

# VASCULAR PLANT DIVERSITY AND BIOLOGICAL SPECTRUM OF GALIYAT VALLEY, DISTRICT ABBOTTABAD, KHYBER PAKHTUNKHWA, PAKISTAN

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**Abstract-** The present study was aimed to assess the vascular plant diversity in term of floristic composition, habit, life form and leaf size classification at Galiyat valley of district Abbottabad, KP. The vascular plant species investigated during the research were 343 distributed in 250 genera and 87 families. Pteridophytes were 7 species (2.04%), Gymnosperms 6 species (1.74%), Angiosperms (monocots) with 54 species (15.74%) and Angiosperms (dicots) with 276 species (80.46%). The habit of different plant species showed that herbs were 228 species (66.47%), Shrubs 63 species (18.36%), trees 41 species (11.95%) and climbers were 11 species (3.20%). The leading family with highest number of species and genera was Asteraceae with 32 species and 25 genera followed by Poaceae with 31 species and 19 genera. The other dominating families include, Lamiaceae (28 spp. & 17 genera), Rosaceae (22 spp. 11 genera), Ranunculaceae (16 spp. & 10 genera), Fabaceae (11 spp. & 8 genera), Apiaceae (10 spp. & 9 genera), Polygonaceae (10 spp. & 8 genera), Caprifoliaceae (10 spp. & 6 genera). Remaining families were represented by less than 10 plant species. Life form classes showed that Therophytes were dominating with 119 species (34.69%), followed by Hemicryptophytes with 61 species (17.78%). The other life form classes were Geophytes 38 species (11.07%), Megaphanerophytes 46 species (13.41%), Nanophanerophytes 42 species (12.24%), Chamaephytes 29 species (8.45%) and Lianas 8 species (2.33%). The study of leaf size classification showed that Microphylls were dominating with 134 species (39.06%) followed by Nanophylls with 98 species (28.57%). Leptophylls were 33 species (9.62%), Mesophylls 72 species (20.99%) and Megaphylls were 06 species (1.74%).

**Index terms** - Biological spectrum, floristic composition, Galiyat, habit, life forms, leaf size, vascular plant diversity.

## INTRODUCTION

District Abbottabad is located in Hazara division of Khyber Pakhtunkhwa, Pakistan and extended over an area of over 1967 km<sup>2</sup>. The geographical coordinates of the area are 34°06' N latitudes and 73°20' E longitude. Galiyat region, or hill tract, is a narrow strip or area roughly 50-80 km north-east of Islamabad, Pakistan, extending on both sides of the Khyber Pakhtunkhwa-Punjab border, between Abbottabad and Murree. The beautiful region of Galiyat is situated in district Abbottabad, Khyber Pakhtunkhwa, spreading over an area of 250,000 acres with a population of about 189,426 (GoP, 2017). It is a long valley of 40 km and is dominating by the moist temperate forest (Jamal and Khadija, 2009). Galiyat are the hub of local and foreign tourists and the geographic coordinates of the area are from 33°53'15" to 34°11'25" N latitudes and from 73°16'43" to 73°25'23" E longitudes. The elevation ranges from 1450 to 3033 m presenting a diversified flora and fauna. Winter is severe and snowfall takes place in hilly areas *i.e.*, above Changa Gali and Barian in Bara Gali, Nathia Gali, Ayubia, Mashkpuri and Miranjani top mainly in the months of December, January and February (Ahmad and Afzal, 2014). The geologic time scale indicate the geological origin of the area from Indian plate which is 40 to 170 million years old (Shaheen and Asad, 2002). Weather in summers is temperate with long monsoon season whereas in winter, it is severe cold. Snow season remains from mid-December to mid-February (Shinwari and Khan, 2000). Mean annual rainfall is 1500 mm (with heavy winter snow) and 11°C respectively (Ahmad and Afzal, 2014).

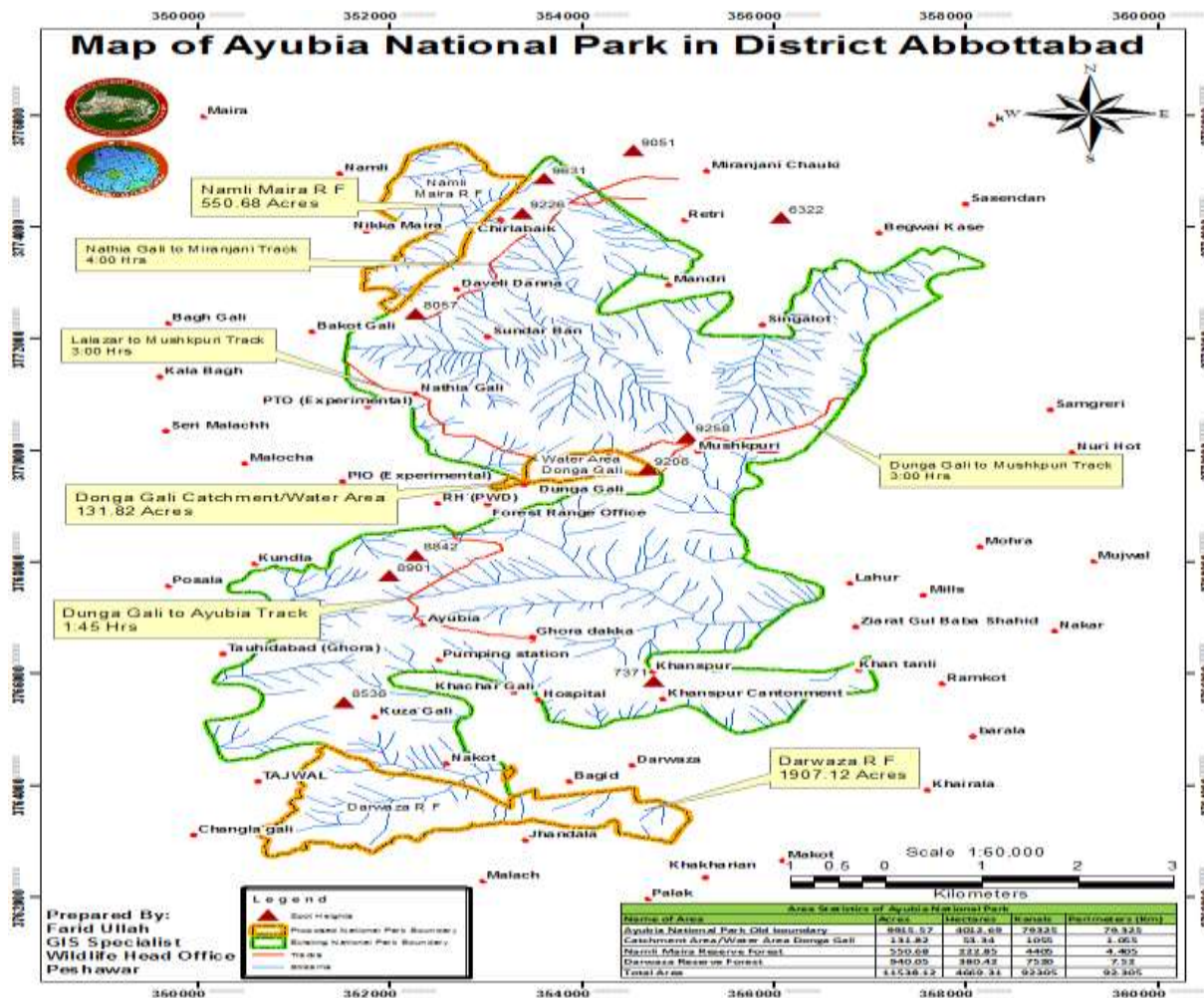


Fig.1 Map of Galiyat showing surrounding villages and tracks (Wildlife Department Khyber Pakhtunkhwa).

Floristic checklists provide the most useful botanical data of a specific geographical area. Floristic composition is a good marker, as changing kind of floristic composition in various intimate milieu reveal the presence of different ecological factors; lead to intraspecific and interspecific diversity (Safidkon et al., 2003). Floristic study of an area helps to analyze the plant wealth and its potential values. The identification of local plant species in an area is of immense importance to know the existence of specific species, their growing seasons, determining new species and effect of climatic factors like temperature, grazing and other stresses on vegetation of an area (Ali, 2008; Ahmad et al., 2008). Some other contributors to floristic composition of various localities are (Adnan et al., 2014; Ahmad et al., 2009; Ahmad et al., 2016; Bibi et al., 2014; Ibrar et al., 2015; Haider and Ibrahim, 2022; Manan et al., 2022; Bibi et al., 2019). The study area has a great potential to support a thick plant biodiversity due to microhabitats and diverse topographic features. The study was designed to document the floristic composition and biological spectrum of the research area. It will be helpful for the conservation and sustainable utilization of plant natural resources and for future investigations.

## MATERIALS AND METHODS

A detailed field survey was carried out to record and document the floristic composition and biological spectrum of Galiyat valley, District Abbottabad, Khyber Pakhtunkhwa, Pakistan. Field trips were arranged at regular intervals of the year 2019-2022. Plant specimens were collected, identified, dried and pasted on herbarium sheets. Chemical insecticides and pesticides were used to avoid insect and pests attack on the preserved specimens. The specimens were identified with help of literature (Ali et al., 2016; Stewart, 1972; Nasir and Ali, 1970-1989; Ali and Nasir, 1989-1991; Polunin and Stainton, 1990; Ali and Qaiser, 1993-2022). Life form and leaf size of the collected plant species were identified with the help of Raunkiaer (1934). The collected plant specimens were

deposited at Herbarium Centre of Plant Biodiversity, University of Peshawar and Herbarium, Department of Botany, University of Peshawar.

**RESULTS**

A total of 343 plant species, distributed in 86 families and 250 genera, were recorded and collected from the research area. Families with highest number of plant species were Asteraceae with 32 species (9.32%) and 25 genera (10%) followed by Poaceae with 31 species (9.03%) and 19 genera (7.6%). The other families include, Lamiaceae (28, 8.16% spp. 17, 6.8% genera), Rosaceae (22, 6.41% spp.11, 4.4% genera), Ranunculaceae (16, 4.6% spp.10, 4% genera), Fabaceae (11, 3.2% spp. 08, 3.2% genera), Apiaceae (10, 2.9% spp. 09, 3.6% genera), Polygonaceae (10, 2.9% spp.08, 3.2% genera), Caprifoliaceae (10, 2.9% spp.06, 2.4% genera). Remaining families were represented by less than 10 plant species (Table 1, Fig. 2).

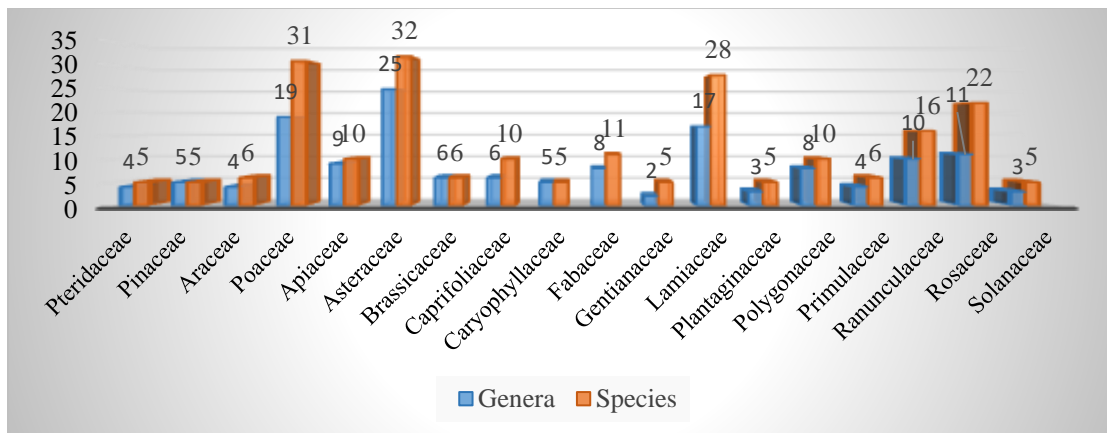


Fig.2. leading plant families with their number of species and genera

Pteridophytes were 7 species (2.04%), Gymnosperms 6 species (1.74%), Angiosperms (monocots) with 54 species (15.74%) and Angiosperms (dicots) with 276 species (80.46%) (Fig. 3).

Dicot 276/80.46%

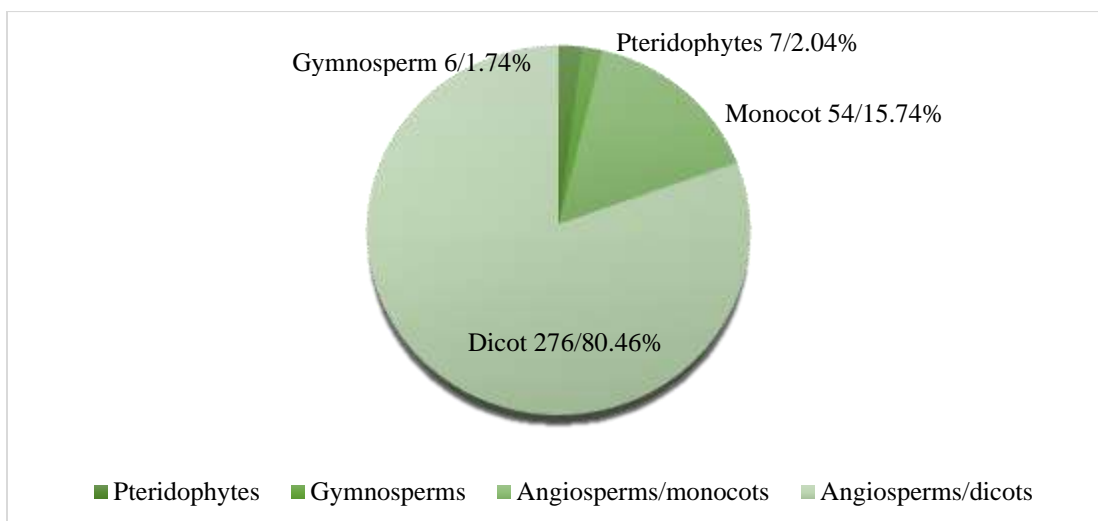


Fig.3. Major Divisions of plants growing in the area.

The habit of different plant species showed that herbs were 228 species (66.47%), Shrubs 63 species (18.36%), trees 41 species (11.95%) and climbers were 11 species (3.20%) (Fig. 4).

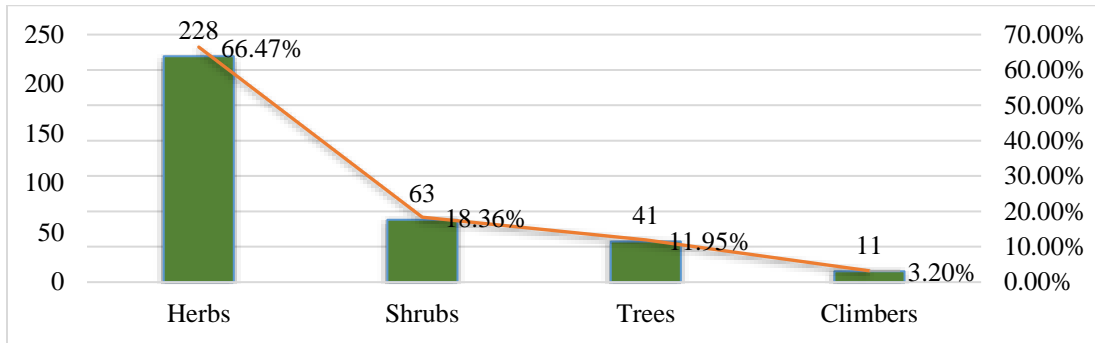


Fig.4. Habit of plant species growing in the research area.

Life form classes showed that Therophytes were dominating with 119 species (34.69%), followed by Hemicryptophytes with 61 species (17.78%). The other life form classes were Geophytes (38 spp. 11.07%), Megaphanerophytes (46 spp. 13.41%), Nanophanerophytes (42 spp. 12.24%), Chamaephytes (29 spp. 8.45%) and Lianas (8 spp. 2.33%) (Fig. 5).

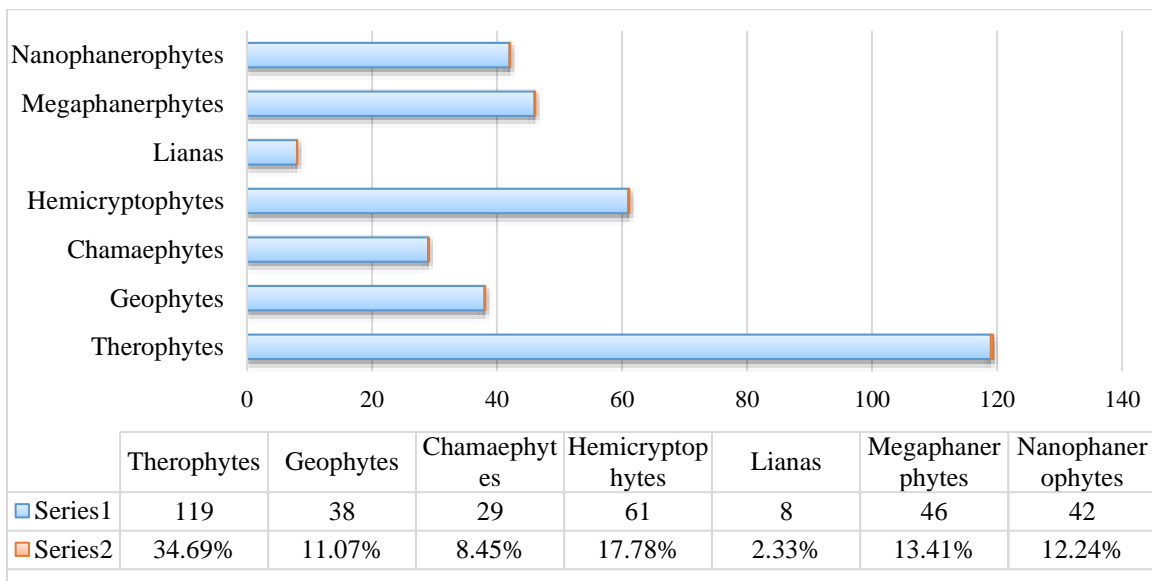


Fig.5. Raunkiaer life form classes of plant species in the area.

Leaf size classification showed that Microphylls were dominating with 134 species (39.06%) followed by Nanophylls with 98 species (28.57%). Leptophylls were 33 species (9.62%), Mesophylls 72 species (20.99%) and Megaphylls were 06 species (1.74%) (Fig. 6).

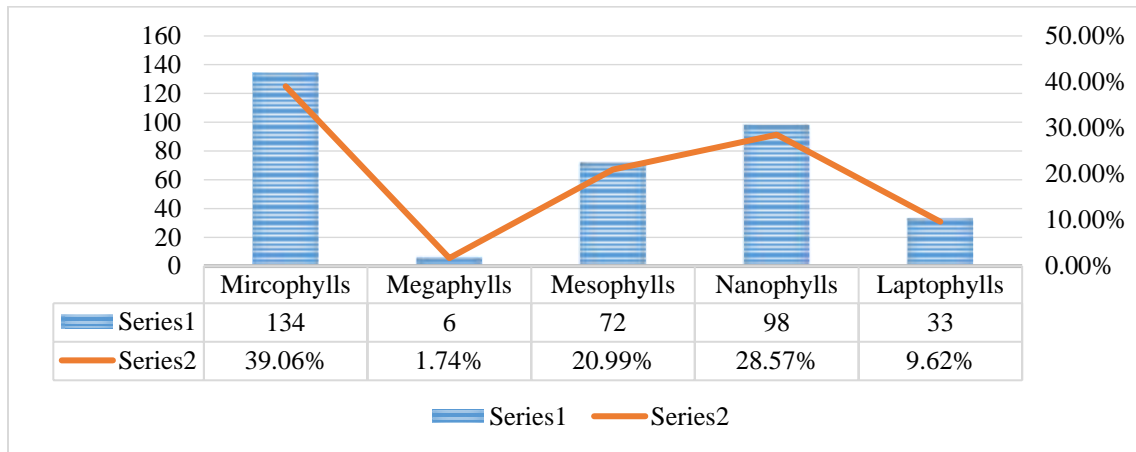


Fig. 6. Leaf size classes of plant species in the area.

Table 1. Plant species growing in the area along with their habit, life form and leaf size.

S.No.	Family	Botanical name	Habit	Life form	Leaf size
<b>A. Pteridophytes</b>					
1.	Dryopteridaceae	1. <i>Dryopteris ramose</i> (C. Hope) C. Chr.	H	H	Me
2.	Lygodiaceae	2. <i>Lygodium japonicum</i> (Thumb.) Sw.	C	G	N
3.	Pteridaceae	3. <i>Adiantum venustum</i> D. Don	H	G	N
		4. <i>Onychium japonicum</i> (Thunb.) Kuntze	H	G	Mi
		5. <i>Pteridium caudatum</i> (L.) Maxon	H	G	Me
		6. <i>Pteris acanthoneura</i> Alston	H	H	Mi
		7. <i>Pteris cretica</i> L.	H	H	Mi
<b>B. Gymnosperms</b>					
4.	Cupressaceae	8. <i>Juniperus communis</i> L.	S	Np	L
5.	Pinaceae	9. <i>Abies pindrow</i> (Royle ex D. Don) Royle	T	Mp	L
		10. <i>Cedrus deodara</i> (Roxb. ex D. Don)	T	Mp	N
		11. <i>Picea smithiana</i> (Wall.) Boiss.	T	Mp	L
		12. <i>Pinus wallichiana</i> A.B. Jacks.	T	Mp	L
6.	Taxaceae	13. <i>Taxus baccata</i> Nan. Li & R. R. Mill.	T	Mp	L
<b>C. Angiosperms/ Monocot</b>					
7.	Alismataceae	14. <i>Sagittaria trifolia</i> L.	H	Np	Mi
8.	Araceae	15. <i>Arisaema jacquemontii</i> Blume	H	G	Me
		16. <i>Arisaema utile</i> Hook. f. ex Schott	H	Th	Me
		17. <i>Arisaema flavum</i> Forssk.	H	G	Me
		18. <i>Arum jacquemontii</i> Blume	H	G	Mi
		19. <i>Sauromatum venosum</i> (Dryand. ex Aiton) Kunth	H	G	Me
		20. <i>Acorus calamus</i> L.	H	G	N
9.	Asparagaceae	21. <i>Asparagus filicinus</i> Buch.-Ham. ex D. Don	H	Ch	L
10.	Convallariaceae	22. <i>Polygonatum multiflorum</i> (L.) All.	H	G	Mi
		23. <i>Polygonatum verticillatum</i> (L.) All.	H	Th	N
11.	Cyperaceae	24. <i>Carex filicina</i> Nees	H	H	L
		25. <i>Carex wallichiana</i> Spreng.	H	G	N
		26. <i>Cyperus cyperoides</i> (L.) Kuntze	H	H	N
		27. <i>Dioscorea deltoidea</i> Wall. ex. Griseb.	C	G	Me
12.	Dioscoreaceae				
13.	Iridaceae	28. <i>Iris hookerana</i> Foster	H	G	Me
14.	Orchidaceae	29. <i>Dactylorhiza hatagirea</i> (D. Don) Soó	H	G	N
		30. <i>Epipactis helleborine</i> (L.) Crantz	H	G	Mi
		31. <i>Epipactis persica</i> (Soó) Hausskn. ex Nannf.	H	G	Mi
		32. <i>Zeuxine strateumatica</i> (L.) Schltr.	H	Th	Mi

15.	Oxalidaceae	33. <i>Oxalis corniculata</i> L.	H	Th	N
		34. <i>Oxalis debilis</i> Kunth	H	Th	N
16.	Paeoniaceae	35. <i>Paeonia emodi</i> Royle	H	G	Me
17.	Papilionaceae	36. <i>Crotalaria juncea</i> L.	H	H	Mi
18.	Poaceae	37. <i>Agrostis pilosula</i> Trin.	S	H	L
		38. <i>Agrostis stolonifera</i> L.	H	H	L
		39. <i>Agrostis vinealis</i> Schreb.	H	H	L
		40. <i>Apluda mutica</i> L.	H	H	N
		41. <i>Bothriochloa bladhii</i> (Retz.) S.T. Blake	H	H	N
		42. <i>Brachiaria ramosa</i> (L.) Stapf.	H	Th	N
		43. <i>Bromus catharticus</i> Vahl	H	H	N
		44. <i>Bromus hordeaceus</i> L.	H	Th	N
		45. <i>Bromus pectinatus</i> Thunb.	H	Th	N
		46. <i>Bromus porphyranthos</i> Cope	H	Th	N
		47. <i>Chrysopogon gryllus</i> (L.) Trin.	H	H	L
		48. <i>Cymbopogon citratus</i> (Dc.) Stapf	H	H	L

		49. <i>Cymbopogon distans</i> (Nees ex Steud.) W. Watson	S	H	L
		50. <i>Cynodon dactylon</i> L.	H	G	Mi
		51. <i>Dactylis glomerata</i> L.	H	H	N
		52. <i>Digitaria nodosa</i> Parl.	H	H	N
		53. <i>Digitaria sanguinalis</i> (L.) Scop.	H	H	
		54. <i>Elymus borianus</i> (Meld.) T. A. Cope, comb, nov.	H	Ch	L
		55. <i>Lolium multiflorum</i> Lam.	H	Th	N
		56. <i>Lolium temulentum</i> L.	H	Th	N
		57. <i>Oplismenus undulatifolius</i> (Ard.) Roem. & Schult.	H	H	N
		58. <i>Phleum himalaicum</i> Mez.	H	H	N
		59. <i>Phleum pratense</i> L.	H	H	Mi
		60. <i>Phragmites australis</i> (Cav.) Trin. ex Steud.	H	Th	Mi
		61. <i>Piptatherum aequiglume</i> (Duthie ex Hook. f.) Roshev.	H	H	Mi
		62. <i>Poa annua</i> L.	H	H	N
		63. <i>Poa pratensis</i> L.	H	H	N
		64. <i>Setaria pumila</i> (Poir.) Roem. & Schult.	H	Th	N
		65. <i>Stipa caragana</i> Trin.	H	H	Mi
		66. <i>Stipa jacquemontii</i> Jaub. & Spach.	H	H	Mi
		67. <i>Themeda anathera</i> (Nees) Hack.	H	H	Mi
<b>D. Angiosperm/ Dicots</b>					
19.	Acanthaceae	68. <i>Adhatoda vasica</i> Nees.	S	Np	Mi
		69. <i>Dicliptera bupleuroides</i> Nees	H	Ch	Mi
		70. <i>Strobilanthes urticifolia</i> Wall. ex Kuntze	S	Th	N
20.	Amaranthaceae	71. <i>Achyranthes aspera</i> L.	H	Th	Mi
		72. <i>Amaranthus viridis</i> L.	H	Th	Mi
21.	Anacardiaceae	73. <i>Pistacia integerrima</i> L.	T	Mp	Mi
		74. <i>Rhus succedanea</i> L.	T	Mp	Mi
22.	Apiaceae	75. <i>Aegopodium burtii</i> Nasir	S	Th	Mi
		76. <i>Bunium persicum</i> (Boiss.) B. Fedtsch.	H	Th	N
		77. <i>Bupleurum hamiltonii</i> N.P. Balakr.	H	Th	L
		78. <i>Bupleurum lanceolatum</i> Wall. ex DC.	H	G	N
		79. <i>Conium maculatum</i> L.	H	Th	Me

		80. <i>Coriandrum sativum</i> L.	H	Th	L
		81. <i>Heracleum candicans</i> Wall. ex DC.	H	Ch	Mi
		82. <i>Pleurospermum stylosum</i> C.B. Clarke	H	H	Mi
		83. <i>Selinum wallichianum</i> (DC.) Raizada & H.O. Saxena	H	G	Me
		84. <i>Torilis japonica</i> (Houtt.) DC.	H	Th	N
23.	Apocynaceae	85. <i>Carissa opaca</i> Stapt ex Haines	S	Ph	Mi
		86. <i>Nerium indicum</i> Mill.	S	Np	Mi
24.	Araliaceae	87. <i>Hedera nepalensis</i> K. Koch.	C	L	Mi
25.	Asteraceae	88. <i>Achillea millefolium</i> L.	H	H	N
		89. <i>Ageratum albidum</i> (DC.) Hemsl.	H	Th	Mi
		90. <i>Ainsliaea aptera</i> DC.	H	H	Mi
		91. <i>Anaphalis busua</i> (Buch.Ham.) DC.	S	G	N
		92. <i>Artemisia incisa</i> Pamp.	H	Ch	L
		93. <i>Artemisia roxburghiana</i> Wall. ex Besser	H	Th	N
		94. <i>Aster falcifolius</i> Handel-Mazzetti	H	Th	N
		95. <i>Bidens pilosa</i> L.	H	Th	N
		96. <i>Chrysanthemum cenarifolium</i> Trey	H	Th	L
		97. <i>Chrysanthemum leucanthemum</i> L.	H	Th	L
		98. <i>Cichorium intybus</i> L.	H	Th	Mi
		99. <i>Cnicus argyranthus</i> (DC) Hk.f.	H	Th	Me
		100. <i>Echinops cornigerus</i> DC.	H	Th	Mi
		101. <i>Erigeron canadensis</i> L.	H	Th	Mi
		102. <i>Erigeron roylei</i> DC.	H	Th	L
		103. <i>Gerbera gossypina</i> (Royle) Beauverd	H	H	Mi
		104. <i>Leontopodium brachyactis</i> Gand.	H	Ch	N
		105. <i>Leucanthemum vulgare</i> (Vaill.) Lam.	H	H	Mi
		106. <i>Ligularia jacquemontiana</i> (Decne.) M. A. Rau	H	G	L
		107. <i>Matricaria chamomilla</i> L.	H	Th	N
		108. <i>Parthenium hysterophorous</i> L.	H	Th	Mi
		109. <i>Saussurea costus</i> (Falc.) Lipsch.	H	G	L
		110. <i>Senecio analogus</i> DC.	H	Th	Me
		111. <i>Senecio chrysanthemoides</i> DC.	H	Th	Me
		112. <i>Senecio nudicaulis</i> Buch.-Ham. ex D. Don	H	G	Mi
		113. <i>Serratula pallida</i> DC.	H	Th	Mi
		114. <i>Solidago virgaurea</i> L.	H	H	N
		115. <i>Sonchus asper</i> L.	H	Th	Mi
		116. <i>Taraxacum campylodes</i> G. E. Haglund	H	H	Mi
		117. <i>Taraxacum officinale</i> Weber	H	G	Me
		118. <i>Tussilago farfara</i> L.	H	Th	N
26.	Balsaminaceae	119. <i>Impatiens bicolor</i> Royle	H	Th	Mi
27.	Berberidaceae	120. <i>Berberis kunawurensis</i> Royle	S	Np	N
		121. <i>Berberis parkeriana</i> C.K. Schneid.	S	Np	N
		122. <i>Berberis lycium</i> Royel	S	Np	N
		123. <i>Podophyllum hexandrum</i> (Royle) T.S.Ying	H	G	Me
28.	Betulaceae	124. <i>Alnus nitida</i> (Spach) Endl.	T	Mp	Me
29.	Boraginaceae	125. <i>Cynoglossum lanceolatum</i> Forssk.	H	H	Mi
		126. <i>Myosotis arvensis</i> (L.) Hill	H	Th	Mi
		127. <i>Onosma hispida</i> var. I.M. Johnst.	H	H	N
30.	Brassicaceae	128. <i>Capsella bursa pastoris</i> Moench.	H	Th	Me
		129. <i>Crucihimalaya himalaica</i> (Edgew.)	H	Th	Mi

		Al-Shehbaz, O'Kane & R.A.			
		130. <i>Draba oreades</i> Schrenk	H	Ch	N
		131. <i>Eruca sativa</i> Mill	H	Th	N
		132. <i>Lepidium virginicum</i> L.	H	Th	N
		133. <i>Sisymbrium irio</i> L.	H	Th	N
31.	Buxaceae	134. <i>Sarcococca pruniformis</i> Lindl.	S	Np	Me
		135. <i>Buxus wallichiana</i> Biall.	S	Np	Mi
32.	Cannabaceae	136. <i>Cannabis sativa</i> L.	H	Th	Mi
33.	Caprifoliaceae	137. <i>Abelia triflora</i> R.Br. ex Wall.	S	Mp	Mi
		138. <i>Dipsacus inermis</i> Wall.	H	H	
		139. <i>Lonicera quinquelocularis</i> Hard.	S	Np	Mi
		140. <i>Lonicera webbiana</i> Wall. ex DC.	S	Np	Mi
		141. <i>Morina persica</i> L.	H	H	Mi
		142. <i>Valeriana jatamansi</i> Jones	H	G	Mi
		143. <i>Viburnum grandiflorum</i> Wall. ex DC.	S	Np	Mi
		144. <i>Viburnum mullaha</i> Buch.-Ham. ex D. Don	S	Np	Me
		145. <i>Viburnum cotinifolium</i> D. Don	S	Th	Me
34.	Caryophyllaceae	146. <i>Arenaria serpyllifolia</i> Bourg. ex Willk. & Lange	H	Th	N
		147. <i>Cerastium fontanum</i> Baumg	H	Th	Mi
		148. <i>Silene conidea</i> L.	H	Th	N
		149. <i>Stellaria media</i> (L.) Vill.	H	Th	N
		150. <i>Vaccaria hispanica</i> (Mill.) Rausch.	H	Th	Mi
35.	Celastraceae	151. <i>Euonymus fimbriatus</i> Wall.	T	Mp	Me
		152. <i>Euonymus hamiltonianus</i> Wall.	S	Mp	Me
		153. <i>Parnassia laxmannii</i> Pall. ex Schult.	H	H	Mi
36.	Chenopodiaceae	154. <i>Chenopodium album</i> L.	H	Th	N
		155. <i>Chenopodium umbrosum</i> (M. Bieb.) Kuntze	S	Th	Mi
37.	Convolvulaceae	156. <i>Ipomea purpurea</i> L.	C	Th	Me
		157. <i>Cuscuta reflexa</i> Roxb.	C	Mp	L
38.	Cornaceae	158. <i>Cornus macrophylla</i> Wall.	T	Mp	Me
39.	Crassulaceae	159. <i>Sedum ewersii</i> Ledeb.	H	Th	L
40.	Cucurbitaceae	160. <i>Solena amplexicaulis</i> (Lam.) Gandhi	C	Th	Mi
41.	Ebenaceae	161. <i>Diospyros lotus</i> L.	T	Mp	Mi
		162. <i>Diospyros kaki</i> L.	T	Mp	Me
42.	Ericaceae	163. <i>Lyonia ovalifolia</i> (Wall.) Drude	T	Mp	Me
		164. <i>Orthilia secunda</i> (L.) House	H	H	N
		165. <i>Rhododendron arboreum</i> Sm.	T	Mp	Me
43.	Euphorbiaceae	166. <i>Euphorbia helioscopia</i> L.	H	Th	Mi
		167. <i>Euphorbia wallichii</i> Hook. f.	H	Th	N
		168. <i>Ricinus communis</i> L.	S	Np	Me
44.	Fabaceae	169. <i>Acacia Arabica</i> L.	T	Mp	L
		170. <i>Acacia nilotica</i> L.	T	Mp	L
		171. <i>Desmodium elegans</i> DC.	S	Np	Me
		172. <i>Indigofera heterantha</i> Brandis	S	Np	L
		173. <i>Lepedeza juncea</i> (L.f.) Pers	H	H	N
		174. <i>Lotus corniculatus</i> L.	H	H	L
		175. <i>Medicago denticulate</i> Willd.	H	Th	L
		176. <i>Medicago laciniata</i> (L.) Mill.	H	Th	L
		177. <i>Robinia pseudoacacia</i> L.	T	Mp	Mg
		178. <i>Trifolium fragiferum</i> L.	H	Th	N
		179. <i>Trifolium repens</i> L.	H	Th	Mi
45.	Fagaceae	180. <i>Quercus dilatata</i> Lindl. ex A. DC.	T	Mp	Mi



		181. <i>Quercus baloot</i> Griff.	T	Mp	Me
		182. <i>Quercus incana</i> Bartram	T	Mp	Mi
46.	Fumariaceae	183. <i>Fumaria indica</i> (Hauskn.) Pugsley	H	Th	N
47.	Geraniaceae	184. <i>Geranium lucidum</i> L.	H	Ch	Mi
		185. <i>Geranium wallichianum</i> D. Don ex Sweet	H	Th	Me
48.	Gentianaceae	186. <i>Gentiana kurroo</i> Royle	H	Th	N
		187. <i>Gentiana pedicellata</i> (D. Don) Wall.	H	H	N
		188. <i>Swertia alata</i> C.B. Clarke	H	Th	N
		189. <i>Swertia chirata</i> Buch-Ham. ex Wall.	H	Th	Mi
		190. <i>Swertia paniculata</i> Wall.	H	Th	N
49.	Hamamelidaceae	191. <i>Parrotiopsis jacquemontiana</i> (Decne.) Rehder	S	Np	Me
50.	Hydrangeaceae	192. <i>Deutzia staminea</i> R. Br. ex Wall.	S	Np	N
51.	Hypericaceae	193. <i>Hypericum perforatum</i> L.	H	L	Mi
52.	Juglandaceae	194. <i>Juglans regia</i> L.	T	Mp	Me
53.	Lamiaceae	195. <i>Ajuga bracteosa</i> Wall ex Benth.	H	Th	Mi
		196. <i>Ajuga integrifolia</i> Buch.-Ham.	H	H	Mi
		197. <i>Ajuga parviflora</i> Benth.	H	Th	Mi
		198. <i>Anisomeles indica</i> (L.) Kuntze	H	Ch	Mi
		199. <i>Calamintha umbrosa</i> L.	H	Th	N
		200. <i>Clinopodium hydaspidis</i> (Fal ex Benth.) Kuntze	S	H	N
		201. <i>Clinopodium vulgare</i> L.	H	H	N
		202. <i>Isodon coetsa</i> (Buch.-Ham. ex D. Don) Kudô	H	Ch	Mi
		203. <i>Isodon rugosus</i> (Wall. ex Benth.) Codd	H	Ch	Mi
		204. <i>Lamium album</i> L.	H	Ch	N
		205. <i>Lamium amplexicaule</i> L.	H	Th	N
		206. <i>Leonurus cardiac</i> L.	H	H	Mi
		207. <i>Marrubium vulgare</i> L.	H	Th	Mi
		208. <i>Mentha arvensis</i> L.	H	Th	N
		209. <i>Mentha longifolia</i> (L.) L.	H	Ch	N
		210. <i>Nepeta cataria</i> L.	H	Ch	Me
		211. <i>Nepeta connate</i> Royle ex Benth.	H	Th	Me
		212. <i>Nepeta erecta</i> (Royle ex Benth.) Benth.	H	Th	Mi
		213. <i>Origanum vulgare</i> L.	H	Ch	Mi
		214. <i>Phlomoides bracteosa</i> (Royle ex Benth.) Kamelin & Makhm.	H	Ch	Mi
		215. <i>Phlomoides rotata</i> (Benth. ex Hook.f.) Mathiesen	H	Ch	Mi
		216. <i>Prunella vulgaris</i> L.	H	Ch	Mi
		217. <i>Rabdosia longituba</i> (Miq.) H. Hara.	S	Th	Me
		218. <i>Rydingia limbata</i> Benth. & V. A. Albert	H	Ch	N
		219. <i>Salvia moorcoftiana</i> Wall ex Benth.	H	Ch	Me
		220. <i>Salvia mukerjeei</i> Bennet & Raizada	H	Th	Me
		221. <i>Salvia nubicola</i> Wall. ex Sweet	H	Ch	Me
		222. <i>Scutellaria chamaedrifolia</i> Hedge & A.J.Paton	H	H	L
54.	Lythraceae	223. <i>Woodfordia fruticosa</i> (L.) Kurz	S	Mp	Mi
55.	Malvaceae	224. <i>Alcea rosea</i> L. Syn: <i>Althea rosa</i> L.	H	H	Mg
		225. <i>Malva neglecta</i> Wallr.	H	Th	Me
		226. <i>Malva verticillata</i> L.	H	Th	Me

		227. <i>Malva sylvestris</i> L.	H	Ch	Mi
56.	Melanthiaceae	228. <i>Trillium govanianum</i> Wall. ex D.Don	H	Th	Me
57.	Meliaceae	229. <i>Cedrela serrata</i> Royle	T	Mp	N
		230. <i>Melia azadarach</i> L.	T	Th	N
58.	Moraceae	231. <i>Broussonetia papyrifera</i> Vent.	T	Mp	Mg
		232. <i>Ficus carica</i> L.	S	Mp	Mg
		233. <i>Ficus palmata</i> Forssk.	S	Mp	Me
		234. <i>Morus nigra</i> L.	T	Mp	Mg
59.	Myrtaceae	235. <i>Eucalyptus globulus</i> L.	T	Mp	Mi
		236. <i>Myrtus communis</i> L.	S	Np	Mi
60.	Nyctaginaceae	237. <i>Mirabilis jalapa</i> L.	H	H	N
61.	Oleaceae	238. <i>Fraxinus excelsior</i> L.	T	Mp	Mi
		239. <i>Jasminum officinale</i> L.	S	Np	Mi
		240. <i>Jasminum humile</i> L.	S	Np	Mi
		241. <i>Olea ferruginea</i> Wall. ex Aitch.	T	Mp	Mi
62.	Onagraceae	242. <i>Oenothera rosea</i> L'Hér. ex Aiton	H	Th	N
63.	Phyllanthaceae	243. <i>Leptopus cordifolius</i> Decne.	S	Mp	L
64.	Phytolaccaceae	244. <i>Phytolacca acinosa</i> Roxb.	H	G	Mi
		245. <i>Phytolacca latbenia</i> L.	H	H	Me
65.	Plantaginaceae	246. <i>Plantago lanceolata</i> L.	H	Th	Me
		247. <i>Plantago major</i> L.	H	H	Me
		248. <i>Veronica laxa</i> Benth.	H	G	Mi
		249. <i>Veronica persica</i> Poir.	H	Th	N
		250. <i>Wulfeniopsis amherstiana</i> (Benth.) D.Y. Hong	H	Th	N
66.	Polygonaceae	251. <i>Polygonum molle</i> D. Don, Prodr.	H	G	Mi
		252. <i>Antenoron filiforme</i> (Thunb.) Roberty & Vautier	H	Th	Me
		253. <i>Bistorta amplexicaule</i> L.	H	Th	Me
		254. <i>Fagopyrum gilesii</i> (Hemsl.) Hedb.	H	Th	N
		255. <i>Persicaria amplexicaulis</i> (D.Don) Ronse Decr.	H	Th	Mi
		256. <i>Polygonum multiflorum</i> L.	H	Th	N
		257. <i>Rheum australe</i> D. Don	H	G	Me
		258. <i>Rumex acetosa</i> L.	H	G	Me
		259. <i>Rumex hastatus</i> D. Don.	H	H	N
		260. <i>Rumex nepalensis</i> Spreng.	H	Ch	Mi
67.	Primulaceae	261. <i>Anagallis arvensis</i> L.	H	Th	N
		262. <i>Androsace foliosa</i> Duby	H	H	N
		263. <i>Androsace hazarica</i> R.R. Stewart ex Y.J. Nasir	H	H	N
		264. <i>Androsace rotundifolia</i> Hardw.	H	Th	Mi
		265. <i>Lysimachia chenopodioides</i> Watt. ex Hook. f.	H	G	Me
		266. <i>Primula denticulata</i> Sm.	H	G	Me
68.	Punicaceae	267. <i>Punica granatum</i> L.	T	Np	Mi
69.	Ranunculaceae	268. <i>Aconitum violaceum</i> Jacquem. Ex Stapf.	H	Ch	Me
		269. <i>Actaea spicata</i> L.	H	Ch	Me
		270. <i>Anemone tetraflora</i> L.	H	Ch	Me
		271. <i>Aquilegia fragrans</i> Benth.	H	H	N
		272. <i>Aquilegia pubiflora</i> Wall. ex Royle	H	G	Mi
		273. <i>Callianthemum pimpinelloides</i> (D.Don ex Royle) Hook.f. & Thomson	H	Th	N
		274. <i>Caltha palustris</i> var. <i>alba</i> (Cambess.) Hook.f. & Thomson	H	Th	Me

		275. <i>Clematis buchananiana</i> DC.	C	L	Mi
		276. <i>Clematis catesbyana</i> Pursh	S	L	Mi
		277. <i>Clematis graveolens</i> Lindl.	S	G	Mi
		278. <i>Clematis montana</i> Buch.-Ham. ex DC.	C	L	Mi
		279. <i>Delphinium vestitum</i> Wall. ex Royle	H	Th	N
		280. <i>Ranunculus hirtellus</i> Royle	H	Th	Mi
		281. <i>Ranunculus munroanus</i> J.R. Drumm. ex Dunn	H	G	Mi
		282. <i>Ranunculus muricatus</i> L.	H	Th	Mi
		283. <i>Thalictrum cultratum</i> Wall.	H	Ch	N
70.	Rhamnaceae	284. <i>Rhamnus purpurea</i> Edgew.	S	Th	Me
		285. <i>Rhamnus virigata</i> Roxb.		Np	Mi
		286. <i>Zizyphus oxyphylla</i> Edgew.	T	Np	N
		287. <i>Zizyphus vulgaris</i> L.	T	Np	N
71.	Rosaceae	288. <i>Agrimonia eupatoria</i> L.	H	H	Mi
		289. <i>Cotoneaster bacillaris</i> Wall. Ex. Lindl.	S	Np	N
		290. <i>Duchesnea indica</i> (Jacks.) Focke	H	H	N
		291. <i>Fragaria nubicola</i> (Lindl. ex Hook.f.) Lacaíta	H	Th	Mi
		292. <i>Potentilla fruticosa</i> L.	S	Th	N
		293. <i>Potentilla nepalensis</i> Hook.	H	Th	N

		294. <i>Prunus padus</i> L.	T	Mp	Me
		295. <i>Rosa brunoi</i> Lindle	S	Np	Mi
		296. <i>Rosa canina</i> L.	S	Th	Me
		297. <i>Rosa chinensis</i> Jacq.	S	Th	Mi
		298. <i>Rosa macrophylla</i> Lindl.	S	Np	Mi
		299. <i>Rosa moschata</i> Herrm.	S	Np	Mi
		300. <i>Rosa multiflora</i> Thunb.	S	Mp	Me
		301. <i>Rosa webbiana</i> Wall. ex Royle	S	Np	Mi
		302. <i>Rubus ellipticus</i> Sm.	S	Np	Mi
		303. <i>Rubus fruticosus</i>	S	Np	Mi
		304. <i>Rubus pedunculatus</i> D. Don	S	Np	Mi
		305. <i>Rubus vulgaris</i> Weihe & Nees	S	Np	Mi
		306. <i>Sorbaria tomentosa</i> (Lindl.) Rehder	S	Np	Mi
		307. <i>Sorbus cuspidata</i> (Spach) Hedl.	S	Mp	Mi
		308. <i>Spiraea canescens</i> D. Don	S	Np	N
72.	Rubiaceae	309. <i>Galium elegans</i> Wall. ex Roxb.	H	Th	N
		310. <i>Galium subfalcatum</i> Nazim. & Ehrend.	H	Th	N
		311. <i>Galium aparine</i> L.	H	Th	L
		312. <i>Rubia himalayensis</i> Klotzsch	C	L	Mi
73.	Rutaceae	313. <i>Skimmia laureola</i> Franch.	S	Np	Mi
		314. <i>Zanthoxylum armatum</i> DC.	S	Np	Me
74.	Salicaceae	315. <i>Populus ciliate</i> Wall. ex Royle	T	Mp	Me
		316. <i>Salix denticulate</i> Andersson	T	Mp	Mi
		317. <i>Salix alba</i> L.	T	Mp	Mi
75.	Sapindaceae	318. <i>Acer caesium</i> Wall. ex Brandis	T	Mp	N
		319. <i>Aesculus indica</i> (Wall. ex Cambess.) Hook.	T	Mp	Mi
76.	Saxifragaceae	320. <i>Bergenia ciliata</i> (Haw.) Sternb.	H	H	Me
		321. <i>Bergenia stracheyii</i> (Hook. f. & Thomson) Engl.	H	G	Me

77.	Scrophulariaceae	322. <i>Buddleja crispa</i> Benth.	S	Np	Mi
		323. <i>Scrophularia calycina</i> Benth.	H	Ch	N
		324. <i>Verbascum thapsus</i> L.	H	Th	Me
78.	Simaroubaceae	325. <i>Ailanthus altissima</i> (Mill.) Swingle	T	Mp	Me
79.	Solanaceae	326. <i>Atropa acuminata</i> Royle ex Lindl.	H	Th	Me
		327. <i>Datura stramonium</i> L.	S	Th	Me
		328. <i>Solanum surattense</i> Brum.f.	H	Th	Mi
		329. <i>Solanum nigrum</i> L.	H	Th	Mi
		330. <i>Solanum villosum</i> (L.) Moench	H	Th	Mi
80.	Staphyleaceae	331. <i>Staphylea emodi</i> L.	S	Mp	Me
81.	Thymelaeaceae	332. <i>Daphne mucronata</i> Royle	S	Np	N
		333. <i>Daphne papyracea</i> Wall. ex G. Don	S	Np	Mi
82.	Ulmaceae	334. <i>Celtis australis</i> (Willd.) C.C. Towns.	T	Mp	N
		335. <i>Ulmus wallichiana</i> Planch.	T	Mp	Me
		336. <i>Ulmus villosa</i> Brandis ex Gamble	T	Mp	Mi
83.	Urticaceae	337. <i>Urtica dioica</i> L.	H	Th	Mi
84.	Verbenaceae	338. <i>Verbena officinalis</i> L.	H	H	Mi
85.	Viburnaceae	339. <i>Sambucus adnata</i> Wall. Ex DC.	S	Th	Mi
86.	Violaceae	340. <i>Viola canescens</i> Wall.	H	H	Mi
		341. <i>Viola odorata</i> L.	H	H	N
87.	Vitaceae	342. <i>Vitis Jacquemontii</i> R. Parker	C	Np	Me
		343. <i>Parthenocissus semicordata</i> (Wall.) Planch.	C	Th	Mi

## DISCUSSION

The floristic structure of an area is reflected by its vegetation. The sum of all species either wild or cultivated is the flora of a particular region (Longhi et al., 1992). The ecological amplitude of plant species and their interaction with the environment and other species is also revealed by the floristic list of an area (Giusti et al., 1995). The present study showed that according to plant habit the number of herbaceous plants were most dominant with 228 species. These findings are congruent with the other researches in different ecological regions (Khattak et al., 2015; K. U. Khan et al., 2015; Ahmad et al., 2016; Rehman et al., 2016; Khan et al., 2016; Ilyas et al., 2018; Anwar et al., 2019; Manan et al., 2022 and Haider and Ibrahim, 2022). Various plant species adapt with different environmental conditions which shows their life form. To describe vegetation adaptation is of immense importance for plant species survival (Mera et al., 1999; Cain and Castro, 1959). In the research area life forms of all species were arranged into different life form classes which showed that therophytes were dominant with 119 species followed by hemicryptophytes with 61 species. Similar findings were observed by different researchers in other areas (Haider and Ibrahim, 2022; Bibi et al., 2019; Ali et al., 2018 and Khan et al., 2017). The ecological factors and their relation with the leaf size is very important because it play key role in studying the vegetation structure at regional scale (Floret et al., 1990). The leaf size spectrum showed that Microphylls were dominating with 134 species (39.06%) followed by Nanophylls with 98 species (28.57%). Leptophylls were 33 species (9.62%), Mesophylls 72 species (20.99%) and Megaphylls were 06 species (1.74%).

## CONCLUSION

The present research records the rich floral biodiversity of Galiyat that will serve as reference work for the further studies. The present work is a part of the whole area and yet a detailed study is required to explore the area floristically and ecologically.

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