



## Floristic composition and life form classes of district Shangla, Khyber Pakhtunkhwa, Pakistan

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### Abstract

The present study was conducted in order to explore the floristic composition and life form classes of district Shangla, Khyber Pakhtunkhwa Pakistan. Floristic survey of district Shangla was conducted from 15 March 2011 to 5 November 2013 to collect information's concerning the flora of district Shangla. The flora of district Shangla consist of 515 plant species belonging to 101 families. The plants explore belong to 113 annual herbs, 227 perennial herbs and 38 biennial herbs. The taxonomically investigated shrubs were 89 species and trees were 48 species. The well-represented families were Asteraceae contributing 63 taxa, Labiateae 31, Rosaceae 26, Ranunculaceae 23, Papilionaceae 18, Brassicaceae 17 and Polygonaceae 10 taxa. The life form spectrum showed that the most dominant life form class was Therophyte with maximum number of 222 species (43.3%) followed by Phanerophytes with 137 species (26.8%), Chamaephytes with 56 species (10.92%), Cryptophytes with 50 species (9.85%), Hydrophytes 28 species (5.44%), Geophytes 12 species (2%), and Hemicryptophytes 10 species (1.98%) respectively. The present study reveals that the study area is diverse in its floristic composition having varieties of life form classes. The dominant Therophytic life form shows that the flora of the area is under sever anthropogenic activity. Phenophytes occupy second position in life form, which shows that the area is occupied by stratified thick forests. However, the forests of the study area are under sever threat of deforestation and erosion thus protective measures should be adopted for the conservation of the precious flora of the study area.

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## Introduction

Flora is a precious endowment of nature upon which humanity has always been dependent. The authentic knowledge of plants is based on trial and error method and passed on from one generation to another after refining and additions (Khan *et al.*, 2013). The replacement of wild plants with desired cultivated crops on large scale has affected the availability of plants in their natural habitat. Worldwide land cover, is altered principally by direct human use; through agriculture, pasture, forestry, and development. Due to which natural habitats are reduced, leaving less area available for native species (Qureshi *et al.*, 2010).

In some parts of the globe including Himalayan region, the humans are using plant resources very ruthlessly. During the last hundred years, the area has been subjected to major structural changes leading to a decrease of about 50% of the potential forest area. The loss and degradation of natural forests clearly implies a decline in species number and genetic diversity of population (Ibrar, 2003).

Floristic composition of a particular area provides basic and diverse information about the plant distribution. Since world, have verities of geographical and ecological zone, which support different types of floristic composition. Floristic composition of a particular region is helpful for identification and conservation of plant wealth on scientific and systematic manner (Masroor, 2011). Local plants distribution gives vital information's about plants species, their distribution and climatic effect, which effect the distribution of the plants in that particular region (Ali, 2008).

To study the vegetation of an area it is important to know about the life form of plants. Life form spectrum is the indicator of micro and macroclimate (Shimwell 1971). Human disturbance and climatic condition of a particular area could be indicated by life form spectra (Cain and Castro, 1959). According to the Raunkiaer (1934) classification the plants are

classified into five groups (Costa *et al.*, 2007; Batalha and Mantovani, 2001; Hussain and Perveen, 2009) which is Phanerophytes, Hemicryptophytes, Cryptophytes, Chamaephytes, Therophytes. Review of literature showed that very little work has been done on life form spectra in Pakistan (Malik *et al.*, 2007; Hadi *et al.*, 2009; Rahmatullah and Ahmad, 2010). District Shangla which is situated between 34°-31" to 33°-08", North latitudes and 72°-33" to 73°-01" East longitudes is one of such unexplored areas of Pakistan. On the East it boundary meet with district Batagram, West with district Swat, South with district Buner and North with district Kohistan (Fig. 1). Shangla district consists of small valleys, hillocks, and thick forests. Western extremities of great Himalayan range are situated in district Shangla. The area is mostly moist temperate and receive a heavy rain during winter, hence the area is represented by thick flora. The area also has a fertile land which supports rich biodiversity but the area is totally unexplored for its floristic composition and life form spectrum. So the basic aim of the present study was to explore the floristic composition and life form classes of district Shangla.

## Materials and methods

### *Survey of the study areas*

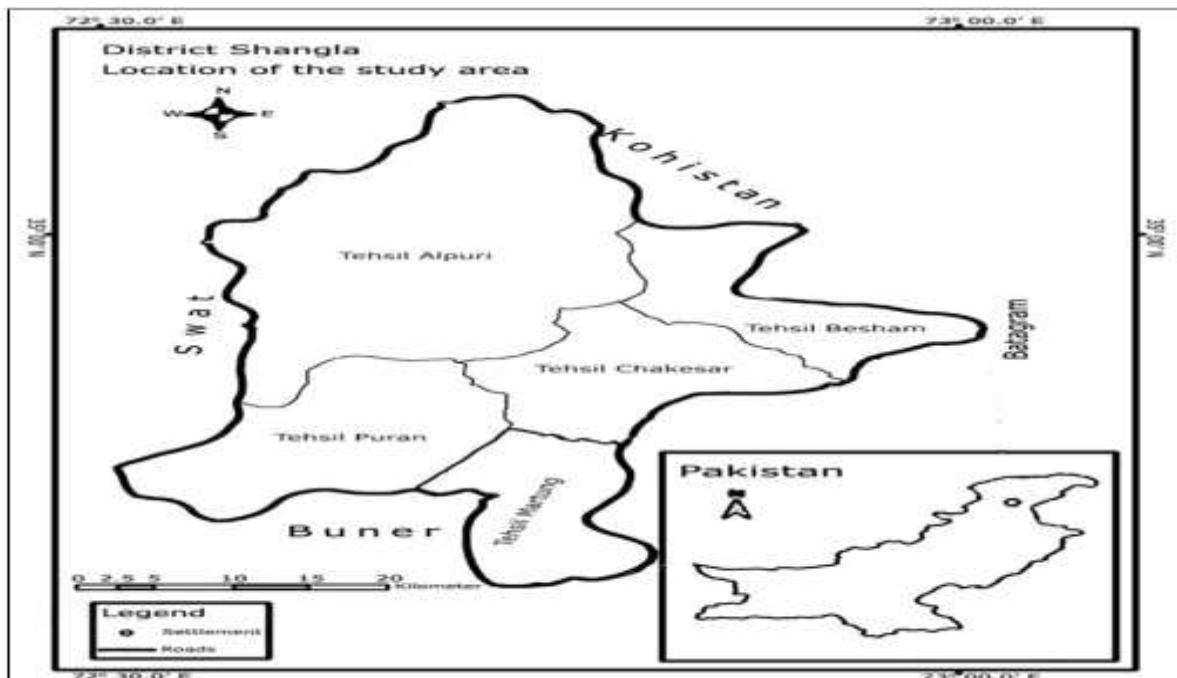
The study areas were visited three years (From 15 March 2011 to 5 November 2013) consecutively to collect the taxa along with relevant information. Total of 31 localities were studied thoroughly, because these localities were rich in flora and easily accessible which represent floristic composition of the whole district Shangla. The visits of the selected areas were conducted with the help of local guides. The plain areas were studied during the month of March-June while Mountainous areas were studied from July to the end of September, because in winter mountains are densely covered with snow and unaccessible to reach. Similarly in winter season plants lack flowering.

### *Collection and identification of plant specimens*

Plant specimens were collected along with

extensive field notes including family, botanical name and life form. Efforts were made to photograph habit including flowers, fruits and habitat of most of the plant species. Voucher specimens were deposited in Herbarium Hazara University Pakistan. Identification

was carried out with the help of authentic literature i.e. Flora of Pakistan and Flora Iranica (Rechinger 1957-2001) or as far as possible on more recently available data on other taxonomic work, Shinwari and Rahman, 2006.



**Fig. 1.** Location of district Shangla on the map of Pakistan.

Plants were classify into various life form classes by following Raunkiaer (1934), Muller and Ellenberg (1974) and Hussain (1989). The life form classes were presented as describe by Raunkiar (1934) and are given below;

#### *Therophytes*

These are annual seed plants that's complete their life cycle in single year.

#### *Geophytes*

These are perennials plants in which storage of food occur in underground parts such as tubers, bulbs and rhizome etc.

#### *Hydrophytes*

They are water plants which partially or wholly submerged in water.

#### *Hemicrytophytes*

They are perennial herbaceous plants which bears its overwintering buds at ground level.

#### *Chamaephytes*

They are usually consisting of woody plants whose perennating buds lies close to the ground surface.

#### *Phanerophytes*

They are perennial plant whose perennating buds born on aerial shoot.

Formula as proposed by Raunkiaer to calculate the life form is;

$$\text{Biological Spectrum} = \frac{\text{Number of species of a particular life form class}}{\text{Total number of all species in a stand}} \times 100$$

Total number of all species in a stand.

#### **Results**

In order to explore the floristic composition and its life form classes in district Shangla, the floristic

survey was conducted from 15 March 2011 to 10 to 5 November 2013. In the present study a total of 31 localities were studied thoroughly, because these localities were rich in flora and easily accessible which represent floristic composition of the whole district Shangla. The detailed information regarding to flora and its life form classes which were taxonomically investigated consist of the total of 515

plant species belonging to 101 families were identified from the study area (Table 1). Out of these 101 families, the well-represented families were Asteraceae contributing 63 taxa, Labiatae 31, Rosaceae 26, Ranunculaceae 23, Papilionaceae 18, Brassicaceae 17 and Polygonaceae 10 taxa. There was a great variety in life form in the flora of district Shangla.

**Table 1.** Floristic checklist along with Family, Botanical Name and life form classes of district Shangla Pakistan.

| S#  | Family         | Botanical Name  | Life form    |
|-----|----------------|---|--------------|
| 1.  | Acanthaceae    | <i>Strobilanthes glutinosus</i> Nees                      | Cryptophyte  |
| 2.  | Acanthaceae    | <i>Strobilanthes urticifolia</i> Wall. ex Kuntze          | Phanerophyte |
| 3.  | Acanthaceae    | <i>Pteracanthus urticifolius</i> (Kuntze) Bremek          | Therophyte   |
| 4.  | Acanthaceae    | <i>Strobilanthes wallichii</i> Nees                       | Therophyte   |
| 5.  | Aceraceae      | <i>Acer caesium</i> Wall. ex Brandle                      | Phanerophyte |
| 6.  | Alismataceae   | <i>Sagittaria guayanesis</i> H. B. & K.                   | Hydrophyte   |
| 7.  | Alliaceae      | <i>Allium griffithianum</i> Boiss.                        | Geophyte     |
| 8.  | Alliaceae      | <i>Allium humile</i> Kunth                                | Geophyte     |
| 9.  | Amaranthaceae  | <i>Alternanthera pungens</i> Kunth                        | Cryptophyte  |
| 10. | Amaranthaceae  | <i>Amaranthus caudatus</i> L.                             | Therophyte   |
| 11. | Amaranthaceae  | <i>Amaranthus spinosus</i> L.                             | Therophyte   |
| 12. | Amaranthaceae  | <i>Amaranthus viridis</i> L.                              | Therophyte   |
| 13. | Amaranthaceae  | <i>Celosia argentea</i> L.                                | Therophyte   |
| 14. | Amaranthaceae  | <i>Deeringia amaranthoides</i> (Lam.) Merr.               | Therophyte   |
| 15. | Amaryllidaceae | <i>Narcissus tazetta</i> L.                               | Therophyte   |
| 16. | Amaryllisaceae | <i>Ixiolirion tataricum</i> (Pall.) Herb.                 | Therophyte   |
| 17. | Anacardiaceae  | <i>Cotinus coggyria</i> Scop.                             | Phanerophyte |
| 18. | Anacardiaceae  | <i>Rhus punjabensis</i> J. L. Stewart ex Brindle          | Phanerophyte |
| 19. | Anacardiaceae  | <i>Rhus</i> sp  | Phanerophyte |
| 20. | Anacardiaceae  | <i>Rhus succedanea</i> var. <i>himalaica</i> J. D. Hooker | Phanerophyte |
| 21. | Apiaceae       | <i>Aegopodium burttii</i> E. Nasir                        | Cryptophyte  |
| 22. | Apiaceae       | <i>Pimpinella diversifolia</i> DC                         | Cryptophyte  |
| 23. | Apiaceae       | <i>Oenanthe javanica</i> (Blume) DC.                      | Hydrophyte   |
| 24. | Apiaceae       | <i>Angelica glauca</i> Edgew                              | Phanerophyte |
| 25. | Apiaceae       | <i>Bupleurum falcatum</i> L.                              | Phanerophyte |
| 26. | Apiaceae       | <i>Bupleurum longicaule</i> Wall. ex DC.                  | Phanerophyte |
| 27. | Apiaceae       | <i>Heracleum candicans</i> Wall. ex DC.                   | Phanerophyte |
| 28. | Apiaceae       | <i>Pleurospermum brunonis</i> DC. Clarke                  | Phanerophyte |
| 29. | Apiaceae       | <i>Bunium persicum</i> (Boiss.) Fedtsch                   | Therophyte   |
| 30. | Apiaceae       | <i>Cortia depressa</i> (Don) Norman                       | Therophyte   |
| 31. | Apiaceae       | <i>Eryngium coeruleum</i> M-Bieb.                         | Therophyte   |
| 32. | Apiaceae       | <i>Pleurospermum stylosum</i> C. B. Clarke                | Therophyte   |
| 33. | Apiaceae       | <i>Scandix pecten-veneris</i> L.                          | Therophyte   |

|     |              |   |              |
|-----|--------------|---|--------------|
| 34. | Apocynaceae  | <i>Asclepias cusassavica</i> L.                   | Phanerophyte |
| 35. | Apocynaceae  | <i>Calotropis procera</i> (Aiton) W. T. Aiton     | Phanerophyte |
| 36. | Apocynaceae  | <i>Periploca aphylla</i> Decne.                   | Phanerophyte |
| 37. | Araceae      | <i>Arum Jacquemontii</i> Blum                     | Chamaephyte  |
| 38. | Araceae      | <i>Arisaema flavum</i> Schott                     | Phanerophyte |
| 39. | Araceae      | <i>Acorus calamus</i> L.                          | Hydrophyte   |
| 40. | Araceae      | <i>Arisaema Jacquemontii</i> Blum, Rumphia        | Therophyte   |
| 41. | Araceae      | <i>Arisaema utile</i> Hook. F. ex Schott          | Therophyte   |
| 42. | Araliaceae   | <i>Hedera nepalensis</i> K. Koch                  | Therophyte   |
| 43. | Asparagaceae | <i>Asparagus officinalis</i> L.                   | Cryptophyte  |
| 44. | Asparagaceae | <i>Asparagus racemosus</i> Willd.                 | Cryptophyte  |
| 45. | Asparagaceae | <i>Asparagus filicinus</i> Buch.-Ham. ex D. Don   | Phanerophyte |
| 46. | Asparagaceae | <i>Asparagus gracilis</i> Royle                   | Phanerophyte |
| 47. | Asparagaceae | <i>Asparagus adscendens</i> Roxb.                 | Therophyte   |
| 48. | Asteraceae   | <i>Achillea millefolium</i> L.                    | Chamaephyte  |
| 49. | Asteraceae   | <i>Aster mulliusculus</i> (DC.) C. B. Clarke      | Chamaephyte  |
| 50. | Asteraceae   | <i>Hippolytia dolichophylla</i> Kitam.            | Chamaephyte  |
| 51. | Asteraceae   | <i>Myriactis willichii</i> Less.                  | Chamaephyte  |
| 52. | Asteraceae   | <i>Saussurea albescens</i> (DC.) Sch. Bip.        | Chamaephyte  |
| 53. | Asteraceae   | <i>Leontopodium himalayanum</i> DC.               | Chamaephyte  |
| 54. | Asteraceae   | <i>Serratula palida</i> DC.                       | Chamaephyte  |
| 55. | Asteraceae   | <i>Solidago virgaurea</i> L.                      | Chamaephyte  |
| 56. | Asteraceae   | <i>Taraxacum officinale</i> Webber.               | Chamaephyte  |
| 57. | Asteraceae   | <i>Tussilago farfara</i> L.                       | Chamaephyte  |
| 58. | Asteraceae   | <i>Picris hieracioides</i> L.                     | Cryptophyte  |
| 59. | Asteraceae   | <i>Anthemis</i> spp                               | Phanerophyte |
| 60. | Asteraceae   | <i>Artemisia scoparia</i> Waldst & Kit.           | Phanerophyte |
| 61. | Asteraceae   | <i>Inula cuspidata</i> (DC.) Clarke.              | Phanerophyte |
| 62. | Asteraceae   | <i>Pluchea wallichiana</i> DC.                    | Phanerophyte |
| 63. | Asteraceae   | <i>Allardia glabra</i> Dence                      | Therophyte   |
| 64. | Asteraceae   | <i>Allardia</i> sp.                               | Therophyte   |
| 65. | Asteraceae   | <i>Anaphalis margaritacea</i> L.                  | Therophyte   |
| 66. | Asteraceae   | <i>Anaphalis triplinervis</i> (Sims) C. B. Clarke | Therophyte   |
| 67. | Asteraceae   | <i>Artemisia vulgaris</i> L.                      | Therophyte   |
| 68. | Asteraceae   | <i>Aster altaicus</i> Willd.                      | Therophyte   |
| 69. | Asteraceae   | <i>Aster belliooides</i> (D.Don) Bth. & Hk.F.     | Therophyte   |
| 70. | Asteraceae   | <i>Aster crispa</i> Forsak.                       | Therophyte   |
| 71. | Asteraceae   | <i>Aster himalaicus</i> C. B. Clarke              | Therophyte   |
| 72. | Asteraceae   | <i>Biden tripartia</i> L.                         | Therophyte   |
| 73. | Asteraceae   | <i>Bidens cernua</i> L.                           | Therophyte   |
| 74. | Asteraceae   | <i>Calendula arvensis</i> Linn.                   | Therophyte   |
| 75. | Asteraceae   | <i>Carbenia benedicta</i> L.                      | Therophyte   |
| 76. | Asteraceae   | <i>Carpesium abrotanoides</i> L.                  | Therophyte   |
| 77. | Asteraceae   | <i>Carthamus lanatus</i> L.                       | Therophyte   |

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| 78.  | Asteraceae    | <i>Carthamus oxyacantha</i> M. Bieb.                   | Therophyte      |
| 79.  | Asteraceae    | <i>Centaurea iberica</i> Trev. ex Spreng.              | Therophyte      |
| 80.  | Asteraceae    | <i>Cichorum intybus</i> L.                             | Therophyte      |
| 81.  | Asteraceae    | <i>Cirsium arvense</i> (L.) Scop.                      | Therophyte      |
| 82.  | Asteraceae    | <i>Cirsium falconeri</i> (Hook. F.) Petrak             | Therophyte      |
| 83.  | Asteraceae    | <i>Cirsium verutum</i> (D.Don) Sprengel                | Therophyte      |
| 84.  | Asteraceae    | <i>Conyza absinthifolia</i> DC.                        | Therophyte      |
| 85.  | Asteraceae    | <i>Conyza canadensis</i> (L.) Cronquist.               | Therophyte      |
| 86.  | Asteraceae    | <i>Cynara scolymus</i> L.                              | Therophyte      |
| 87.  | Asteraceae    | <i>Erigeron multicaulis</i> Wall.ex DC.                | Therophyte      |
| 88.  | Asteraceae    | <i>Erigeron multiradiatus</i> Benth.                   | Therophyte      |
| 89.  | Asteraceae    | <i>Galinosaga Parviflora</i> Cav.                      | Therophyte      |
| 90.  | Asteraceae    | <i>Gnaphalium affine</i> D. Don                        | Therophyte      |
| 91.  | Asteraceae    | <i>Hippolytia nana</i> (Clarke).                       | Therophyte      |
| 92.  | Asteraceae    | <i>Inula grandiflora</i> Willd.                        | Therophyte      |
| 93.  | Asteraceae    | <i>Jurinea dolomiaeae</i> Boiss.                       | Therophyte      |
| 94.  | Asteraceae    | <i>Lactuca dissecta</i> D. Don                         | Therophyte      |
| 95.  | Asteraceae    | <i>Launea procumbense</i> (Roxb.) Ramayya & Rajjagopal | Therophyte      |
| 96.  | Asteraceae    | <i>Onopodium acanthium</i> L.                          | Therophyte      |
| 97.  | Asteraceae    | <i>Parthenium hysterophorus</i> L.                     | Therophyte      |
| 98.  | Asteraceae    | <i>Prenanthes brunonianana</i> Wall ex DC.             | Therophyte      |
| 99.  | Asteraceae    | <i>Pseudognaphalium affine</i> (D. Don) Anderb.        | Therophyte      |
| 100. | Asteraceae    | <i>Scorzonera virgata</i> DC.                          | Therophyte      |
| 101. | Asteraceae    | <i>Senecio chrysenthmeoides</i> DC.                    | Therophyte      |
| 102. | Asteraceae    | <i>Sonchus asper</i> L.                                | Therophyte      |
| 103. | Asteraceae    | <i>Sonchus oleraceus</i> L.                            | Therophyte      |
| 104. | Asteraceae    | <i>Xanthium sibiricum</i> Patrin.                      | Therophyte      |
| 105. | Asteraceae    | <i>Xanthium strumarium</i> L.                          | Therophyte      |
| 106. | Balsaminaceae | <i>Impatiens flemingii</i> Hook. F                     | Hemicryptophyte |
| 107. | Balsaminaceae | <i>Impatiens glandulifera</i> Royle                    | Hemicryptophyte |
| 108. | Balsaminaceae | <i>Impatiens thomsonii</i> Hook.                       | Hemicryptophyte |
| 109. | Balsaminaceae | <i>Impatiens bicolor</i> Royle                         | Therophyte      |
| 110. | Balsaminaceae | <i>Impatiens branchycentra</i> Kar. & Kir.             | Therophyte      |
| 111. | Balsaminaceae | <i>Impatiens edgeworthii</i> Hook. F.                  | Therophyte      |
| 112. | Berberidaceae | <i>Berberis calliobotrys</i> Bien. ex Koehne           | Phanerophyte    |
| 113. | Berberidaceae | <i>Berberis jaeschkeana</i> C. K. Schneid.             | Phanerophyte    |
| 114. | Berberidaceae | <i>Berberis lycium</i> Royle                           | Phanerophyte    |
| 115. | Berberidaceae | <i>Berberis pseudumbellata</i> Parker                  | Phanerophyte    |
| 116. | Betulaceae    | <i>Alnus nitida</i> (Spach) Endl.                      | Phanerophyte    |
| 117. | Boraginaceae  | <i>Cynoglossum glochidiatum</i> Wall. ex Benth.        | Chamaephyte     |
| 118. | Boraginaceae  | <i>Lindelofia longiflora</i> (Benth.) Baill.           | Cryptophyte     |
| 119. | Boraginaceae  | <i>Buglossoides arvensis</i> (L.) Johnston             | Therophyte      |
| 120. | Boraginaceae  | <i>Heliotropium undulatum</i> Vahl                     | Therophyte      |
| 121. | Boraginaceae  | <i>Lithospermum arvense</i> L.                         | Therophyte      |

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|------|-----------------|--|-----------------|
| 122. | Boraginaceae    | <i>Nonea edgeworthii</i> A. DC.  | Therophyte      |
| 123. | Boraginaceae    | <i>Pseudomertensia moltkiooides</i> (Royle ex Benth.) Kazmi                | Therophyte      |
| 124. | Boraginaceae    | <i>Trichodesma indicum</i> (L.) Lehm.                                      | Therophyte      |
| 125. | Brassicaceae    | <i>Malcolmia cabulica</i> (Biess.) H. & T.                                 | Chamaephyte     |
| 126. | Brassicaceae    | <i>Thlaspi andersonii</i> (H. & T.) O. E. S.                               | Chamaephyte     |
| 127. | Brassicaceae    | <i>Neslia apiculata</i> Fisch, C.A. Mey. & Ave-Lall                        | Hemicryptophyte |
| 128. | Brassicaceae    | <i>Nasturtium officinale</i> R. Br.  | Hydrophyte      |
| 129. | Brassicaceae    | <i>Eruca sativa</i> Mill.  | Phanerophyte    |
| 130. | Brassicaceae    | <i>Alliaria petiolata</i> (M. B.) Cav. & Grande.                           | Therophyte      |
| 131. | Brassicaceae    | <i>Arabis pangiensis</i> G. Watt   | Therophyte      |
| 132. | Brassicaceae    | <i>Brassica campestris</i> (L.) Clampham                                   | Therophyte      |
| 133. | Brassicaceae    | <i>Capsella bursa-pastoris</i> (L.) Medik.                                 | Therophyte      |
| 134. | Brassicaceae    | <i>Cardaria draba</i> (L.) Desv.   | Therophyte      |
| 135. | Brassicaceae    | <i>Lepidium apetalum</i> Willd.  | Therophyte      |
| 136. | Brassicaceae    | <i>Malcolmia africana</i> (L.) R.  | Therophyte      |
| 137. | Brassicaceae    | <i>Rorippa islandica</i> (Oeder) Borbas                                    | Therophyte      |
| 138. | Brassicaceae    | <i>Sisymbrium erysimoides</i> Desf.  | Therophyte      |
| 139. | Brassicaceae    | <i>Sisymbrium irio</i> L.  | Therophyte      |
| 140. | Brassicaceae    | <i>Thlaspi arvense</i> L.  | Therophyte      |
| 141. | Brassicaceae    | <i>Thlaspi griffithianum</i> Boiss.  | Therophyte      |
| 142. | Brassicaceae    | <i>Thlaspi perfoliatum</i> L.  | Therophyte      |
| 143. | Buddlejaceae    | <i>Buddleja crispa</i> Benth.  | Phanerophyte    |
| 144. | Buxaceae        | <i>Buxus wallichiana</i> Baillon   | Phanerophyte    |
| 145. | Buxaceae        | <i>Sarcococca saligna</i> (D. Don) Müll. Arg.                              | Phanerophyte    |
| 146. | Caesalpiniaceae | <i>Caesalpinia decapetala</i> (Roth) Alston                                | Phanerophyte    |
| 147. | Campanulaceae   | <i>Campanula cashmeriana</i> Royle.  | Therophyte      |
| 148. | Campanulaceae   | <i>Campanula pallida</i> Wall  | Therophyte      |
| 149. | Campanulaceae   | <i>Campanula tenuissima</i> Dunn   | Therophyte      |
| 150. | Campanulaceae   | <i>Sphenoclea zeylanica</i> Gaertn.  | Therophyte      |
| 151. | Cannabaceae     | <i>Cannabis sativa</i> L.  | Cryptophyte     |
| 152. | Caprifoliaceae  | <i>Lonicera quinquelocularis</i> Hardwicke                                 | Chamaephyte     |
| 153. | Caprifoliaceae  | <i>Viburnum grandiflorum</i> Wall. ex DC.                                  | Cryptophyte     |
| 154. | Caprifoliaceae  | <i>Scabiosa olivieri</i> Coult.  | Geophyte        |
| 155. | Caprifoliaceae  | <i>Morina longifolia</i> Wall. ex DC.                                      | Phanerophyte    |
| 156. | Caprifoliaceae  | <i>Viburnum cotinifolium</i> D. Don  | Phanerophyte    |
| 157. | Caprifoliaceae  | <i>Viburnum foetens</i> (D. Don) Wall. ex DC.                              | Phanerophyte    |
| 158. | Caryophyllaceae | <i>Dianthus orientalis</i> Adams   | Chamaephyte     |
| 159. | Caryophyllaceae | <i>Minuartia Linn.</i>   | Cryptophyte     |
| 160. | Caryophyllaceae | <i>Silene gonosperma</i> (Rohrb.) Bocquet                                  | Cryptophyte     |
| 161. | Caryophyllaceae | <i>Silene vulgaris</i> (Moench) Garcke                                     | Cryptophyte     |
| 162. | Caryophyllaceae | <i>Cerastium pusillum</i> Ser.   | Therophyte      |
| 163. | Caryophyllaceae | <i>Gypsophila cerastioides</i> D. Don                                      | Therophyte      |
| 164. | Caryophyllaceae | <i>Lepyrodielis holosteoides</i> (C. A. Mey.) Fenzl ex Fisch. & C. A. Mey. | Therophyte      |

|      |                 |  |              |
|------|-----------------|--|--------------|
| 165. | Caryophyllaceae | <i>Silene coniodes</i> L.                                | Therophyte   |
| 166. | Caryophyllaceae | <i>Silene morcroftiana</i> Wall.                         | Therophyte   |
| 167. | Caryophyllaceae | <i>Silene viscosa</i> (L.) Pers.                         | Therophyte   |
| 168. | Caryophyllaceae | <i>Spergularia marina</i> (L.) Besser                    | Therophyte   |
| 169. | Caryophyllaceae | <i>Stellaria media</i> (L.) Vill.                        | Therophyte   |
| 170. | Celastraceae    | <i>Euonymus fimbriatus</i> Wall.                         | Phanerophyte |
| 171. | Celastraceae    | <i>Gymnosperma royleana</i> Wall.                        | Phanerophyte |
| 172. | Celastraceae    | <i>Maytenus royleanus</i> Wall.                          | Phanerophyte |
| 173. | Celastraceae    | <i>Maytenus wallichiana</i> (Springe) Raju & Bull.       | Phanerophyte |
| 174. | Chenopodiaceae  | <i>Chenopodium ambrosioides</i> L.                       | Chamaephyte  |
| 175. | Chenopodiaceae  | <i>Chenopodium foliosum</i> (Moench) Aschers.            | Chamaephyte  |
| 176. | Chenopodiaceae  | <i>Chenopodium album</i> L.                              | Therophyte   |
| 177. | Chenopodiaceae  | <i>Chenopodium botrys</i> L.                             | Therophyte   |
| 178. | Colchicaceae    | <i>Colchicum luteum</i> Baker                            | Geophyte     |
| 179. | Convallariaceae | <i>Polygonatum gemmiflorum</i> Decne.                    | Therophyte   |
| 180. | Convallariaceae | <i>Polygonatum verticillatum</i> (L.) All.               | Therophyte   |
| 181. | Convolvulaceae  | <i>Convolvulus arvensis</i> L.                           | Therophyte   |
| 182. | Convolvulaceae  | <i>Ipomoea hederacea</i> (L.) jacq.                      | Hydrophyte   |
| 183. | Convolvulaceae  | <i>Ipomoea purpurea</i> (L.) Roth                        | Hydrophyte   |
| 184. | Crassulaceae    | <i>Rhodiola quadrifida</i> (Pallas) Schrenk              | Cryptophyte  |
| 185. | Crassulaceae    | <i>Hylotelephium ewersii</i> (Ledeb.) H. Ohba            | Therophyte   |
| 186. | Crassulaceae    | <i>Rhodiola wallichiana</i> (Hook) S.H. Fu.              | Therophyte   |
| 187. | Crassulaceae    | <i>Sedum oreades</i> (Decne.) Raym-Hamet                 | Therophyte   |
| 188. | Cucurbitaceae   | <i>Cucumis melo</i> var. <i>agrestis</i> Naudin, Ann.    | Therophyte   |
| 189. | Cucurbitaceae   | <i>Solena amplexicaulis</i> (Lam.) Gandhi                | Therophyte   |
| 190. | Cupressaceae    | <i>Juniperus communis</i> L.                             | Phanerophyte |
| 191. | Cuscutaceae     | <i>Cuscuta reflexa</i> Roxb.                             | Therophyte   |
| 192. | Cyperaceae      | <i>Cyperus rotundus</i> L.                               | Hydrophyte   |
| 193. | Cyperaceae      | <i>Eleocharis</i> Sp.                                    | Hydrophyte   |
| 194. | Cyperaceae      | <i>Cyperus glomeratus</i> L.                             | Therophyte   |
| 195. | Cyperaceae      | <i>Cyperus niveus</i> Retz.                              | Therophyte   |
| 196. | Datiscaceae     | <i>Datisca cannabina</i> Linn.                           | Phanerophyte |
| 197. | Dipsacaceae     | <i>Dipsacus inermis</i> Wall.                            | Chamaephyte  |
| 198. | Ebenaceae       | <i>Diospyros kaki</i> L.                                 | Phanerophyte |
| 199. | Ebenaceae       | <i>Diospyros lotus</i> L.                                | Phanerophyte |
| 200. | Elaeagnaceae    | <i>Elaeagnus umbellata</i> Thunb.                        | Phanerophyte |
| 201. | Equisetaceae    | <i>Equisetum arvense</i> L.                              | Hydrophyte   |
| 202. | Ericaceae       | <i>Rhododendron arboreum</i> Smith                       | Phanerophyte |
| 203. | Ericaceae       | <i>Rhododendron hypenanthon</i> Balf. F.                 | Phanerophyte |
| 204. | Euphorbiaceae   | <i>Euphorbia hirta</i> Linn.                             | Cryptophyte  |
| 205. | Euphorbiaceae   | <i>Andracme cordifolia</i> (Wall. ex Decne.) Muell. Arg. | Phanerophyte |
| 206. | Euphorbiaceae   | <i>Chrozophora tinctoria</i> (L.) Raf.                   | Therophyte   |
| 207. | Euphorbiaceae   | <i>Euphorbia helioscopia</i> Linn.                       | Therophyte   |
| 208. | Euphorbiaceae   | <i>Euphorbia hypericifolia</i> L.                        | Therophyte   |

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| 209  | Euphorbiaceae    | <i>Euphorbia wallichii</i> Hook. F.                                | Therophyte   |
| 210. | Fagaceae         | <i>Quercus baloot</i> Griff.                                       | Phanerophyte |
| 211. | Fagaceae         | <i>Quercus dilatata</i> Lindl.                                     | Phanerophyte |
| 212. | Fagaceae         | <i>Quercus glauca</i> Thunb.                                       | Phanerophyte |
| 213. | Fagaceae         | <i>Quercus incana</i> W. Bartram                                   | Phanerophyte |
| 214. | Fagaceae         | <i>Quercus semecarpifolia</i> Sm.                                  | Phanerophyte |
| 215. | Fumariaceae      | <i>Corydalis govaniana</i> Wall.                                   | Therophyte   |
| 216. | Fumariaceae      | <i>Corydalis stewartii</i> Fedde, Repert.                          | Therophyte   |
| 217. | Fumariaceae      | <i>Fumaria indica</i> (Hausskn.) Pugsley                           | Therophyte   |
| 218. | Gentianaceae     | <i>Gentianodes cachemirica</i> (Decne.) Omer, Ali & Qaiser.        | Therophyte   |
| 219. | Gentianaceae     | <i>Gentianodes marginata</i> (Royle ex D.Don.) Omer, Ali & Qaiser. | Therophyte   |
| 220  | Gentianaceae     | <i>Gentianodes olivieri</i> (Griseb.) Omer, Ali & Qaiser.          | Therophyte   |
| 221. | Gentianaceae     | <i>Swertia ciliata</i> (D. Don ex G. Don) B. L. Burtt              | Therophyte   |
| 222. | Gentianaceae     | <i>Swertia cordata</i> (G. Don ) Clarke                            | Therophyte   |
| 223. | Gentianaceae     | <i>Swertia paniculata</i> Wall.                                    | Therophyte   |
| 224. | Gentianaceae     | <i>Swertia petiolata</i> D. Don                                    | Therophyte   |
| 225. | Geraniaceae      | <i>Geranium nepalense</i> Sweet.                                   | Chamaephyte  |
| 226. | Geraniaceae      | <i>Geranium ocellatum</i> Camb.                                    | Chamaephyte  |
| 227. | Geraniaceae      | <i>Geranium wallichianum</i> D. Don ex Sweet                       | Chamaephyte  |
| 228  | Geraniaceae      | <i>Erodium cicutarium</i> (L.) Hert. ex Aiton                      | Therophyte   |
| 229. | Geraniaceae      | <i>Geranium</i> spp  | Therophyte   |
| 230  | Guttifereae      | <i>Hypericum dyeri</i> Rehder                                      | Phanerophyte |
| 231. | Guttifereae      | <i>Hypericum oblongifolium</i> Choisy                              | Phanerophyte |
| 232. | Guttifereae      | <i>Hypericum perforatum</i> L.                                     | Phanerophyte |
| 233. | Hamamellidaceae  | <i>Parrotiopsis jacquemontiana</i> (Decne.) Rehder                 | Phanerophyte |
| 234. | Hippocastanaceae | <i>Aesculus indica</i> (Wall. ex Camb.) H. K. F.                   | Phanerophyte |
| 235. | Hyacinthaceae    | <i>Scilla griffithii</i> Hochr.                                    | Therophyte   |
| 236. | Iridaceae        | <i>Moraea sisyrinchium</i> Ker Gawl.                               | Geophyte     |
| 237. | Iridaceae        | <i>Iris hookeriana</i> R. C. Foster                                | Geophyte     |
| 238. | Iridaceae        | <i>Iris germanica</i> L.   | Geophyte     |
| 239. | Juglandaceae     | <i>Juglans regia</i> L.  | Phanerophyte |
| 240  | Juncaceae        | <i>Juncus maritimus</i> Lam.                                       | Cryptophyte  |
| 241. | Juncaceae        | <i>Juncus articulatus</i> L.                                       | Hydrophyte   |
| 242. | Lamiaceae        | <i>Lagotis cashmeriana</i> (Royale) Rupr.                          | Chamaephyte  |
| 243. | Lamiaceae        | <i>Eremostachys superba</i> Royle ex Benth.                        | Chamaephyte  |
| 244. | Lamiaceae        | <i>Eremostachys superba</i> Royle ex Benth.                        | Chamaephyte  |
| 245. | Lamiaceae        | <i>Leonurus cardiaca</i> L.  | Chamaephyte  |
| 246. | Lamiaceae        | <i>Phlomis bracteosa</i> Royle ex Benth.                           | Chamaephyte  |
| 247. | Lamiaceae        | <i>Phlomis spectabilis</i> Falc. ex Benth.                         | Chamaephyte  |
| 248. | Lamiaceae        | <i>Salvia moorcroftiana</i> Wall.                                  | Chamaephyte  |
| 249. | Lamiaceae        | <i>Salvia nubicola</i> Wall. ex Sweet                              | Chamaephyte  |
| 250. | Lamiaceae        | <i>Teucrium stocksianum</i> Boiss.                                 | Chamaephyte  |
| 251. | Lamiaceae        | <i>Thymus linearis</i> Benth.                                      | Chamaephyte  |

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| 252. | Lamiaceae    | <i>Leucas cephalotes</i> (Roth) Spreng.                  | Cryptophyte     |
| 253. | Lamiaceae    | <i>Mentha longifolia</i> (L.) Huds.                      | Cryptophyte     |
| 254. | Lamiaceae    | <i>Origanum vulgare</i> L.                               | Cryptophyte     |
| 255. | Lamiaceae    | <i>Stachys emodi</i> Hedge                               | Cryptophyte     |
| 256. | Lamiaceae    | <i>Stachys parviflora</i> Benth.                         | Cryptophyte     |
| 257. | Lamiaceae    | <i>Salvia</i> Spp  | Hemicryptophyte |
| 258. | Lamiaceae    | <i>Teucrium royalcanum</i> Wall. ex Benth.               | Hemicryptophyte |
| 259. | Lamiaceae    | <i>Caryopteris odorata</i> (D. Don) B. L. Rob.           | Phanerophyte    |
| 260. | Lamiaceae    | <i>Colebrookea oppositifolia</i> Sm.                     | Phanerophyte    |
| 261. | Lamiaceae    | <i>Lagocheilus cuneatus</i> Benth.                       | Phanerophyte    |
| 262. | Lamiaceae    | <i>Otostegia limbata</i> (Benth.) Boiss.                 | Phanerophyte    |
| 263. | Lamiaceae    | <i>Rabdosia rugosa</i> Benth.                            | Phanerophyte    |
| 264. | Lamiaceae    | <i>Rosmarinus officinalis</i> L.                         | Phanerophyte    |
| 265. | Lamiaceae    | <i>Salvia macrosiphon</i> Boiss.                         | Phanerophyte    |
| 266. | Lamiaceae    | <i>Ajuga bracteosa</i> Wall. ex Benth.                   | Therophyte      |
| 267. | Lamiaceae    | <i>Ajuga pereviaflora</i> Benth.                         | Therophyte      |
| 268. | Lamiaceae    | <i>Calamintha umbrosa</i> (M. Bieb.) Fisch. & C. A. Mey. | Therophyte      |
| 269. | Lamiaceae    | <i>Isodon rugosus</i> (Wall. ex Benth.) Codd             | Therophyte      |
| 270. | Lamiaceae    | <i>Lamium album</i> L.                                   | Therophyte      |
| 271. | Lamiaceae    | <i>Lamium amplexicaule</i> L.                            | Therophyte      |
| 272. | Lamiaceae    | <i>Lycopus europaeus</i> L.                              | Therophyte      |
| 273. | Lamiaceae    | <i>Nepeta laevigata</i> (D. Don) Hand.-Mazz.             | Therophyte      |
| 274. | Lamiaceae    | <i>Prunella vulgaris</i> L.                              | Therophyte      |
| 275. | Lamiaceae    | <i>Salvia lanata</i> Roxb.                               | Therophyte      |
| 276. | Lamiaceae    | <i>Teucrium</i> Spp                                      | Therophyte      |
| 277. | Liliaceae    | <i>Polygonatum multiflorum</i> (L.) All.                 | Geophyte        |
| 278. | Liliaceae    | <i>Smilax aspera</i> L.                                  | Geophyte        |
| 279. | Liliaceae    | <i>Fritillaria roylei</i> Hook.                          | Geophyte        |
| 280. | Liliaceae    | <i>Lilium polyphyllum</i> D. Don                         | Geophyte        |
| 281. | Liliaceae    | <i>Tulipa clusiana</i> DC.                               | Geophyte        |
| 282. | Linaceae     | <i>Reinwardtia trigyna</i> (Roxb.)                       | Phanerophyte    |
| 283. | Loranthaceae | <i>Viscum album</i> L.                                   | Therophyte      |
| 284. | Loranthaceae | <i>Viscum cruciatum</i> Sieber ex Spring.                | Therophyte      |
| 285. | Lythraceae   | <i>Ammannia senegalensis</i> Lam.                        | Hydrophyte      |
| 286. | Lythraceae   | <i>Woodfordia fruiticosa</i> (L.) S. Kurz.               | Phanerophyte    |
| 287. | Malvaceae    | <i>Malva neglecta</i> Wallr.                             | Chamaephyte     |
| 288. | Malvaceae    | <i>Hibiscus rosa-sinensis</i> L.                         | Phanerophyte    |
| 289. | Malvaceae    | <i>Hibiscus trionum</i> L.                               | Therophyte      |
| 290. | Meliaceae    | <i>Cedrella serrata</i> Royle                            | Phanerophyte    |
| 291. | Meliaceae    | <i>Melia azedarach</i> L.                                | Phanerophyte    |
| 292. | Mimosaceae   | <i>Acacia albida</i> Delile                              | Phanerophyte    |
| 293. | Mimosaceae   | <i>Acacia arabica</i> willd.                             | Phanerophyte    |
| 294. | Mimosaceae   | <i>Acacia modesta</i> Wall.                              | Phanerophyte    |
| 295. | Moraceae     | <i>Broussonetia papyrifera</i> (L.) L, Her. ex Vent.     | Phanerophyte    |

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| 296. Moraceae      | <i>Ficus lacor</i> Ham.                        | Phanerophyte    |
| 297. Moraceae      | <i>Ficus palmata</i> Forssk.                   | Phanerophyte    |
| 298. Moraceae      | <i>Ficus racemosa</i> L.                       | Phanerophyte    |
| 299. Moraceae      | <i>Morus nigra</i> L.                          | Phanerophyte    |
| 300. Myrsinaceae   | <i>Maesa indica</i> Wall. Ex Roxb.             | Phanerophyte    |
| 301. Myrtaceae     | <i>Eugenia jambolina</i> Lam.                  | Phanerophyte    |
| 302. Myrtinaceae   | <i>Eucalyptus paniculata</i> Sm.               | Phanerophyte    |
| 303. Nyctaginaceae | <i>Boerhavia procumbens</i> Banks ex Roxb.     | Therophyte      |
| 304. Nyctaginaceae | <i>Mirabilis jalapa</i> L.                     | Therophyte      |
| 305. Oleaceae      | <i>Jasminum grandiflorum</i> L.                | Phanerophyte    |
| 306. Oleaceae      | <i>Jasminum humile</i> L.                      | Phanerophyte    |
| 307. Oleaceae      | <i>Jasminum officinale</i> L.                  | Phanerophyte    |
| 308. Oleaceae      | <i>Jasminum</i> sp                             | Phanerophyte    |
| 309. Oleaceae      | <i>Olea ferruginea</i> Wall. ex Aitch.         | Phanerophyte    |
| 310. Onagraceae    | <i>Oenothera rosea</i> L. Her. ex Aiton        | Cryptophyte     |
| 311. Onagraceae    | <i>Epilobium hirsutum</i> L.                   | Therophyte      |
| 312. Onagraceae    | <i>Epilobium laxum</i> Royle                   | Therophyte      |
| 313. Orchidaceae   | <i>Dactylorhiza hatagirea</i> (D. Don) Soo     | Cryptophyte     |
| 314. Orchidaceae   | <i>Cypripedium cordigerum</i> D. Don.          | Therophyte      |
| 315. Oxiladaceae   | <i>Oxalis acetosella</i> L.                    | Hemicryptophyte |
| 316. Oxiladaceae   | <i>Oxalis corniculata</i> L.                   | Therophyte      |
| 317. Oxiladaceae   | <i>Oxalis pes-caprae</i> L.                    | Therophyte      |
| 318. Paeoniaceae   | <i>Paeonia emodi</i> Wall. ex Royle            | Therophyte      |
| 319. Pandanaceae   | <i>Pandanus tectorius</i> Parkinson            | Phanerophyte    |
| 320. Papaveraceae  | <i>Eschscholtzia fructicosa</i> Bernh.         | Therophyte      |
| 321. Papaveraceae  | <i>Papaver dubium</i> L.                       | Therophyte      |
| 322. Papaveraceae  | <i>Papaver pavoninum</i> C. A. Mey.            | Therophyte      |
| 323. Papaveraceae  | <i>Papaver pavoninum</i> Schrenk               | Therophyte      |
| 324. Papilionaceae | <i>Indigofera heterantha</i> Wall. ex. Brand   | Chamaephyte     |
| 325. Papilionaceae | <i>Lespedeza juncea</i> (L. F.) Pers.          | Chamaephyte     |
| 326. Papilionaceae | <i>Trifolium pratense</i> L.                   | Chamaephyte     |
| 327. Papilionaceae | <i>Oxytropis lapponica</i> (Wahl.) Gay.        | Chamaephyte     |
| 328. Papilionaceae | <i>Medicago lupulina</i> L.                    | Hemicryptophyte |
| 329. Papilionaceae | <i>Astragalus grahamianus</i> Royle ex Benth.  | Phanerophyte    |
| 330. Papilionaceae | <i>Dalbergia sissoo</i> Roxb.                  | Phanerophyte    |
| 331. Papilionaceae | <i>Desmodium elegans</i> DC.                   | Phanerophyte    |
| 332. Papilionaceae | <i>Desmodium triflorum</i> (L.) DC.            | Phanerophyte    |
| 333. Papilionaceae | <i>Indigofera atropurpurea</i> Ham. ex Horn.   | Phanerophyte    |
| 334. Papilionaceae | <i>Robinia Pseudo-acacia</i> L.                | Phanerophyte    |
| 335. Papilionaceae | <i>Astragalus pyrrhotrichus</i> Boiss.         | Therophyte      |
| 336. Papilionaceae | <i>Astragalus retamocarpus</i> Boiss. & Hohen. | Therophyte      |
| 337. Papilionaceae | <i>Lathyrus aphaca</i> L.                      | Therophyte      |
| 338. Papilionaceae | <i>Lathyrus emodi</i> (Wall. ex Frisch.) Ali   | Therophyte      |
| 339. Papilionaceae | <i>Lathyrus pratensis</i> L.                   | Therophyte      |

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| 340. | Papilionaceae  | <i>Lotus corniculatus</i> L.                             | Therophyte   |
| 341. | Papilionaceae  | <i>Medicago denticulata</i> Willd.                       | Therophyte   |
| 342. | Papilionaceae  | <i>Medicago sativa</i> L.                                | Therophyte   |
| 343. | Papilionaceae  | <i>Phaseolus vulgaris</i> L.                             | Therophyte   |
| 344. | Papilionaceae  | <i>Sesbania concolor</i> J. B. Gillett                   | Therophyte   |
| 345. | Papilionaceae  | <i>Vicia monantha</i> Retz.                              | Therophyte   |
| 346. | Papilionaceae  | <i>Vicia sativa</i> L.                                   | Therophyte   |
| 347. | Parnassiaceae  | <i>Parnassia nubicola</i> Wall. ex Royle                 | Therophyte   |
| 348. | Phytolaccaceae | <i>Phytolacca acinosa</i> Roxb.                          | Therophyte   |
| 349. | Pinaceae       | <i>Abies pindrow</i> Royle                               | Phanerophyte |
| 350. | Pinaceae       | <i>Cedrus deodara</i> (Roxb. ex D. Don) G. Don           | Phanerophyte |
| 351. | Pinaceae       | <i>Picea smithiana</i> (Wall.) Boiss.                    | Phanerophyte |
| 352. | Pinaceae       | <i>Pinus gerardiana</i> Wall. ex Lamb.                   | Phanerophyte |
| 353. | Pinaceae       | <i>Pinus roxburghii</i> Sargent                          | Phanerophyte |
| 354. | Pinaceae       | <i>Pinus wallichiana</i> A. B. Jackson                   | Phanerophyte |
| 355. | Plantaginaceae | <i>Plantago lanceolata</i> L.                            | Hydrophyte   |
| 356. | Plantaginaceae | <i>Plantago himalaica</i> Pilg.                          | Therophyte   |
| 357. | Plantaginaceae | <i>Plantago major</i> L.                                 | Therophyte   |
| 358. | Platanaceae    | <i>Platanus orientalis</i> L.                            | Phanerophyte |
| 359. | Plumbaginaceae | <i>Limonium cabulicum</i> (Boiss.) Kuntze                | Chamaephyte  |
| 360. | Poaceae        | <i>Calamagrostis pseudophragmites</i> (Hall. F.) Koeler  | Chamaephyte  |
| 361. | Poaceae        | <i>Digitaria sanguinalis</i> (L.) Scop.                  | Cryptophyte  |
| 362. | Poaceae        | <i>Alopecurus myosuroides</i> Huds.                      | Therophyte   |
| 363. | Poaceae        | <i>Avena fatua</i> L.                                    | Therophyte   |
| 364. | Poaceae        | <i>Chrysopogon gryllus</i> (L.) Trin.                    | Therophyte   |
| 365. | Poaceae        | <i>Echinochloa crusgalli</i> (L.) P. Beauv. Ess. Agrost. | Therophyte   |
| 366. | Poaceae        | <i>Isachne himalaica</i> Hook. F.                        | Therophyte   |
| 367. | Poaceae        | <i>Pennisetum orientale</i> Rich.                        | Therophyte   |
| 368. | Poaceae        | <i>Setaria viridis</i> (L.) P. Beauv.                    | Therophyte   |
| 369. | Poaceae        | <i>Sorghum halepense</i> (L)Pers.                        | Therophyte   |
| 370. | Podophyllaceae | <i>Podophyllum hexandrum</i> Royle.                      | Therophyte   |
| 371. | Polygonac      | <i>Polygonum aviculare</i> L.                            | Cryptophyte  |
| 372. | Polygonaceae   | <i>Fagopyrum gilesii</i> (Hesl.) Hedberg                 | Chamaephyte  |
| 373. | Polygonaceae   | <i>Bistorta affinis</i> (D.Don) Green                    | Chamaephyte  |
| 374. | Polygonaceae   | <i>Fallopia dumetorum</i> (L.) Holub                     | Cryptophyte  |
| 375. | Polygonaceae   | <i>Polygonum plebium</i> R. Br.                          | Cryptophyte  |
| 376. | Polygonaceae   | <i>Rumex dentatus</i> L.                                 | Cryptophyte  |
| 377. | Polygonaceae   | <i>Rumex hastatus</i> D. Don                             | Phanerophyte |
| 378. | Polygonaceae   | <i>Aconogonon alpinum</i> (All.) Schur                   | Therophyte   |
| 379. | Polygonaceae   | <i>Bistorta amplexicaulis</i> (D. Don) Greene            | Therophyte   |
| 380. | Polygonaceae   | <i>Oxyria digyna</i> (L.) Hill                           | Therophyte   |
| 381. | Polygonaceae   | <i>Polygonum capitatum</i> Han.                          | Therophyte   |
| 382. | Polygonaceae   | <i>Polygonum glabrum</i> L.                              | Therophyte   |
| 383. | Polygonaceae   | <i>Polygonum patulum</i> Bieb.                           | Therophyte   |

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| 384. | Polygonaceae     | <i>Rumex nepalensis</i> Sprenge.                   | Therophyte      |
| 385. | Potamogetonaceae | <i>Potamogeton natans</i> L.                       | Hydrophyte      |
| 386. | Primulaceae      | <i>Androsace himalaica</i> Kunth).                 | Cryptophyte     |
| 387. | Primulaceae      | <i>Primula denticulata</i> Wight                   | Cryptophyte     |
| 388. | Primulaceae      | <i>Anagallis arvensis</i> L.                       | Therophyte      |
| 389. | Primulaceae      | <i>Androsace foliosa</i> Decne. ex Duby            | Therophyte      |
| 390. | Primulaceae      | <i>Androsace rotundifolia</i> Hardwicke            | Therophyte      |
| 391. | Primulaceae      | <i>Androsace semipervivooides</i> Jacq. ex Duby    | Therophyte      |
| 392. | Primulaceae      | <i>Cortusa brotheri</i> Pax. ex Lipsky.            | Therophyte      |
| 393. | Primulaceae      | <i>Lysimachia chenopodioides</i> Watt ex HK. F.    | Therophyte      |
| 394. | Primulaceae      | <i>Lysimachia japonica</i> Thunb.                  | Therophyte      |
| 395. | Primulaceae      | <i>Primula elliptica</i> Royle                     | Therophyte      |
| 396. | Primulaceae      | <i>Primula macrophylla</i> D. Don                  | Therophyte      |
| 397. | Primulaceae      | <i>Primula rosea</i> Royle                         | Therophyte      |
| 398. | Pteridophyte     | <i>Pteris excelsa</i> Gaud.                        | Therophyte      |
| 399. | Pteridophyte     | <i>Pteris vitata</i> L.                            | Therophyte      |
| 400. | Ranunculaceae    | <i>Thalictrum cultratum</i> Wall.                  | Chamaephyte     |
| 401. | Ranunculaceae    | <i>Aconitum heterophyllum</i> Wall.                | Chamaephyte     |
| 402. | Ranunculaceae    | <i>Actaea spicata</i> L.                           | Chamaephyte     |
| 403. | Ranunculaceae    | <i>Anemone falconeri</i> Thoms.                    | Chamaephyte     |
| 404. | Ranunculaceae    | <i>Clematis</i> Sp                                 | Chamaephyte     |
| 405. | Ranunculaceae    | <i>Aquilegia fragrans</i> Benth.                   | Chamaephyte     |
| 406. | Ranunculaceae    | <i>Delphinium nordhagenii</i> Wendelbo             | Chamaephyte     |
| 407. | Ranunculaceae    | <i>Anemone obtusiloba</i> D. Don                   | Cryptophyte     |
| 408. | Ranunculaceae    | <i>Anemone rupicola</i> Camb.                      | Cryptophyte     |
| 409. | Ranunculaceae    | <i>Aquilegia nivalis</i> Falc. ex Jackson          | Cryptophyte     |
| 410. | Ranunculaceae    | <i>Caltha alba</i> Cambess.                        | Cryptophyte     |
| 411. | Ranunculaceae    | <i>Trollius acaulis</i> Lindle.                    | Cryptophyte     |
| 412. | Ranunculaceae    | <i>Aconitum chasmanthum</i> Stapf ex Holmes        | Hemicryptophyte |
| 413. | Ranunculaceae    | <i>Clematis montana</i> Buch-Ham.ex DC.            | Hemicryptophyte |
| 414. | Ranunculaceae    | <i>Clematis grata</i> Wall.                        | Phanerophyte    |
| 415. | Ranunculaceae    | <i>Aconitum rotundifolium</i> Kar. & Kir           | Therophyte      |
| 416. | Ranunculaceae    | <i>Anemone tetrasepala</i> Royle                   | Therophyte      |
| 417. | Ranunculaceae    | <i>Aquilegia pubiflora</i> Wall. ex Royle          | Therophyte      |
| 418. | Ranunculaceae    | <i>Clematis connata</i> DC.                        | Therophyte      |
| 419. | Ranunculaceae    | <i>Clematis orientalis</i> L.                      | Therophyte      |
| 420. | Ranunculaceae    | <i>Delphinium roylei</i> Munz                      | Therophyte      |
| 421. | Ranunculaceae    | <i>Delphinium vestitum</i> Wall.                   | Therophyte      |
| 422. | Ranunculaceae    | <i>Ranunculus muricatus</i> L.                     | Therophyte      |
| 423. | Ranunculaceae    | <i>Ranunculus</i> sp                               | Therophyte      |
| 424. | Rhamnaceae       | <i>Ziziphus nummularia</i> (Burm. F.) Wight & Arn. | Phanerophyte    |
| 425. | Rhamnaceae       | <i>Ziziphus oxyphylla</i> Edgew.                   | Phanerophyte    |
| 426. | Rhamnaceae       | <i>Zizyphus mauritiana</i> Lam.                    | Phanerophyte    |
| 427. | Rosaceae         | <i>Filipendula vestita</i> Wall.                   | Chamaephyte     |

|      |               |   |              |
|------|---------------|---|--------------|
| 428. | Rosaceae      | <i>Duchesnea indica</i> (Andr.) Focke                 | Cryptophyte  |
| 429. | Rosaceae      | <i>Fragaria nubicola</i> (Hook. F.) Lindl. ex Lacaita | Cryptophyte  |
| 430. | Rosaceae      | <i>Potentila</i> spp                                  | Cryptophyte  |
| 431. | Rosaceae      | <i>Potentilla monanthes</i> Lindle.ex Lehm.           | Cryptophyte  |
| 432. | Rosaceae      | <i>Potentilla supina</i> L.                           | Hydrophyte   |
| 433. | Rosaceae      | <i>Cotoneaster microphylla</i> Wall. ex Lindl.        | Phanerophyte |
| 434. | Rosaceae      | <i>Cotoneaster nummularia</i> Fisch. & Mey.           | Phanerophyte |
| 435. | Rosaceae      | <i>Crataegus sonogarica</i> G. Koch                   | Phanerophyte |
| 436. | Rosaceae      | <i>Potentilla sericophylla</i> Parker                 | Phanerophyte |
| 437. | Rosaceae      | <i>Prunus cerasioides</i> D. Don                      | Phanerophyte |
| 438. | Rosaceae      | <i>Prunus persica</i> L.                              | Phanerophyte |
| 439. | Rosaceae      | <i>Pyrus pashia</i> Buch-Ham ex D.Don                 | Phanerophyte |
| 440. | Rosaceae      | <i>Rosa damascena</i> Miller.                         | Phanerophyte |
| 441. | Rosaceae      | <i>Rosa moschata</i> J. Herm.                         | Phanerophyte |
| 442. | Rosaceae      | <i>Rosa webbiana</i> Wall. ex Royle                   | Phanerophyte |
| 443. | Rosaceae      | <i>Rubus cornuta</i> Wall. ex Royle                   | Phanerophyte |
| 444. | Rosaceae      | <i>Rubus ellipticus</i> Sm.                           | Phanerophyte |
| 445. | Rosaceae      | <i>Rubus fruticosus</i> Agg.                          | Phanerophyte |
| 446. | Rosaceae      | <i>Rubus sanctus</i> Schreber                         | Phanerophyte |
| 447. | Rosaceae      | <i>Sorbaria tomentosa</i> (Lindl.) Rehder.            | Phanerophyte |
| 448. | Rosaceae      | <i>Spirea canescens</i> D. Don.                       | Phanerophyte |
| 449. | Rosaceae      | <i>Agrimonia eupatoria</i> L.                         | Therophyte   |
| 450. | Rosaceae      | <i>Fragaria indica</i> Andrew                         | Therophyte   |
| 451. | Rosaceae      | <i>Geum elatum</i> Wallich                            | Therophyte   |
| 452. | Rosaceae      | <i>Geum urbanum</i> L.                                | Therophyte   |
| 453. | Rosaceae      | <i>Potentilla astrogueinea</i> Lodd.                  | Therophyte   |
| 454. | Rosaceae      | <i>Potentilla curviseta</i> Hook.F.                   | Therophyte   |
| 455. | Rosaceae      | <i>Potentilla grisae</i> Juz.                         | Therophyte   |
| 456. | Rosaceae      | <i>Potentilla nepalensis</i> Hook.                    | Therophyte   |
| 457. | Rosaceae      | <i>Potentilla reptans</i> L.                          | Therophyte   |
| 458. | Rosaceae      | <i>Sibbaldia coneata</i> Kunze                        | Therophyte   |
| 459. | Rosaceae      | <i>Sibbaldia procumbens</i> L.                        | Therophyte   |
| 460. | Rubiaceae     | <i>Galium asperifolium</i> Wall.                      | Cryptophyte  |
| 461. | Rubiaceae     | <i>Galium</i> Sp                                      | Cryptophyte  |
| 462. | Rubiaceae     | <i>Randia dumatorum</i> Lam.                          | Phanerophyte |
| 463. | Rubiaceae     | <i>Galium elegans</i> Wall. ex D. Don                 | Therophyte   |
| 464. | Rubiaceae     | <i>Galium tricornutum</i> Danday                      | Therophyte   |
| 465. | Rubiaceae     | <i>Rubia cordifolia</i> L.                            | Therophyte   |
| 466. | Rutaceae      | <i>Skimmia laureola</i> Franch.                       | Phanerophyte |
| 467. | Rutaceae      | <i>Zanthoxylum armatum</i> DC.                        | Phanerophyte |
| 468. | Salicaceae    | <i>Salix denticulata</i> Anderss.                     | Phanerophyte |
| 469. | Salicaceae    | <i>Salix tetrasperma</i> Roxb.                        | Phanerophyte |
| 470. | Sapindaceae   | <i>Dodonaea viscosa</i> (L.) Jacq.                    | Phanerophyte |
| 471. | Saxifragaceae | <i>Bergenia stracheyi</i> (Hook. F. & Thomson) Engl.  | Chamaephyte  |

|                       |  |                 |
|-----------------------|--|-----------------|
| 472. Saxifragaceae    | <i>Bergenia ciliata</i> (Haw.) Strnb.          | Cryptophyte     |
| 473. Saxifragaceae    | <i>Saxifraga flagellaris</i> Willd.            | Cryptophyte     |
| 474. Saxifragaceae    | <i>Saxifraga parnassifolia</i> D.Don           | Therophyte      |
| 475. Saxifragaceae    | <i>Saxifraga stenophylla</i> Royle             | Therophyte      |
| 476. Scrophulariaceae | <i>Pedicularis pyramidalis</i> Royle           | Chamaephyte     |
| 477. Scrophulariaceae | <i>Pedicularis punctata</i> Dec.               | Chamaephyte     |
| 478. Scrophulariaceae | <i>Verbascum thapsus</i> L.                    | Cryptophyte     |
| 479. Scrophulariaceae | <i>Veronica laxa</i> Benth.                    | Cryptophyte     |
| 480. Scrophulariaceae | <i>Scrophularia nodosa</i> L.                  | Hydrophyte      |
| 481. Scrophulariaceae | <i>Euphrasia himalayica</i> Wettst.            | Therophyte      |
| 482. Scrophulariaceae | <i>Kickxia ramosissima</i> (Wall.) Janchen     | Therophyte      |
| 483. Scrophulariaceae | <i>Veronica anagallis-Aquatica</i> L.          | Therophyte      |
| 484. Scrophulariaceae | <i>Wulfenia amherstiana</i> Benth.             | Therophyte      |
| 485. Simarubaceae     | <i>Ailanthus altissima</i> (Mill.) Swingle     | Phanerophyte    |
| 486. Solanaceae       | <i>Solanum surattense</i> Burm.                | Chamaephyte     |
| 487. Solanaceae       | <i>Hyoscyamus niger</i> L.                     | Cryptophyte     |
| 488. Solanaceae       | <i>Capsicum annuum</i> L.                      | Phanerophyte    |
| 489. Solanaceae       | <i>Withania somnifera</i> (L.) Dunal           | Phanerophyte    |
| 490. Solanaceae       | <i>Datura innoxia</i> Mill.                    | Therophyte      |
| 491. Solanaceae       | <i>Datura stramonium</i> L.                    | Therophyte      |
| 492. Solanaceae       | <i>Physalis divaricata</i> D. Don              | Therophyte      |
| 493. Solanaceae       | <i>Solanum nigrum</i> Var. <i>nigrum</i> L.    | Therophyte      |
| 494. Solanaceae       | <i>Solanum nigrum</i> Var. <i>villosum</i> L.  | Therophyte      |
| 495. Tamaricaceae     | <i>Tagetes minuta</i> L.                       | Therophyte      |
| 496. Taxaceae         | <i>Taxus fuana</i> Nan Li & R. R. Mill         | Phanerophyte    |
| 497. Thymelaeaceae    | <i>Daphne mucronata</i> Royle                  | Phanerophyte    |
| 498. Thymelaeaceae    | <i>Daphne papyracea</i> Wall. ex Steud.        | Phanerophyte    |
| 499. Thymelaeaceae    | <i>Wikstroemia canescens</i> Wall. ex Meisn.   | Phanerophyte    |
| 500. Trilliaceae      | <i>Trillium govanianum</i> Wall. ex Royle      | Therophyte      |
| 501. Ulmaceae         | <i>Celtis caucasica</i> Willd.                 | Phanerophyte    |
| 502. Urticaceae       | <i>Debregeasia salicifolia</i> (D. Don) Rendle | Phanerophyte    |
| 503. Urticaceae       | <i>Girardinia palmata</i> Blume                | Therophyte      |
| 504. Urticaceae       | <i>Pilea umbrosa</i> Blume                     | Therophyte      |
| 505. Urticaceae       | <i>Urtica dioica</i> L.                        | Therophyte      |
| 506. Valerianaceae    | <i>Valeriana jatamansi</i> Jones               | Therophyte      |
| 507. Verbenaceae      | <i>Verbena officinalis</i> L.                  | Therophyte      |
| 508. Verbenaceae      | <i>Phyla nodiflora</i> (L.) Green.             | Hydrophyte      |
| 509. Verbenaceae      | <i>Lantana camara</i> L.                       | Phanerophyte    |
| 510. Verbenaceae      | <i>Vitex negundo</i> L.                        | Phanerophyte    |
| 511. Violaceae        | <i>Viola betonicifolia</i> Smith               | Hemicryptophyte |
| 512. Violaceae        | <i>Viola biflora</i> L.                        | Therophyte      |
| 513. Violaceae        | <i>Viola canescens</i> Wall.                   | Therophyte      |
| 514. Vitaceae         | <i>Vitis jacquemontii</i> R. Parker            | Cryptophyte     |
| 515. Zygophyllaceae   | <i>Tribulus terrestris</i> L.                  | Therophyte      |

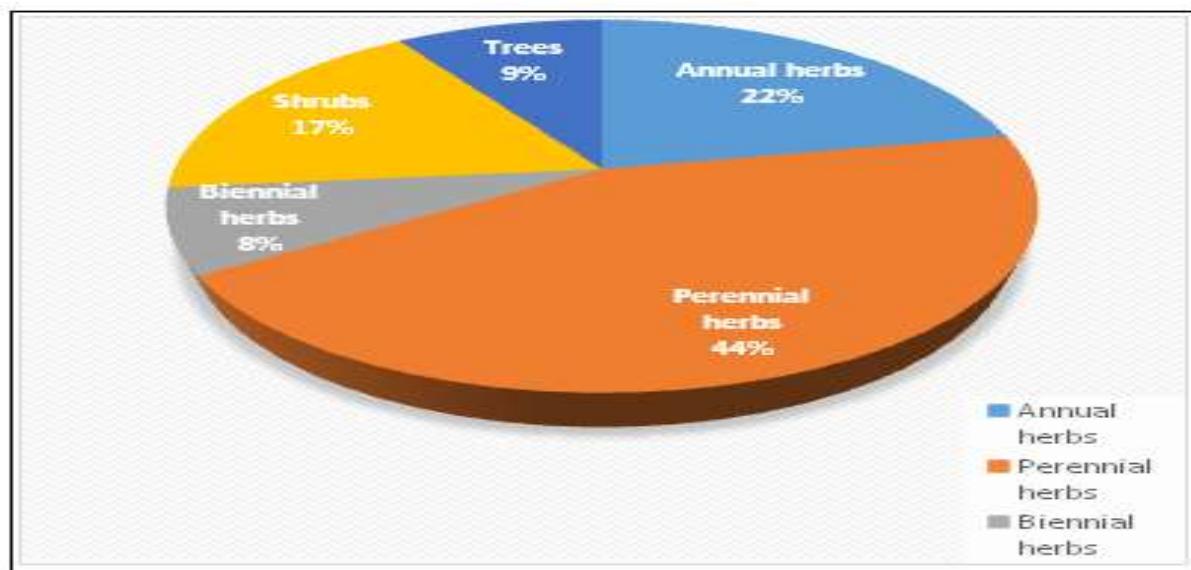
The herbaceous flora was dominated in the present study. The totals of 378 herbs species were taxonomically investigated. The plants species explore belong to 113 (22%) annual herbs, 227 (44%) perennial herbs and 38 (8%) biennial herbs. The taxonomical investigated shrubs were 89 (17%) species and trees were 48 (9%) species (Fig. 2). The most abundant life form class is Therophyte, which occupy a large space in regard of life form. Out of 515 plant species, 222 species (43.3%) are composed of Therophyte, which is followed by Phanerophyte having 137 species, and constitute 26.8% of the total population of flora of district Shangla. Similarly, Chamaephytes composed of 56 species, which constitute 10.92%, Cryptophyte composed of 50 species, which constitute 9.85%, Hydrophyte composed of 28 species that constitute 5.44%, Geophyte 12 species, which constitute 2%, and

Hemicryptophyte composed of 10 species, which constitute 1.98% of the total flora of district Shangla Pakistan (Fig. 3).

### Discussion

The present study reveals that district Shangla is diverse in its floristic composition having varieties of life form classes. We have thoroughly studied flora of Pakistan for the taxa reported from the study area and reached to the conclusion that few taxa are reported previously. Pakistan has a rich and diverse flora, with about 1572 genera and around 6000 plant species. These plants species are mostly common in the Hindu Kush, Himalaya and Karakorum regions. The locality of mountain range posses most of medicinal plants which is used for the treatment of common ailments in the local communities of Pakistan.

**Fig. 2.** Habit of the flora of district Shangla, Pakistan.



**Fig. 2.** Habit of the flora of district Shangla, Pakistan.

Literature study reveal that previously no such study has been conducted on floristic composition of district Shangla. As well as no proper documentation is present on floristic composition of this area. No voucher specimens were found anywhere which shows the floristic composition of these localities. No one knows that who identified the plants of the research area and in which herbarium these specimen

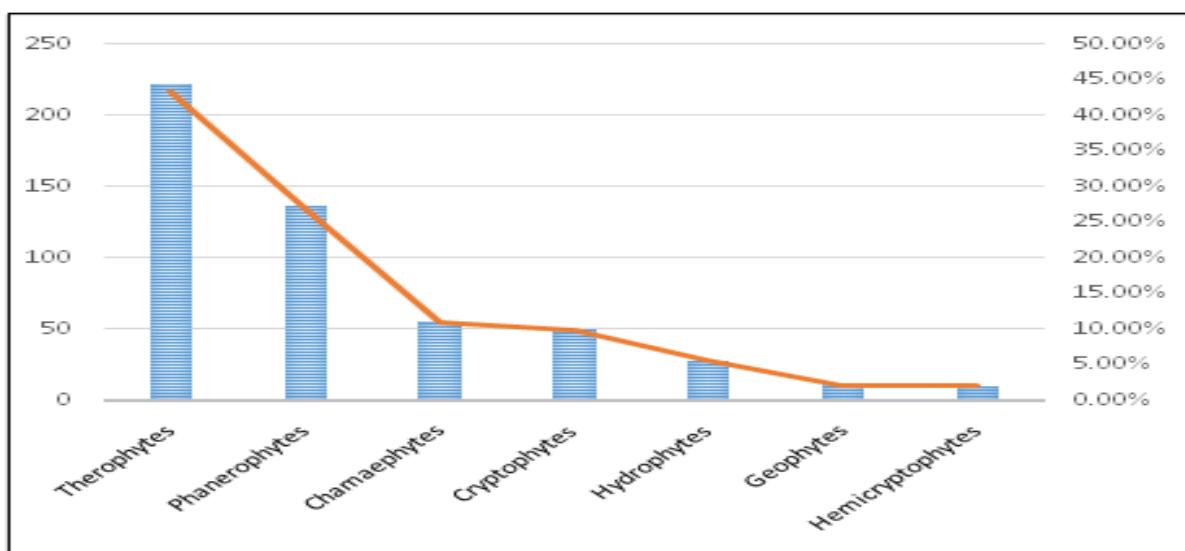
are deposited. Thus the present work is the only source, which provides a complete checklist of the flora of district Shangla.

In this study we identified a total of 515 taxa which belong to 101 families. Out of these 101 families, the well-represented families were Asteraceae contributing 63 taxa, Labiateae 31, Rosaceae 26,

Ranunculaceae 23, Papilionaceae 18, Brassicaceae 17 and Polygonaceae 10 taxa (Table 1).

Similar studied was carried out in different localities of Pakistan. Khan *et al.* (2013) carried out similar work on floristic composition of district Mardan and explore 91 plant species belonging to 76 genera and 38 families. In these families the dominated families of the floristic composition were Asteraceae, Poaceae and Cucurbitaceae. Amjad (2012) studied life form and leaf size spectrum of vegetation and explore 97 plant species belonging to 47 families from the hilly area of Azad Jammu and Kashmir Pakistan. Khan *et*

*al.* (2011) studied Floristic composition of darra Adam khel, khyber pakhtunkhwa, Pakistan and explore 54 plant species belonging to 30 families. The dominant families were Asteraceae, Lamiaceae and Solanaceae with 4 species, followed by Euphorbiaceae, Mimosaceae, Moraceae and Zygophyllaceae with 3 species. Each of the Amaranthaceae, Apocynaceae, Capparidaceae, Poaceae, Rhamnaceae, and Verbenaceae had 2 species, while the remaining families had a single species each. Badshah *et al.* (2013) studied the floristic composition of district Tank and explore 205 species which belong to 56 families.



**Fig. 3.** Life form classes of the flora of district Shangla, Pakistan.

These families were Poaceae with 34 species, Papilionaceae with 19 species Asteraceae with 14 species, Chenopodiaceae with 10 species, Brassicaceae with 9 species, Euphorbiaceae with 8 species, Boraginaceae and Polygonaceae, with 7 species each. Shah *et al.* (2013) carried out floristic study of Chakesar valley, District Shangla and reported 319 plant species belonging to 85 families and 215 genera. Rashid *et al.* (2011) studied the floristic composition of Malam Jaba Swat and explore 200 plants species belonging to 75 families.

The present study also reveals that the flora of the research area is gradually decreasing year by year. The reason of this is the extensive deforestation in the

area. Not only the trees but also the other plants inhabited under the trees canopy gradually decreases. It creates life form endangered for some species. Similarly the most valuable and medicinal flora of the locality is gradually diminishing due to extensive utilization of these plants. Some species which are economically important are becoming threatened. Thus, conservation strategies and protective measures should be adopted are to preserve such precious flora of the study area. In most of the localities the soil is eroded due to extensive agriculture which also create a problem to decrease floristic composition as well as the fertile land is converted into barren soil due to several factors. Thus, special attention is needed to exclude such

problems.

Biological life form classes' spectra are useful to determine the plant communities in a study area. Therefore the life form spectra of district Shangla was also investigated in this study. Life form of the flora of district Shangla was classified into various classes.

The most abundant life form class is Therophyte, which occupy a large space in regard of life form. Out of 515 plant species, 222 species (43.3%) are composed of Therophyte, which is followed by Phanerophyte having 137 species, and constitute 26.8% of the total population of flora of study area. The dominant Therophytic and Phenarophytic life form in the study area indicate that the area is under sever biotic and anthropogenic activity (Qureshi, 2008, 2009 and 2010). Similarly, prominent Therophytic life form is the indicator that the area receive a heavy rain (Xueli and Halin, 2003). Variation in elevation and temperature along different gradients favour the spreading of Therophyte in the study area (Cain and Castro, 1959; Tareen and Qadir, 1993). Unfavourable environmental condition also favour the spreading of Therophytes (Shimwell, 1971; Malik and Hussain, 1990).

In present study the dominant life form along the slopes were Cryptophyte and grasses which indicate that the area is moist temperate (Nurminen, 2003). Low temperature in winter and high temperature in autumn in some parts of the study area can be consider is the main reason to spread Chamaephytes in these localities of the study area.

### **Conclusion**

The present study reveals that the study area is diverse in its floristic composition having varieties of life form classes. The dominant Therophytic life form show that the flora of the area is under sever anthropogenic activity (Deforestation, Grazing, Erosion, Fuel wood, Urbanization, Medicinal uses, Ornamental uses etc.). Similarly, Phenarophytes

occupy second position in life form, which shows that the area is occupied by stratified thick forests. The forests of the study area are under sever threat of deforestation and erosion. The presence of Cryptophyte and Hemicryptophyte shows that some areas receive a rare amount of water and the flora adopted itself according to that environmental condation to preserve water.

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