Nasir, 1989-1992; Ali & Qaiser, 1995-2015). Further, the specimens were confirmed at the Herbarium, Department of Botany University of Peshawar. The plants with voucher numbers were deposited to the Herbarium, Department of Botany University of Peshawar, Pakistan. A complete alphabetical floristic list of species along with families and ecological descriptions like leaf size, life form and habit were prepared. Plants were classified into various life form and leaf size classes following Raunkiaer (1934) and Hussain (1989). The following formulae were applied for the determination of Life form and leaf size spectra.

RESULTS AND DISCUSSION

A. Floristic Composition and its Ecological Characteristics

Floristic diversity of a region is the total of the species within its geographical boundaries, whether wild or cultivated. Plants distribution is affected due to unplanned agricultural extension, overgrazing, anthropogenic interaction and natural disasters. The flora of a Lala Kalay area consisted of 80 species belonging to 45 families. These were divided into 2 gymnosperm, 38 dicotyledons and 5 monocotyledon (Table-1). Asteraceae and Solanaceae were the dominant families each with 6 species, followed by Euphorbiacae and Poaceae (5 species), Moraceae and Rosaceae (4 species each), while . Alliaceae, Cupressaceae, Cucurbitaceae, Fabaceae, Lamiaceae, Malvaceae, Myrsinaceae, Polygonaceae, Rhamnaceae, Rutaceae and Salicaceae contributed each with 2 species. Rest of the families contributed single species (Table-1). Asteraceae, Solanaceae, Poaceae and Euphorbiaceae were the leading families. Whereas Nasir and Sultan (2002) studied the floristic list of district Chakwal, and showed Asteraceae and Poaceae as the dominant families, which also supports our findings. Shah and Hussain (2009) carried out the study of vegetation of Hayatabad, Peshawar, and stated that Asteraceae, Brassicaceae, Poaceae and Solanaceae are the dominant families, which also supports our findings. Hussain and Chaudhry

(2009) studied vegetation of Samahni valley, in which they listed Poaceae as the dominant family, which is contradictory to our findings. El-Ghanim et al. (2010) studied the vegetation analysis in Hail region Saudi Arabia, which represented 34 families. The family Asteraceae was represented by the highest number of species followed by Poaceae and Brassicaceae, also supported our findings. Pharswan et al. (2010) studied Alpine Meadows of Kedranath and reported that Asteraceae was the dominant family with 11.25 % species, strongly supported our findings. Our results are consistently supported by them as Asteraceae and Poaceae have emerged as the most common families in their investigated areas. Khan et al. (2011) while studying the Floristic Composition and Biological Spectrum of vegetation of Darra Adam Khel, KPK, Pakistan, listed about 54 plant species belonging to 30 Families. The dominant families were Asteraceae, Lamiaceae and Solanaceae, which also partillay supports our findings. Amjad (2013) studied Floristic Composition of Homogenity of plant community at Kotli Hills, and reported Poaceae, Asteraceae and Lamiaceae having high number of species, which further strengthen our finding. Badshah et al. (2013) presented the floristic list and biological spectrum of District Tank and showed Poaceae as the dominant family which is in contrast to our findings because of the semi-arid nature of the area, facilitate the growth of grasses. Al-Sharif et al. (2013) studied the floristic composition and of Khulasai region of Western Saudi Arabia, also reported Asteraceae as the leading family.

A. Life form

The life form reflects physiognomy of the flora and vegetation which is the result of all life processes in combination with environment. It helps in the recognition of ecological elucidation of vegetation (Amjad et al., 2016). Based on life form, therophytes was dominated in the area with 30 species (37.5%), followed by Microphenrophytes 16 species (20%), Nannophanerophytes 14 species (17.5 %) and Chaemephytes 8 species (10 %) were the dominant life form classes. Geophytes 7 species (8.75%) Phanerophytes 3 species (3.75%) and Hemocryptophytes represented by only 1 species (1.25 %) were the next important species (Table-2, Fig. 1). Tareen and Qadir (1993) studied Sinjawi to Duki regions. They stated that Hemicryptophytes, Therophytes and Chamaephytes were found to be significantly higher and Geophytes were found to be significantly lower than the normal spectrum, which almost agrees with our finding. They further reported that Life Form spectrum of different altitudinal zones showed that Anerophytes decrease gradually from lower elevation to higher elevations. Nasir and Sultan (2002) found that life form spectra of the plants were predominantly represented by Therophytes 49 species, which supports to our findings.

Malik et al. (2007) reported therophytes followed by hemicryptophytes from the area strengthens our findings. Shah and Hussain (2009) carried out the Phytosociological study of vegetation of Hayatabad, Peshawar during 2008. They observed that therophytes were dominant class over others, strongly supporting our findings. El-Ghanim et al. (2010) observed during the vegetation analysis in Hail region Saudi Arabia that therophytes and chamaephytes are the dominating Life forms of vegetation spectra, supporting the present study. Khan et al. (2011) while studying the Floristic Composition and Biological Spectrum of vegetation of Darra Adam Khel, KPK. Pakistan. They listed that Therophytes were leading class, which is in line with the present study. Khan et al. (2012) studied the biological characteristics of Tehsil Takht-e-Nasrati Pakistan and presented that therophytes 77 species was the leading class which agrees with our present findings. Similarly Alsherif et al. (2013) showed therophytes as the dominant life form which strongly support the present work. Shah and Rozina (2013) reported that the therophytes

were the dominant life form, which further strengthen our study. Badshah et al. (2013) reported that therophytes was the dominant life form which supports our findings. They found that life form spectra of plants are therophytes 107 (37.80%) and nanophanerophyte 47 species (16.66%) respectively were dominant life form group.

B. Leaf size Spectra

The overall leaf size spectra of the region was dominated by Microphyll containing a total of 33 species (41.25 %) followed by Mesophyll with 20 species (25 %), Nanophyll 18 species (22.5 %), Leptophyll 4 species (5 %) and Megaphyll 4 species (5 %), given in (Table-2, Fig. 2) Nasir & Sultan (2002) mentioned that the dominant leaf size class of the area was nanophyll, which almost support our finding. Hussain et al. (2009) leaf size spectrum fields of University of Peshawar Botanical Garden at Azhakhel, Nowshehra, concluded that nanophylls were the major Leaf size class followed by microphyl, leptophyll and mesophyll, which are agreed to our findings. Tareen and Qadir (1993) studied Sinjawi to Duki regions. They stated that Leaf size showed that Microphyll Leaf size class was found to be in highest percentage, followed by Nanophylls. Leaf size spectrum of different altitudinal zones show that Microphylls increase gradually from lower to upper zones. Nanophylls were slightly high in the lower zone. Malik et al. (2007) studied the leaf size spectra of Ganga Chotti and Bedori Hills and mentioned that microphylls were the dominant leaf size followed by nanophylls in springs and monsoon which further strengthen our present study owing to the same altitudinal variation. Khan et al. (2012) worked on biological characteristics of plant in Tehsil Takht- e-Nasrati and mentioned that microphylls was the dominant leaf size with (52.8%) species followed by nanophylls (19.88%) support our present findings. Very recently Samreen et al (2018) have elucidated the floral diversity of Frontier Region, Dera Ismail Khan is also in line our findings.

Table- 1. Floristic list of flora of Lala Kalay, Peshwar Pakistan.

Division	Families	Species	Specimen No.	Life Form	Leaf Size
Gymnosperms	1) Cupressaceae	Thuja orientalis L.	Samad1 (PUP)	Np	L
		Cupressus sempervirens L.	Samad 2 (PUP)	Mp	L
	2) Araucariaceae	Araucaria columnaris (Forste) Hook. F.	Samad 4 (PUP)	Mp	L
Angiosperms					
Monocoty-ledons	3) Alliaceae	Allium cepa L.	Samad 3 (PUP)	G	N
		Allium sativm L.	Samad 5 (PUP)	G	N
	4) Agavaceae	Agava americana L.	Samad 6 (PUP)	Np	Mic
	5) Cyperaceae	Cyperus rotundus L.	Samad 8 (PUP)	G	N
	6) Cannaceae	Canna indica L.	Samad 10 (PUP)	Ch	Mg
	7) Poaceae	Saccharum officinarum L.	Samad 7 (PUP)	Th	Mes
		Triticum aestivum L.	Samad 9 (PUP)	Th	Mic
		Phalaris minor L.	Samad 11 (PUP)	Ch	Mic
		Zea mays L.	Samad 12 (PUP)	Th	Mes
		Avena fatua L.	Samad 13 (PUP)	Th	Mic
Dicotyledons	8) Amaranthaceae	Achyranthes aspera L.	Samad 14 (PUP)	Th	Mes
	9) Araceae	Epipremnum aureum (Lind. & Andre)	Samad 15 (PUP)	Ch	Mic
	10)Asclepiada-ceae	Calotropis procera Ait. f.: Hook. f.	Samad 16 (PUP)	Ch	Mes
	11) Araliaceae	Schefflera arboricola (Hayata) Merrill.	Samad 17 (PUP)	Np	Mic
	12) Asteraceae	Tagetes erecta L.	Samad 19 (PUP)	Th	N
		Cichorium intybus L.	Samad 18 (PUP)	G	N
		Xanthium strumarium L.	Samad 20 (PUP)	Th	N
		Helianthus annuus L.	Samad 21 (PUP)	Th	Mes
		Parthineum hysterophorous L.	Samad 22 (PUP)	Th	Mes
		Taraxacum officinale F. H. Wigg.	Samad 23 (PUP)	Th	Mic
	13) Acanthaceae	Dicliptera roxburghiana Var.	Samad 24 (PUP)	Np	Mes
	14) Anacardiaceae	Mangifera indica L.	Samad 25 (PUP)	Th	Mic
	15) Brassicaceae	Brassica compestris L.	Samad 26 (PUP)	Th	Mic
	16) Celastraceae	Euonymus japonicus Thunb.	Samad 27 (PUP)	Ch	N
	17) Cannabaceae	Cannabis sativa L.	Samad 28 (PUP)	Th	Mic
	18)Chenopodiaceae	Chenopodium album L.	Samad 31 (PUP)	Th	Mic
	19) Cucurbitaceae	Lagenaria siceraria (Molina) Standler.	Samad 30 (PUP)	Th	Mic
		Cucurbita pepo L.	Samad 29 (PUP)	Th	Mg
	20) Euphorbiaceae	Euphorbia milii Var.	Samad 80 (PUP)	Ch	Mic
		Excoearia bicolor variegata (Hassk.) Zoll.	Samad 32 (PUP)	Ch	Mic
		Ricinus communis L.	Samad 33 (PUP)	Mp	Mg
		Euphorbia heliscopia L.	Samad 35 (PUP)	Th	N
		Sapium sebiferum (L.) Roxb.	Samad 34 (PUP)	Th	Mic
	21) Ebenaceae	Diospyros kaki L.	Samad 36 (PUP)	Mp	Mes
	22) Fabaceae	Pisum sativum L.	Samad 37 (PUP)	Th	N
		Medicago polymorpha L.	Samad 38 (PUP)	Ph	L

	23) Lythraceae	Lagerstroemia speciosa L.	Samad 39 (PUP)	Np	Mic
	24) Lamiaceae	Ocimum sanctum L.	Samad 40 (PUP)	Th	Mes
		Mentha longifolia L.	Samad 41 (PUP)	G	Mic
	25) Malvaceae	Hibiscus rosa-sinensis L.	Samad 42 (PUP)	Np	Mes
		Abelmoschus esculentus L.	Samad 43 (PUP)	Th	Mic
	26) Meliaceae	Melia azedarch L.	Samad 44 (PUP)	Mp	Mic
	27) Myrtaceae	Psidium guajava L.	Samad 45 (PUP)	Th	Mg
		Eucalyptus lanceolatus Honey.	Samad 46 (PUP)	Ch	Mic
	28) Moraceae	Morus alba L.	Samad 47 (PUP)	Mp	Mes
		Morus nigra L.	Samad 48 (PUP)	Mp	Mes
		Ficus carica L.	Samad 50 (PUP)	Np	Mes
		Ficus religiosa Roxb.	Samad 49 (PUP)	Mp	Mes
	29) Myrsinaceae	Anagallis arvensis L.	Samad 55 (PUP)	Th	N
	30) Nyctaginaceae	Bougainvillea glabra (Choisy) Hook.	Samad 51 (PUP)	Np	Mic
	h31) Oleaceae	Jasminum sambac L.	Samad 52 (PUP)	Ph	N
	32) Oxalidaceae	Oxalis corniculata L.	Samad 53 (PUP)	G	Mic
	33) Papilionaceae	Dalbergia sissoo Roxb.	Samad 54 (PUP)	Mp	Mic
	34) Proteaceae	Grevillea robusta A. Cunn. Ex R. Br.	Samad 56 (PUP)	Mp	Mic
	35) Polygonaceae	Rumex dentatus L.	Samad 57 (PUP)	Th	Mes
		Polygonum aviculare L	Samad 58 (PUP)	Th	N
	36) Punicaceae	Punica granatum L.	Samad 59 (PUP)	Mp	N
	37) Rosaceae	Rosa alba L.	Samad 60 (PUP)	Np	N
		Rosa indica L.	Samad 61 (PUP)	Np	N
		Prunus persica L.	Samad 62 (PUP)	Mp	Mic
		Prunus domestica L.	Samad 63 (PUP)	Mp	Mes
	38) Rhamnaceae	Ziziphus mauritiana Lam.	Samad 70 (PUP)	Mp	N
		Ziziphus nummularia L.	Samad 64 (PUP)	Mp	N
	39) Rutaceae	Citrus limon (L.) Burm.	Samad 65 (PUP)	Th	Mes
		Citrus medica L.	Samad 66 (PUP)	Th	Mes
	40) Solanaceae	Solanum melongena L.	Samad 67 (PUP)	H	Mic
		Capsicum frutescens L.	Samad 68 (PUP)	Np	Mes
		Cestrum nocturnum L.	Samad 69 (PUP)	Np	Mic
		Datura stramonium L.	Samad 71 (PUP)	Np	Mes
		Physalis divaricata D. Don.	Samad 72 (PUP)	Th	Mic
		Solanum lycopersicum L.	Samad 73 (PUP)	Th	Mic
	41)Simaroubaceae	Ailanthus altissima (Mill.) Swing.	Samad 74 (PUP)	Mp	Mic
	42) Salicaceae	Salix acmophylla Boiss.	Samad 75 (PUP)	Mp	Mic
		Populus nigra L.	Samad 76 (PUP)	Ph	Mic
	43)Scrophularia-ceae	Scrophularia striata Bioss.	Samad 77 (PUP)	Th	N
	44) Urticaceae	Urtica pilulifera L.	Samad 78 (PUP)	G	Mic
	45)Vitaceae	Vitis vinifera L.	Samad 79 (PUP)	Np	Mes
TOTAL		80			

KEY:

Life-form classes:
1 Th. Therophytes
2 G. Geophytes

Leaf-size classes:
1 L. Leptophylls
2 N. Nannophylls

3	H. Hemicryptophytes	3	Mic. Microphylls
4	Np. Nanophanerophtes	4	Mes. Mesophylls
5	Mp. Microphanerophytes	5	Mg. Megaphylls
6	Ch. Chamaephytes	6	Mac. Macrophylls
7	Ph. Phanerophytes		

Table- 2. Diversity of Life form and Leaf Size Spectra.

S.No	Life form	No. of species	%age
1	Therophytes	30	37.5
2	Microphanerophytes	16	20.0
3	Nanophanerophytes	14	17.5
4	Chamaephytes	8	10 .0
5	Geophytes	7	8.75
6	Phanerophytes	3	3.75
7	Hemicryptophytes	1	1.25
S.No	Leaf Size	No. of species	%age
1	Microphyll	33	41.25
2	Nanophyll	18	22.5
3	Mesophyll	20	25.0
4	Leptophyll	4	5.0
5	Megaphyll	4	5.0

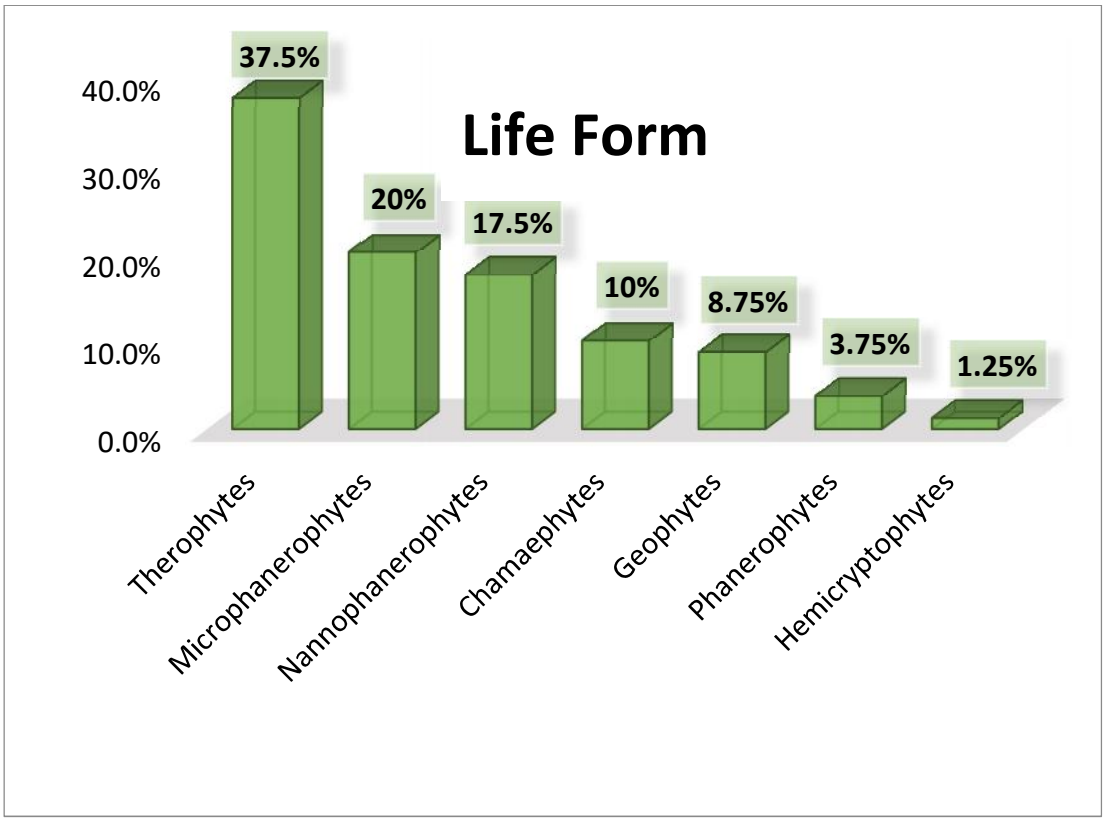

Fig.1. Life Form Spectra (%) of flora of Lala Kalay, Peshawar, Pakistan.

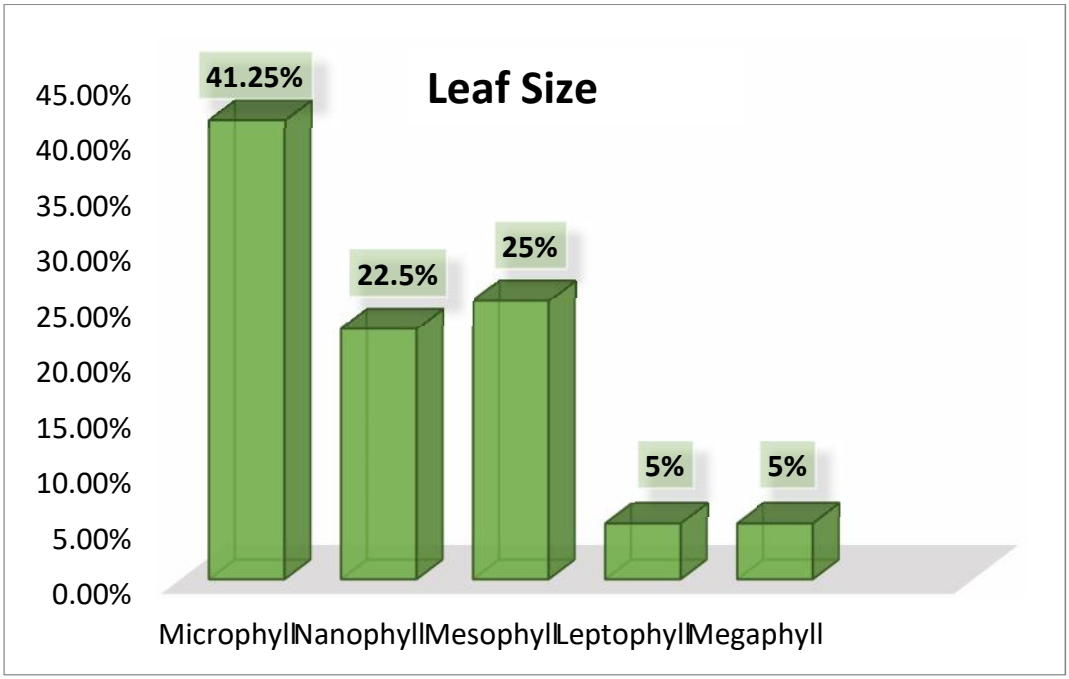

Fig. 2. Leaf Size Spectra (%) of flora of Lala Kalay, Peshawar, Pakistan.

REFERENCES CITED

Ali S.I, Y.J Nasir (eds.).1989-1992. Flora of Pakistan. Islamabad, Karachi.

Ali S.I. and M. Qaiser. (eds.).1995-2015. Flora of Pakistan. Department of Botany, University of Karachi.

Al-Sharif, E. A., A. M. Ayesha and S. M. Rawl. 2013. Floristic composition life form and chorology of plant life at Khulais, Western Saudi Arabia. Pak. J. Bot., 45 (1): 29-38.

Amjad, S. M. 2013. Floristic composition, similarity index and degree of homogeneity of plant communities recorded at Kotli Hills. Top Class J. Agric. Res., 1 (4): 36-42.

Amjad. M. S., M. Arshad, H. M. Sadaf and A. Arshad. 2016. Floristic composition, biological spectrum and conservation status of the vegetation in Nikyal valley, Azad Jammu and Kashmir. Asian Pacific J. Trop. Dis.. 6(1): 63-69.

Badshah, L., F. Hussain and Z. Sher. 2013. Floristic inventory, ecological characteristics and biological spectrum of rangeland, District Tank, Pakistan. Pak. J. Bot., 45 (4): 1159-1168.

Badshah. L, F. Hussain and Z. Sher.2016. Floristic inventory, ecological characteristics and biological Spectrum of plants of Parachinar, Kurram Agency, Pakistan. Pak. J. Bot., 48(4): 1547-1558.

El- Ghanim, W.M., L.M. Hassan, T.M. Galal and A. Badar.2010.Floristic composition and vegetation analysis in Hail region north of central Saudi Arabia. Saudi J. Biol. Sci., 17(2):119-128.

Hussain F. 1989. Field and Laboratory Manual of Plant Ecology. UGC. Islamabad.

Hussain, T. and M.I. Chaudhary. 2009. A Floristic Description of Flora and Ethnobotany of Samahni Valley (A. K.), Pakistan. Ethnobot. Leaflets, 13: 873-99.

Khan M, F. Hussain, S. Musharaf and Imdadullah. 2011. Floristic composition, life form and leaf size spectra of the coal mine area vegetation of Darra Adam Khel, Khyber Pakhtonkhwa, Pakistan. J. Biol. Env. Sci. 1(3), 1-6.

Khan, M., F. Hussain and S. Musharaf. 2012. Biological characteristics of plant species in Tehsil Takht-e-Nasrati Pakistan. J. Biol. Env. Sci. 2 (3): 42-47.

Malik. Z.H., F. Hussain and N.Z. Malik. 2007. Life form and leaf size spectra of plant communities harbouring Ganga Chotti and Bedori Hills during 1999-2000. Int. J. Agric. Biol,, 9:833-838.

Nasir, Z. A and S. Sultan. 2002. Floristic, biological and leaf size spectra of weeds in gram, lentil mustard and wheat fields of District Chakwal, Pakistan. Pak. J. Biol. Sci., 5 (7): 758-762.

Oosting. H.J. 1956. The Study of Plant Communities, 2nd edition, p: 440. W.H. Freeman and company, San-Francisco, California, USA.

Pharswan, K., J. P. Mehta and Subodh. 2010. Floristic composition and biological spectrum of vegetation in Alpine Meadows of Kedarnath: Garhwal Hialays. Nature and Sci., 8 (7): 109-115.

Khan. R., A. Ullah, M. A. Khan, S. M. Shah and A. Rashid. 2015. Diversity Of Halophytes Growing In The University Of Peshawar Botanical Garden, Khyber Pakhtunkhwa, Pakistan. Int. J. Biol. Biotechnol., 12 (2): 283-290.

Raunkiær, C. 1934. The life forms of plants and statistical plants geography being the collected Papers

of C. Raunkiaer. Clarendon Press, Oxford.

Saima. S., A.A. Dasti, Q. Abbas and F. Hussain. 2009. Floristic diversity during monsoon in Ayubia National Park, District Abbottabad, Pakistan. Pak.J. Plant Sci., 16 (1): 43-50.

Samreen, U., M. Ibrar, L. Badshah and Imran. 2018. diversity and ecological characteristics of weed flora at Darazinda, Frontier Region Dera Ismail Khan, Pakistan. Pak. J. Weed Sci. Res., 24(3): 223-229.

Shah, M. and F. Hussain. 2009. Phytosociological study of the vegetation of Hayatabad, Peshawar, Pakistan. Pak. J. Plant Sci., 15 (2): 123-128.

Shah, M. and Rozina. 2013. Phytosociological attributes and phytodiversity of Dheri Baba Hill and Peer Taab Graveyard, district Swabi, Khyber Pakhtunkhwa, Pakistan. Pakhtun. J. Life Sci., 1 (1): 1-6.

Tareen, R.B. and S.A., Qadir. 1993. Life form and leaf size spectra of the plant communities of diverse areas ranging from Harnai, Sinjawi to Duki regions of Pakistan. Pak. J. Bot., 25 (1) 83–92.

Zarezade. A., M. Mirvakili and A. Mirhosseini. 2007. Identified of flora, life form and geographical distribution of plants Damgahan Mehriz of Yazd province. J. Pajoohesh Sazandegi. 74:129-137.