International Journal of Botany Studies
ISSN: 2455-541X; Impact Factor: RJIF 5.12
Received: 26-06-2019; Accepted: 30-07-2019
www.botanyjournals.com
Volume 4; Issue 5; September 2019; Page No. 92-97

Morphological features of various selected tree species on the greater university campus Peshawar, Pakistan

Abdul Basit[1*], Sheharyar Khan[2], Sulaiman[3], Sikandar Shah[4], Aftab Ahmad Shah[5]
[1, 5] Department of Horticulture, Faculty of Crop Production Sciences, The University of Agriculture, Peshawar-Pakistan
[2, 3, 4] Department of Botany, University of Peshawar, Peshawar, Pakistan

Abstract
Trees, generally defined as "woody plants with single stem and a height of at least 10 feet or more" are the fundamental elements of natural ecosystem. Whereas, shrubs are woody plants with more than one stems commonly low heighted. A morphological study was conducted at The Historical University Campus Peshawar, where 13 tree species belonging to 10 families were identified and collected. The study revealed phenological stages, height, leaf spectrum, part used, origin and distribution of trees species. Majority of the tree species were included in the clade Angiosperm and have ornamental aspects. These tree species consisted 11 Dicot and 1 Monocot class of Angiosperm. Tree species found in The University Campus have economic benefits, as their various body parts are used for the treatment of different diseases such as roots for syphilis, dyspepsia and for insecticidal activity, stem help in heart problems and anemia, leaves in blood purification, cancer and stimulant and fruit for curing constipation, diabetes and ophthalmic diseases. It was observed that older tree population at the University Campus was highly affected by urban environmental stresses and their removal due to new academic construction sites.

Keywords: flora distribution, greater campus, morphology, pakistan, tree diversity

Introduction
Trees play an important ecological role within the urban environment, as well as support improved public health and provide aesthetic benefits to cities [1, 2]. The benefits of trees can vary widely depending on the context in which they are planted [3]. Overall, academic institutions and hospitals have found that natural settings and trees result in measurably positive impacts on students and patients. Avenue tree populations have their own unique structure, tending to be less diverse, containing more large-stature species and exhibiting higher levels of spatial continuity than other components of the urban forest [4]. Much of the morphological information for the family is given in the descriptions of the species contained in taxonomic studies of the group [5]. The number of genera varies with classification [6]. Tree, the important component of vegetation must therefore be constantly monitored and managed in order to direct successional processes towards maintaining species and habitat diversity [7].
The vegetation play a greater role in the development of an area of biosphere, because plants have many function in our life [8]. The area has a wide variety of plant biodiversity. The major tree species are *Bombax ceiba, Ficus benghalensis and Pterospermum acerifolium* (Table 1). A tree is a perennial woody species that can grow at least above breast height or more and having a single woody trunk [9]. A total of 13 tree species belonging to 10 different families were reported from study area (Figure 1). About 46.15% of the plant species were ornamental. The floristic composition, morphological structure and plant communities were remained undocumented since long. Plant species especially trees have contributed to the goal of urban biodiversity, which is to realize the variety and sustainability of the ecological framework for urban environments. People who were unmasked to the glimpse of trees become more comfortable as signposted by slower heart beat and blood pressure [10].
The physical structure of habitats depends mostly on trees and hence, they define basically the models for structural convolution and environmental heterogeneity [11]. High tree turnover is positive effect on atmospheric quality and biodiversity [12]. The importance of plants as food, medicine, fibers and others have been treated by many researchers, but the ornamental dimension was not very analyzed [13, 14, 15].

Table 1: List of studied tree species

S. No	Scientific Name	Families	Common Name	Local Name
1.	*Bombax ceiba* L.	Malvaceae	Cotton tree	Sumbal
2.	*Cassia fistula* L.	Fabaceae	Golden rain tree	Amaltas
3.	*Ficus benghalensis* L.	Moraceae	Strangler fig	Banyan
4.	*Dendrocalamus strictus* (Roxb.) Nees	Poaceae	Male bamboo	Bamboo
5.	*Albizia lebbek* (L.) Benth.	Leguminaceae	Indian Walnut	Siris
6.	*Schinus terebenthifolius* Raddi	Anacardiaceae	Brazilian pepper	Wilelaiki
7.	*Pterospermum acerifolium* (L.) Wild.	Malvaceae	Bayur Tree	Kanak champa
8.	*Bauhinia veriegata* (L.) Benth.	Fabaceae	Orchid tree	Kachnar

9.	*Melia azedarach* L.	Meliaceae	Chinaberry tree	Bakain
10.	*Pinus roxburghii* Sarg.	Pinaceae	Chir pine	Nakhtar
11.	*Lagerstroemia indica* (L.) Pers.	Lythraceae	Crape myrtle	
12.	*Dalbergia sissoo* Roxb.	Fabacea	Rosewood	Sheesham tree
13.	*Ailanthus altissima* (Mill.) Swingle	Simaroubaceae	Tree of heaven	Shandai

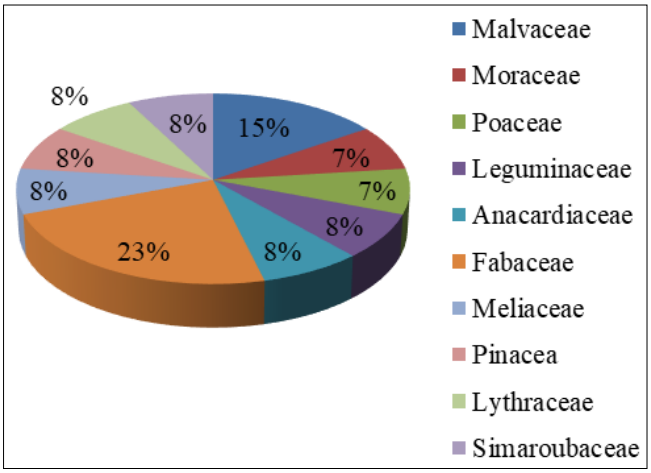

Fig 1: Percentage of Families

Overview of the Greater University Campus Peshawar, Pakistan

The Greater University Campus is located in the North West around 6 kilometers away from the city center on the main grand trunk road leading toward Khyber Pass in the capital city of Khyber Pakhtunkhwa, Peshawar, Pakistan. It is one of the oldest and historical campus having area of approximately 1050 acres (4 km^2) comprises of 515 acres of academic buildings and 495 acres open spaces including sports grounds, lawns, gardens, parks and roads. About 1199 feet above the sea level. More than 1,500,000 square feet area of the campus is buildup which mainly consist of University of Agriculture, University of Peshawar, Islamia College, Pakistan forest institute, University of Engineering and Technology and Khyber Medical College. In Peshawar both the summer and winter weather are extreme, but due to huge plantation and tree cover the temperature is slightly less than the rest of the city. The number of academic as well as residential buildings has increased tremendously over a period of time, which is further boost up in the last decade. Except Agricultural University all other universities are short of open spaces mainly because of their locations. In rapidly changing environment like University Campus, trees are often removed or fatally damaged when they are located near new construction projects. Maintaining the campus tree resource requires significant effort by university planners to organize maintenance schedules around a sound campus tree policy and secure funds for new tree planting and arboricultural services. University planning decisions that maximize the effect of university tree resources will result in a cooler, healthier, and more pleasant environment.

Materials and Methods

Study area and data collection

The study was carried out in University campus Peshawar (located at 34oN latitude, 71oE longitude with an altitude of 350 m above sea level and has a sub-tropical climate) [16], the convenient 495 acres of open spaces including lawns, gardens, parks and road sides is covered by trees, bushes and hedges. The data collection was done by simple field survey method at different phonological stages of different seasons.

Materials

During plant collection various equipment's were used; Plant collection kit, cutter, knife, tags, notebook, pencil, polythene bags, plant presser, gloves, height meter, digital camera and herbarium sheet. For accurate and precise height measurement height meter were used and photography of plants were done with digital camera.

Identification and preservation

The collected plants were shade dried in old newspapers in then mounted on herbarium sheets. The plants were identified (Photograph) with the help of available literature and Flora of Pakistan [17, 18] and deposited in Ornamental Nursery, Department of Horticulture, The University of Agriculture Peshawar, Pakistan.

Photograph: Collection of plants species for identification and studying their nature

Data analysis

The data was graphically presented and summarized statistically using MS Excel 2013.

Results and Discussion

The flora of University campus was unexplored since the study conducted on 129 wild plants by [19]. In the current study a total of 13 trees species belonging to 10 different families, in which 7.69% species was Gymnosperm and the remaining 92.30% of species was Angiosperms, which consist of 92.30% Dicots and only 7.69% Monocots (Table 2; Figure 2). [20] carried out study on ethno-medicinal plants and reported that majority of families (46) belonged to angiosperm. About 61.53% of tree species were cultivated and 38.46% were wild (Figure 2). Effective road side trees are usually upright and form to allow clearance for people, traffic and shade for the footpath. In term of height class distribution 7 specie was in the range of 7-20 and the remaining 6 specie in the range of 20-60 (Table 3; Figure 3). The tree observed with highest height was *Bombax ceiba* and *Schinus terebenthifolius* was the smallest one. Majority of the tree species was in the tropical and subtropical region while few in the temperate region. Origin wise most of the tree species are restricted to Asia (Table 3).

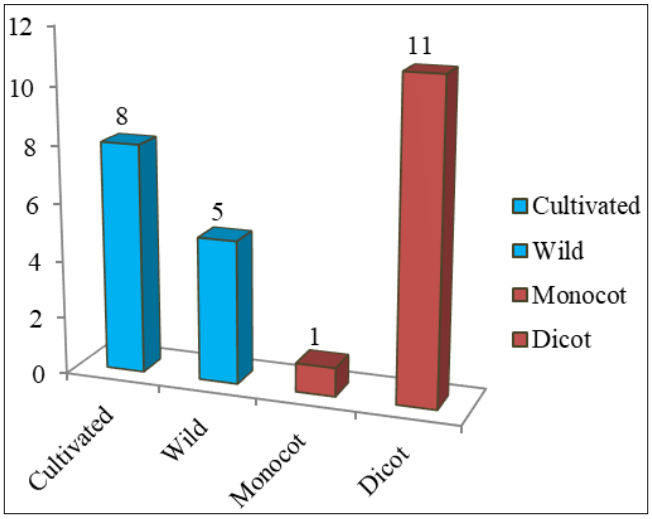

Fig 2: Avaliability and type of Angiosperms

These species were classified to various locations in the campus area like UAP, PFI, UET and UOP. Majority of trees type were of Deliquescent branching habit, which resulted in round shapes while other were of the Excurrent branching habit due to which they were conoid shaped (Table 2). Trees species were collected in different phenological stages as mentioned in (Table 4) and 53.84% of tree species had Compound leaf and the remaining 45.15% contain Simple leaves. According to [21] who conducted study on leaf spectra and biomass, most of the studied species were of narrow leaves. Most of the trees have beautiful flowers which are ornamental in nature (Figure 5, 6). Other parts of the plants such as root, stem, leaves and fruit have medicinal value and used for curing of different ailments (Table 5). *Cassia fistula* could be used in the treatment of fever, constipation (Table 5), polyuria, diabetes, worm infestation, jaundice and cardiac diseases etc. Where the most important part of amaltas is considered to be its fruit pulp when dried [22]. Concluded from their study that selected plant (57) were used for different purposes i.e. ornamental, edible, wood and fuel, religious customs. Leaves of most plants could extensively be used in ethno-medicines while Roots eradication for medicinal purposes could affect the medicinal flora.

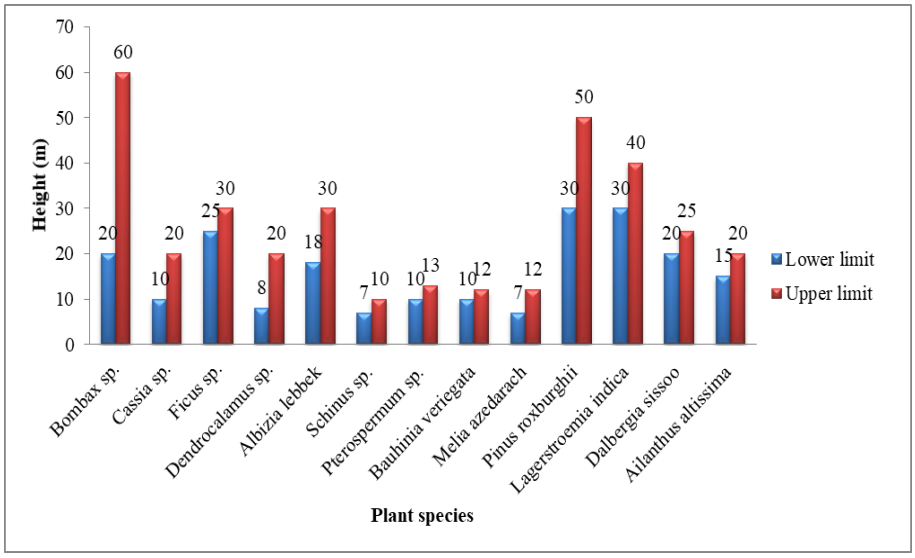

Fig 3: Height of tree species

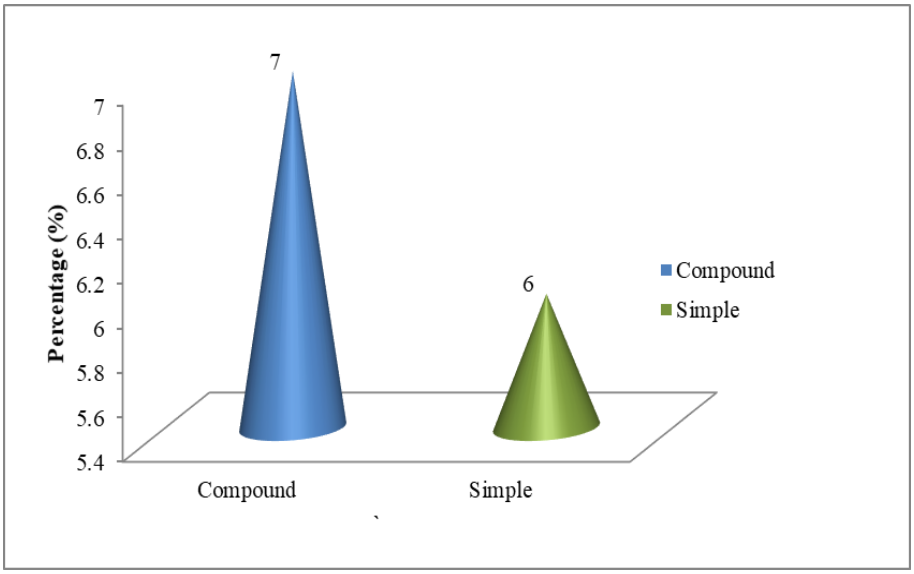

Fig 4: Leaf type of tree species.

Fig 5: Cup Shaped Flower of *Bombax ceiba*

Fig 6: Flower of Buhinia spp.

Table 2: List of plant types with botanical description and their availability

S.No.	Name	Plant type	Availability	Angiosperm type	Type of tree
1.	*Bombax ceiba* L.	Angiosperm	Cultivated	Dicot	Excurrent
2.	*Cassia fistula* L.	Angiosperm	Wild	Dicot	Deliquescent
3.	*Ficus benghalensis* L.	Angiosperm	Cultivated	Dicot	Deliquescent
4.	*Dendrocalamus strictus* (Roxb.) Nees	Angiosperm	Wild	Monocot	-
5.	*Albizia lebbek* (L.) Benth.	Angiosperm	Cultivated	Dicot	Deliquescent
6.	*Schinus terebenthifolius* Raddi	Angiosperm	Wild	Dicot	Small Shrub
7.	*Pterospermum acerifolium* (L.) Wild.	Angiosperm	Wild	Dicot	Deliquescent
8.	*Bauhinia veriegata* (L.) Benth.	Angiosperm	Cultivated	Dicot	Deliquescent
9.	*Melia azedarach* L.	Angiosperm	Cultivated	Dicot	Deliquescent
10.	*Pinus roxburghii* Sarg.	Gymnosperm	Cultivated		Excurrent
11.	*Lagerstroemia indica* (L.) Pers.	Angiosperm	Cultivated	Dicot	Small Shrub
12.	*Dalbergia sissoo* Roxb.	Angiosperm	Cultivated	Dicot	Deliquescent
13.	*Ailanthus altissima* (Mill.) Swingle	Angiosperm	Wild	Dicot	Deliquescent

Table 3: Distribution, origin and height of studied tree species

S. No	Name	Distribution	Height (m)	Origin
1.	*Bombax ceiba* L.	Tropical and subtropical region	20 – 60	Asia
2.	*Cassia fistula* L.	Tropical region	10 – 20	India, Southeast Asia and Thailand
3.	*Ficus benghalensis* L.	Subtropical region	25 – 30	India
4.	*Dendrocalamus strictus* (Roxb.) Nees	Tropical and subtropical region	8 – 20	Southeast Asia and East Asia.
5.	*Albizia lebbek* (L.) Benth.	Tropical and subtropical region	18 – 30	Indomalaya, New Guinea and Northern Australia.
6.	*Schinus terebenthifolius* Raddi	Tropical or Subtropical region	7 – 10	Brazil, Alagoas and Bahia.
7.	*Pterospermum acerifolium* (L.) Wild.	Tropical and subtropical region	10 – 13	Southeast Asia, India and Burma.
8.	*Bauhinia veriegata* (L.) Benth.	Tropical and subtropical region	10 – 12	China, Southeast Asia and indian subcontinent.
9.	*Melia azedarach* L.	Subtropical climatic zone	7 – 12	Indonesia, Malaysia, Australia and Asia.
10.	*Pinus roxburghii* Sarg.	Temperate region	30 – 50	Pakistan, India, Nepal and Bhutan.
11.	*Lagerstroemia indica* (L.) Pers.	Temperate zone	30 – 40	Southeast Asia, Northern Australia and Oceania
12.	*Dalbergia sissoo* Roxb.	Tropical and subtropical	20 – 25	Pakistan, India and Southern Iran
13.	*Ailanthus altissima* (Mill.) Swingle	Temperate region	15 – 20	Central China and Taiwan

Table 4: Phenology and leaf type of tree species

S.No.	Name	Phenology	Leaf type
1.	*Bombax ceiba* L.	January to March	Compound
2.	*Cassia fistula* L.	April to June	Compound
3.	*Ficus benghalensis* L.	Spring	Simple
4.	*Dendrocalamus strictus* (Roxb.) Nees	November to April	Simple
5.	*Albizia lebbek* (L.)Benth.	September to October	Compound
6.	*Schinus terebenthifolius* Raddi	August to November	Compound
7.	*Pterospermum acerifolium* (L.) Wild.	December to July	Simple
8.	*Bauhinia veriegata* (L.)Benth.	January to April	Simple
9.	*Melia azedarach* L.	March to April	Compound
10.	*Pinus roxburghii* Sarg.	-	Simple
11.	*Lagerstroemia indica* (L.) Pers.	Spring and summer months	Simple
12.	*Dalbergia sissoo* Roxb.	March to May	Compound
13	*Ailanthus altissima* (Mill.) Swingle	April to July	Compound

Table 5: List of different parts of the studied trees used for various purposes

S. No.	Name	Parts Used				
		Roots	Stem	Leaves	Fruit	Ornamental
1.	*Bombax ceiba* L.	Seminal disorders	Applied on wounds	Blood purification		+
2.	*Cassia fistula* L.	Syphilis	Running Nose	Skin disorders	Curing constipation	+
3.	*Ficus benghalensis* L.	Bonsai	Timber and fuel	Dysentery and diarrhea	Sweetish flavor	-
4.	*Dendrocalamus strictus* (Roxb.) Nees	Venereal diseases	Sticks, basket and ladders	Cancer		-
5.	*Albizia lebbek* (L.) Benth.	Soil erosion control	Soap and tanning	Mulch and green manure	Scrofula	+
6.	*Schinus terebenthifolius* Raddi		Heart problems	Menstrual cycle	Against bacteria which break tissues	+
7.	*Pterospermum acerifolium* (L.) Wild.	Antidote to poisoning and wounds	Inteststinal complaint and Anemia	Packaging of materials		-
8.	*Bauhinia veriegata* (L.) Benth.	Antidote to snake poison and dyspepsia	Astringents	Vegetables	Vegetables	+
9.	*Melia azedarach* L.	Purgative and vermifuge	Timber	Remedial and production of milk	Outdoor decoration	-
10.	*Pinus roxburghii* Sarg.	Vanillin used for flavoring	Resin	Dye and chemical terpene used for Allelophatic effect	Emergency food and fuel	-
11.	*Lagerstroemia indica* (L.) Pers.	Astringent, de toxicant	Timber	Hydrogogue and drastic purgative	Blood pressure, diabetes and dissolving kidney stones	+
12.	*Dalbergia sissoo* Roxb.	Insecticidal activity	Timber and fuel	Stimulant, gonorrhea and wounds	Pesticide	-
13.	*Ailanthus altissima* (Mill.) Swingle	Curing mental illness	Fuel	Production of milk	Ophthalmic diseases and dysentery	-

Conclusion and Recommendation

It was observed that University campus is rich and high in trees diversity. Majority of the trees were in height range of 10–20m and are in mature stage. Being an educational site trees are mostly planted for ornamental purposes, shade and aesthetic values. Trees are the resources that control environmental pollution, soil erosion and temperature regulation. The research area is under immense construction pressure due to which regeneration of trees has been preventing. Therefore, it is recommended that scientific management of regeneration may enhance the tree diversity in the campus. Hence, reforestation as a conservation technique required to be used for protecting the threaten trees to grant these resources to the future generation. Threatened and endangered tree species on campus should be properly protected to maintain urban tree diversity and prevent their total removal as a result of developmental projects.

Authors' contributions

Conceived and designed the experiments: A Basit, Performed the experiment: A Basit & AA Shah, Analyzed the data: A Basit, S Khan & Sulaiman, Contributed materials/tools: A Basit, S Khan & S Shah, Wrote the article: A Basit, Shehryar & Sulaiman.

References

1. Nowak DJ, Crane DE, Stevens JC, Hoehn RE, Walton JT, Bond J. *et al* A ground-based method of assessing urban forest structure and ecosystem services. Arboriculture and Urban Forestry. 2008; 34(6):347-358.
2. McPherson EG, Simpson JR. Potential energy savings in buildings by an urban tree planting program in California. Urban Forestry & Urban Greening. 2003; *2*(2):73-86.
3. Hale J, Pugh T, Sadler J, Boyko C, Brown J, Caputo S. *et al*. Delivering a Multi-Functional and Resilient Urban Forest. Sustainability. 2015; 7(4):4600-4624.
4. Jim CY, Liu HT. Species Diversity of Three Major Urban Forest Types In Guangzhou City, China. Forest Ecol Mng. 2001; 146:99-114.
5. Prance GT. Flora da Reserva Ducke, Amazonas. Brasil: Chrysobalanaceae. Rodriguésia. 2007; 58(3):493-531.
6. Sothers C, Prance GT, Chase MW. Towards a monophyletic Licania a new generic classification of the polyphyletic Neotropical genus Licania (Chrysobalanaceae). Kew Bull. 2016; 71(4):58. https://doi.org/10.1007/s12225-016-9664-3.
7. Attua EM, Pabi O. Tree species composition, richness and diversity in the northern forestsananna ecotone of Ghana. J Applied Biosci. 2013; 69:5437-5448.
8. Mathur A. A study of some plants of Economic Importance and their values in JIET Campus, 2017.
9. AZA H, ULLAH A. Diversity and economic importance of tree species in the Peshawar Cantonment, Khyber PakhtunKhwa, Pakistan. J Sc & Tech. 2015; 39(2):1-12.
10. Ulrich RS. Natural versus Urban Scenes: Some Psychophysiological Effects. Envir & Behavior. 1981; 13(5):523-556.
11. Singh S, Malik ZA, Sharma CM. Tree species richness, diversity, and regeneration status in different oak (*Quercus* spp.) dominated forests of Garhwal Himalaya, India. J Asia-Pacific Biodiversity. 2016; 9(3):293-300.
12. MA. Huston. Biological diversity. The coexistence of species on changing landscapes, xix, 681 p. Cambridge University Press, 1994. Price £60.00. J Marine Biological Assoc UK. 1995; 75(1):261-261.
13. Nirmal KJI, Soni H, Kumar RN. Aesthetic values of selected floral elements of Khatana and Waghai forests of Dangs, Western Ghats. Indian J Tradit Knowl. 2005; 4(3):275-286.
14. Dafni A, Lev E, Beckmann SU, Eichberger C. Ritual plants of Muslim graveyards in northern Israel. J Ethnobiol Ethnomed. 2006; 2:38. J.A. Hurrell.
15. Kumbhar BA, Dabgar PK. Study of aesthetic values of some traditional worshiping plants of Dang District. Int J Sci Res. 2014; 3(4):46-47.
16. Ahmad M, Khattak MR, Jadoon SA, Rab A, Basit A, Ullah I. *et al*. Influence of zinc sulphate on flowering and seed production of flax (*Linum usitatissimum* L.): A medicinal flowering plant. Int J Biosci. 2019; 14(4):464-476.

17. Nasir SI E. Flora of Pakistan department of Botany, Karachi University, Karachi, Pakistan, 1970-2002.
18. Ali SI, Qaiser M. "Flora of Pakistan," Department of Botany, University of Karachi, Pakistan, 1995-2008.
19. Gul B, Ahmad I, Khan H, Zeb U, Ullah H. Floristic inventory of wild plants of Peshawar university campus. Acta Ecologica Sinica. 2018; 38(6):375-380.
20. Danish A, Abbas HS, Khalid RK, Muhammad F, Manzor H, Ghulam MS. *et al*. Ethnomedicinal exploration of tracheophytes of Hangrai, Distt; Mansehra, Khyber Pakhtunkhwa, Pakistan. J. Biodiversity and Environ. Scie. 2019; 14(1):105-120.
21. Hussain F, Ayaz M, Hayat S, Saljoqi AR. Life form, leaf spectra, seed output and biomass of weeds in the wheat fields of Mayar-Jandool, District Dir. Sarhad Journal of Agriculture. 1993; 9(6):539-542.
22. Malla B, Chhetri RB. Ingenious knowledge on ethnobotanical plants of Kavrepalanchowk district. Kathmandu University J. Sci. Engg. and Technol. 2009; 5(2):96-109.