**International Journal of Ecology and Environmental Sciences**
www.ecologyjournal.in
Online ISSN: 2664-7133, Print ISSN: 2664-7125
Received: 06-03-2021, Accepted: 08-04-2021, Published: 15-05-2021
Volume 3, Issue 2, 2021, Page No. 117-122

# Floral diversity along agricultural habitats in selected regions of Bathinda, Punjab, India

**Navjot Kaur, HK Sidhu**
Department of Zoology, Desh Bhagat University, Mandi Gobindgarh, Punjab, India

**Abstract**
Floral diversity along agricultural habitats was studied at three villages namely Ruldu Singh Wala, Katar Singh Wala and Bir Talab of Bathinda district of Punjab. A total of 113 plant species belonging to 92 genera and 47 families were reported to be present in the studied locations. Out of total 113 species, 74 species were native while 39 species were non-native. Trees formed the most dominant life followed by herbs, shrubs, grasses and climbers. The most dominant family was Fabaceae followed by Poaceae, Moraceae and Meliaceae. The present study gives information about the resources present in the given ecosystem which can be used to efficiently plan their sustainable use in future.

**Keywords:** angiosperms, biodiversity, ecosystem, fabaceae, vegetation

## Introduction

India is decorated with a great variety of vegetation. It is included among the 12 mega-biodiversity countries with richest flora in the world. The country has a variety of habitats and different climatic conditions at different geographical regions which accounts for its unique floral diversity (Chattopadhyay *et al*., 2004) [1]. Plants provide various products like fibre, food, timbre, oils, fuel, raw material for medicines, resins, fruits, fodder, etc. A number of species are used in traditional medicines (Bussmann and Sharon, 2006; Saad *et al*., 2006; Yineger and Yewhalaw, 2007; Yusuf *et al*., 2007) [2, 3, 4, 5]. WHO reported the dependence of people in rural area on medicinal plants to cure various Diseases. India is gifted with rich floral diversity comprising of over 2991 genera of flowering plants. Out of these, 49 genera belonging to 22 families including 80 taxa are endemic to India namely *India, Kashmiria, Adenoon, Nicobariodendron etc.* (Irwin and Narasimhan, 2011) [6]. Angiosperms, one of the major plant groups comprising of about 400,000 species belonging to 450 families (Woods, 2014) [7] have occupied every possible habitat due to their better adaptability.

Punjab is a small state (50,376 km2) in the north western part of the country. It is one of the most fertile regions having about 84% of its area under agriculture. The state supports a rich diversity of flora. 1897 species of Angiosperms, 48 Pteridophytes, 34 Bryophytes, 948 Fungi and 397 Algal species have been reported to be present in Punjab. Indian National forest policy states that 33% of land area should be under forest. Presently the state has only 6.07% area under forests which has increased from 3.72% (Jerath *et al*., 2014) [8] as a result of aforestation and agro forestry practices (accounts to 52% of the total forest area).

Rapid increase in human population has resulted in pollution, climate change, deforestation, habitat loss, invasion of exotic species (Mazumder, 2014; Scanes, 2018) [9, 10]. With the development of new residential areas, due to urbanization, the bigger ecosystems have been fragmented (McKinney, 2002) [11], the natural vegetations have been removed (Aronson *et al*., 2014) [12], and many native species have been replaced either with exotic ornamental or with the plants having better yields (Aravind *et al*., 2010) [13]. Agriculture is another major factor causing over 80% of forest loss globally (FAO, 2010) [14]. An increase in agricultural activities has reduced the forest ecosystems and has a marked effect on wild habitats and fauna due to extensive use of chemical pesticides. Medicinal plant species like *Terminalia bellirica* and *T.chebula are* threatened due to overexploitation for medicinal purpose. Other valuable biological resources are also under pressure namely *Pueraria tuberosa* (edible tubers), *Grewia optiva* (leaves used as fodder) and *Bauhinia vahlii* (leaves used for making food plates). In the semi-arid areas of Punjab sand dunes are leveled for agricultural purposes which resulted in dominant, native flora to be included under the 'Threatened' category; for example *Tecomella undulate* and *Prosopis cineraria*. The present study has been undertaken to study the floristic diversity in selected locations of Bathinda district which can be used to plan sustainable use and conservation of plant diversity.

## Material and Methods

### Study area

Bathinda, nicknamed 'the city of lakes' for its five artificial lakes in the city, lies in the central southern part of state of Punjab. It lies in the north-western India in the Malwa region and is the fifth largest city of Punjab. The area lies between 29°- 33' and 30°- 36' north latitude and 74°- 38' and 75°- 46', east longitude. It covers a geographical area of 3547 sq. km. The present study was conducted at three different villages namely Ruldu Singh Wala, Katar Singh Wala and Bir Talab.

### Documentation of Plant diversity

Each location was visited weekly and the vegetation and plantations surrounding the crops were surveyed during the study period throughout the seasons and the total plants of different species surrounding the agricultural crops were recorded. Plant material was collected during each trip in order to identify them.

Identification was done in department of Forestry, Punjab Agricultural University, Ludhiana by the experts available there.

**Results and Discussion**

The floral biodiversity study revealed the presence a total of 113 plant species belonging to 92 genera and 47 families (Table 1 and Figure 1). Out the documented species 74 species are native while 39 species are non-native (Figure 2). The non-native species may be introduced accidently or deliberately from different areas of the country and cultivated here as ornamental species. The angiosperms form the major flora in the region. The life forms showed a highest diversity in the study area. Trees formed the most dominant life form showing 58% abundance followed by herbs, shrubs, grasses and climbers showing 19%, 15%, 6% and 2% abundance respectively (Figure 3).

**Table 1:** List of plant species in the study area

| S.No. | Scientific Name | Common Name | Family | Native/ Introduced | Habit |
|---|---|---|---|---|---|
| 1 | *Acaccia modesta* | Phalahi | Fabaceae | Native | Tree |
| 2 | *Acacia auriculiformis* | Australian wattle | Fabaceae | Introduced | Tree |
| 3 | *Acacia leucophleoa* | Reru | Fabaceae | Native | Tree |
| 4 | *Acacia nilotca* | Kiker | Fabaceae | Native | Tree |
| 5 | *Achyranthes aspara* | Puthkanda, chirchita | Amaranthaceae | Introduced | Herb |
| 6 | *Acrachne racemosa* | Gha | Poaceae | Native | Grass |
| 7 | *Aegle marmelos* | Bael | Rutaceae | Native | Tree |
| 8 | *Agave americana* | Agave | Agavaceae | Introduced | Herb |
| 9 | *Ailanthus excelsa* | Maharukh | Simaroubaceae | Native | Tree |
| 10 | *Albizia lebbeck* | Kala Sarin | Fabaceae | Native | Tree |
| 11 | *Albizia procera* | White siris | Fabaceae | Native | Tree |
| 12 | *Alstonia scholaris* | Devil's tree | Apocynaceae | Native | Tree |
| 13 | *Amaranthus viridis* | Chulai | Amaranthaceae | Native | Herb |
| 14 | *Araucaria cookie* | Christmas tree | Araucariaceae | Introduced | Tree |
| 15 | *Araucaria heterophylla* | Araucaria | Araucariaceae | Introduced | Tree |
| 16 | *Asperagus racemosus* | Asperagus | Asparagaceae | Native | Herb |
| 17 | *Azadirachata indica* | Neem | Meliaceae | Native | Tree |
| 18 | *Bauhinia veriegata* | Kachnar | Fabaceae | Native | Tree |
| 19 | *Bombax ceiba* | Semal | Bombacaceae | Native | Tree |
| 20 | *Bougainvillea glabra* | Bougainvillea | Nyctaginaceae | Introduced | Shrub |
| 21 | *Butea monosperma* | Flame of forest | Fabaceae | Native | Tree |
| 22 | *Calotropis procera* | Akk | Asclepiadaceae | Native | Shrub |
| 23 | *Cannabis sativa* | Bhang | Cannabaceae | Native | Herb |
| 24 | *Capparis deciduas* | Karir | Capparaceae | Native | Shrub |
| 25 | *Carthamus oxyacantha* | Pohli | Asteraceae | Introduced | Herb |
| 26 | *Cassia fistula* | Amaltas | Fabaceae | Native | Tree |
| 27 | *Cassia glauca* | Golden shower | Fabaceae | Native | Tree |
| 28 | *Cassia siemia* | Cassod tree | Fabaceae | Native | Tree |
| 29 | *Casuarina equistetifolia* | Casuarina, Whistling pine | Casuarinaceae | Native | Tree |
| 30 | *Cedrela toona* | Tun | Meliaceae | Native | Tree |
| 31 | *Cestrum nocturnum* | Night blooming jasmine | Solanaceae | Native | Shrub |
| 32 | *Chenopodium album* | Bathu | Chenopodiaceae | Introduced | Herb |
| 33 | *Chukrasia tabularis* | Indian Redwood | Meliaceae | Native | Tree |
| 34 | *Citrus lemon* | Lemon | Rutaceae | Native | Tree |
| 35 | *Cordia dichotoma* | Lasoda | Boraginaceae | Native | Tree |
| 36 | *Cynodon dactylon* | Khabal grass | Poaceae | Introduced | Climber |
| 37 | *Cyperus niveus* | Motha | Cyperaceae | Native | Herb |
| 38 | *Cyperus rotundus* | Deela/Motha | Cyperaceae | Native | Herb |
| 39 | *Datura stramonium* | Datura | Solanaceae | Introduced | Herb |
| 40 | *Delbergia sissoo* | Shisham, Tahli | Fabaceae | Native | Tree |
| 41 | *Delonix regia* | Gulmohar | Fabaceae | Introduced | Tree |
| 42 | *Digera arvensis* | Tandla | Amaranthaceae | Native | Herb |
| 43 | *Echinochloa crusgalli* | Swank | Poaceae | Native | Grass |
| 44 | *Eleusine indica* | Makra | Poaceae | Native | Herb |
| 45 | *Eragrostis pilosa* | Chiri ghaas | Poaceae | Introduced | Grass |
| 46 | *Eucalyptus tereticornis* | Safeda | Myrtaceae | Introduced | Tree |
| 47 | *Ficus benghalensis* | Banyan | Moraceae | Native | Tree |
| 48 | *Ficus elastic* | Rubber Tree | Moraceae | Native | Tree |
| 49 | *Ficus panda* | Golden Ficus. | Moraceae | Introduced | Tree |
| 50 | *Ficus racemosa* | Gular | Moraceae | Introduced | Tree |
| 51 | *Ficus religiosa* | Peepal | Moraceae | Native | Tree |
| 52 | *Ficus viren* | White fig | Moraceae | Introduced | Tree |

| | | | | | |
|---|---|---|---|---|---|
| 53 | *Grevillea robusta* | Silver oak | Proteaceae | Introduced | Tree |
| 54 | *Hibiscus-rosa-sinensis* | China rose | Malvaceae | Native | Shrub |
| 55 | *Jacaranda acutifolia* | Blue Jacaranda | Bignoniaceae | Introduced | Tree |
| 56 | *Jacaranda mimosifolia* | Jacaranda | Bignoniaceae | Introduced | Tree |
| 57 | *Jasminum humile* | Yellow jasmine | Oleaceae | Native | Shrub |
| 58 | *Jatropha curcus* | Jatropha | Euphorbiaceae | Introduced | Tree |
| 59 | *Lagerstroemia indica* | Crape myrtle | Lythraceae | Native | Shrub |
| 60 | *Lagerstroemia speciosa* | Pride of India | Lythraceae | Native | Tree |
| 61 | *Lantana camera* | Lantana | Verbenaceae | Introduced | Shrub |
| 62 | *Lawsonia inermis* | Heena | Lythraceae | Native | Shrub |
| 63 | *Leucaena leucocephala* | Subabol/ Wild Temarind | Fabaceae | Introduced | Tree |
| 64 | *Mangifera indica* | Mango | Anacardiaceae | Native | Tree |
| 65 | *Melia azedaracha* | Dhek | Meliaceae | Introduced | Tree |
| 66 | *Melia composita* | Bkain | Meliaceae | Introduced | Tree |
| 67 | *Moringa oleifera* | Sohanjana | Moringaceae | Native | Tree |
| 68 | *Morus alba* | Mulberry, tut | Moraceae | Native | Tree |
| 69 | *Musa spp* | Banana | Musaceae | Introduced | Herb |
| 70 | *Neolamarckia cadamba* | Kadam | Rubiaceae | Native | Tree |
| 71 | *Nerium indicum* | Kaner | Apocynaceae | Native | Shrub |
| 72 | *Nyctanthes arbortristis* | Queen of the night, Harshringar | Oleaceae | Native | Shrub |
| 73 | *Parkinsonia aculeata* | Parkin Sonia | Fabaceae | Introduced | Tree |
| 74 | *Parthenium hyserophorus* | Gajar gha | Asteraceae | Introduced | Shrub |
| 75 | *Paspalum distichum* | Narhi ghas | Poaceae | Introduced | Grass |
| 76 | *Phalaris minor* | Gulli danda | Poaceae | Introduced | Herb |
| 77 | *Phragmites karka* | Jortor | Poaceae | Introduced | Grass |
| 78 | *Phyllanthus emblica* | Amla | Phyllanthaceae | Native | Tree |
| 79 | *Polyalthea longifolia* | False Ashok | Annonaceae | Native | Tree |
| 80 | *Polypogen monspeliensis* | Loomba gha | Poaceae | Introduced | Herb |
| 81 | *Pongamia pinnata* | Sukhchain | Fabaceae | Native | Tree |
| 82 | *Populus deltoids* | Poplar | Salicaceae | Introduced | Tree |
| 83 | *Prosopis cineraria* | Jand | Fabaceae | Native | Tree |
| 84 | *Prosopis juliffora* | Pahadi kikar | Fabaceae | Native | Tree |
| 85 | *Prunus persica* | Peach | Rosaceae | Introduced | Tree |
| 86 | *Psidium guajava* | Guava | Myrtaceae | Native | Tree |
| 87 | *Pterospermum acerifoliuma* | Kanak champa | Malvaceae | Native | Tree |
| 88 | *Punica granatum* | Pomegranate | Lythraceae | Native | Shrub |
| 89 | *Putranjiva roxburghii* | Putranjiva | Euphorbiaceae | Native | Tree |
| 90 | *Rosa sps.* | Rose | Rosaceae | Native | Shrub |
| 91 | *Rumex spinosus* | Kandiali palak | Polygonaceae | | Herb |
| 92 | *Saccharum munja* | Kana | Poaceae | Native | Grass |
| 93 | *Saccharum spontaneum* | Kans or Kahi | Poaceae | Native | Grass |
| 94 | *Salvadora oleoides* | Vann | Salvadoraceae | Native | Tree |
| 95 | *Saraca asoca* | Ashoka | Fabaceae | Native | Tree |
| 96 | *Sisymbrium irio* | Sarson | Brassicaceae | Introduced | Herb |
| 97 | *Solanum xanthocarpum* | Shamkanamole | Solanaceae | Native | Herb |
| 98 | *Sonchus arvensis* | Milk weed | Asteraceae | Introduced | Herb |
| 99 | *Syzygium cumini* | Jamun | Myrtaceae | Native | Tree |
| 100 | *Tamarindus indica* | Tamarind | Fabaceae | Native | Tree |
| 101 | *Techtona grandis* | Teak, Sagwaan | Lamiaceae | Native | Tree |
| 102 | *Tecoma stan* | Yellow bells | Bignoniaceae | Introduced | Shrub |
| 103 | *Terminalia bellirica* | Baheda | Combretaceae | Native | Tree |
| 104 | *Terminalia chebula* | Harad | Combretaceae | Native | Tree |
| 105 | *Terminallia arjuna* | Arjun | Combretaceae | Native | Tree |
| 106 | *Ticomela undulata* | Rohida | Bignoniaceae | Native | Shrub |
| 107 | *Tinospora malaberica* | Giloe | Menispermaceae | Native | Climber |
| 108 | *Toona ciliata* | Red cedar | Meliaceae | Native | Tree |
| 109 | *Trianthema portulacastrum* | It-sit/ chupatti | Aizoaceae | Introduced | Herb |
| 110 | *Tribulus terrestris* | Bhakhra | Zygophylaceae | Introduced | Herb |
| 111 | *Zephyranthes candida* | Rain Lily | Amaranthaceae | Introduced | Herb |
| 112 | *Ziziphus mauritiana* | Ber | Rhamnaceae | Native | Tree |
| 113 | *Ziziphus nummularia* | Malhe | Rhamnaceae | Native | Shrub |

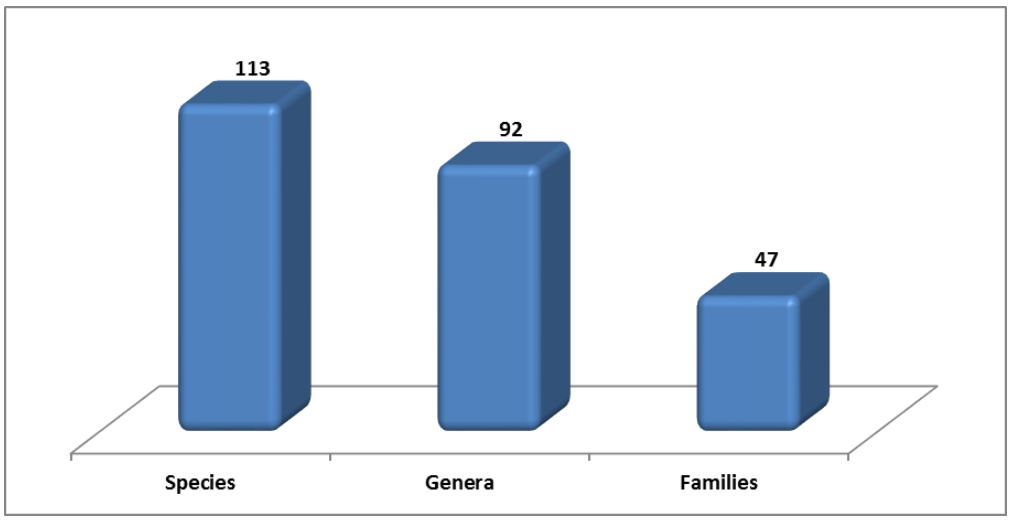


**Fig 1:** number of Species, Genera and Families

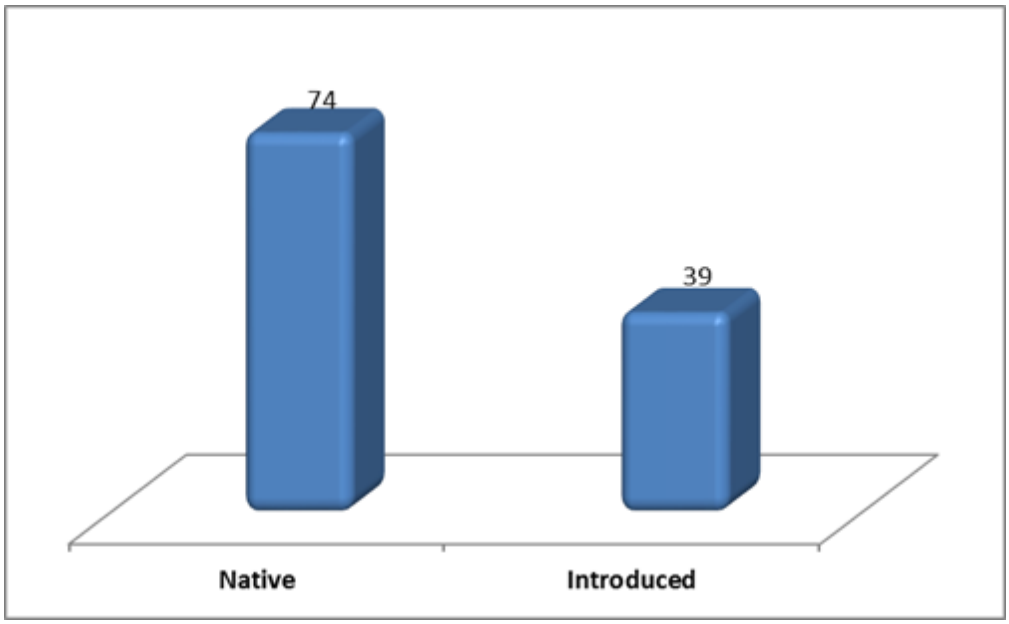


**Fig 2:** Status of Native/Introduced species

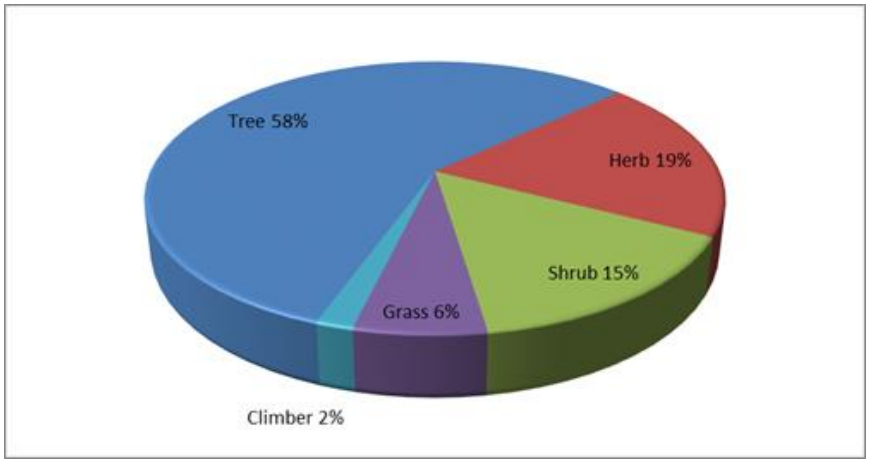


**Fig 3:** Plant distribution according to their habits.

Fabaceae was the most dominant family with 20 species and 13 genera. Poaceae was the most abundant family with 11 species and 10 genera. It was followed by Moraceae family with 7 species and 2 genera and Meliaceae family having 6 species and 5 genera. Family Bignoniaceae and Lythraceae were equally abundant (4 species and 3 genera each). Other contributing families were Amaranthaceae (4 species and 4 genera). Asteraceae, Solanaceae and Myrtaceae showed equal abundance (3 species and 3 genera). Other contributing families were Rutaceae, Malvaceae, Rosaceae (2 species and 2 genera each). 27 families had only one species each (Table 2). Similar observations were reported by other researchers namely Jerath *et al*., (2017) [15] at Pushpa Gujral Science City, Sidhu *et al*., (2011) [16] at Panjab University Campus, Sharma *et al*., (2006) [17] in the Shivalik ecosystem of Punjab, Manhas *et al*., (2010) [18] in the protected ecosystems of Kandi region of Punjab, Rawat *et al*., (2013) [19] in Kandi region of Hoshiarpur and Kaur, (2014) [20] for Doaba region of Punjab. Higher diversity of trees is associated with undisturbed habitats. In the Bathinda district, the forest division is working to enhance the rate of afforestation keeping in view the sustainable use of timber and to create awareness in the people about the forests and their role in maintenance of ecological balance.

**Table 2:** List of families recorded at the study area

| S.No. | Family | Species | Genera |
|---|---|---|---|
| 1 | Fabaceae | 20 | 13 |
| 2 | Poaceae | 11 | 10 |
| 3 | Moraceae | 7 | 2 |
| 4 | Meliaceae | 6 | 5 |
| 5 | Bignoniaceae | 4 | 3 |
| 6 | Amaranthaceae | 4 | 4 |
| 7 | Lythraceae | 4 | 3 |
| 8 | Asteraceae | 3 | 3 |
| 9 | Solanaceae | 3 | 3 |
| 10 | Myrtaceae | 3 | 3 |
| 11 | Combretaceae | 3 | 1 |
| 12 | Rutaceae | 2 | 2 |
| 13 | Apocynaceae | 2 | 2 |
| 14 | Cyperaceae | 2 | 1 |
| 15 | Malvaceae | 2 | 2 |
| 16 | Oleaceae | 2 | 2 |
| 17 | Euphorbiaceae | 2 | 2 |
| 18 | Rosaceae | 2 | 2 |
| 19 | Rhamnaceae | 2 | 1 |
| 20 | Araucariaceae | 2 | 1 |
| 21 | Others (27) | 1 | 1 |

## Conclusion

The present study has generated information on overall floral biodiversity. It has revealed a presence a total of 113 plant species belonging to 92 genera and 47 families of which 74 species are native while 39 species are non-native. Fabaceae was the most dominant family followed by Poaceae, Moraceae and Meliaceae. The listing of plant species within an area acts as an important tool for researchers and forest managers. It gives information about all the resources which can be used to efficiently plan the sustainable use of the resources in future. This information can also be used to educate masses especially students about the basic concepts of biodiversity and sustainable development and to asses any change in the land-use pattern, rate of deforestation and their impact on fauna.

## References


1. Chattopadhyay IK, Biswas U, Bandyopadhyay R, Banerjee, K. Turmeric and Curcumin: Biological applications medicinal applications. Current Science,2004:87(1):44-53.
2. Bussmann RW, Sharon D. Traditional medicinal plant use in Loja province, Southern Ecuador. Journal of Ethnobiology and Ethnomedicine,2006:2:44.
3. Saad B, Azaizeh H, Abu-Hijleh G, Said O. Safety of Traditional Arab Herbal Medicine. eCAM,2006:3(4):433-439.
4. Yineger H, Yewhalaw D. Traditional medicinal plant knowledge and use by local healers in Sekoru District, Jimma Zone, Southwestern Ethiopia. Journal of Ethnobiology and Ethnomedicine,2007:3:24.
5. Yusuf M, Wahab MA, Chowdhury J U, Begum J. Some Tribal Medicinal Plants of Chittagong Hill Tracts, Bangladesh. Bangladesh Journal of Plant Taxonomy,2007:14(2):117-128.
6. Irwin SJ, Narasimhan D. Endemic genera of angiosperm in India: a review. *Rheedea*,2011:21(1):87-105.
7. Woods K. Angiosperm. Retrieved from http://www.eoearth.org/view/article, 2014.
8. Jerath N, Ladhar SS, Singh G. State of Environment, Punjab. Punjab State council for Science and Technology, 2014, 126.
9. Mazumder MK. Diversity, habitat preferences and conservation of the primates of Southern Assam, India: The story of a primate paradise. Journal of Asia Pacific Biodiversity,2014:7:347-354.
10. Scanes CG. Human activity and habitat loss: Destruction, fragmentation, and degradation. Animals and Human Society, Elsevier, 2018, 451-82.
11. McKinney ML. Urbanization, Biodiversity, and Conservation; The impacts of urbanization on native species are poorly studied, but educating a highly urbanized human population about these impacts can greatly improve species conservation in all ecosystems. BioScience,2002:52:883-890.
12. Aronson MF, La Sorte FA, Nilon CH. A global analysis of the impacts of urbanization on bird and plant diversity reveals key anthropogenic drivers. Proceedings of Royal Society B: Biological Sciences,2014:281:20133330.
13. Aravind N, Rao D and Ganeshaiah K. Impact of the invasive plant, Lantana camara, on bird assemblages at MaleMahadeshwara Reserve Forest, South India.Tropical Ecology,2010:51:325-338.
14. FAO. Food and Agriculture Organization of the United Nations, 2010. http://www.fao.org/home/en/
15. Jerath N, Singh G, Bal R, Kaur K. Floral diversity in a science communication and outreach facilty (Pushpa Gujral Science city) in Punjab (India). Journal of biodiversity and environmental sciences,2017:11(2):29-39.
16. Sidhu MC, Thakur S, Ahluwalia AS. Diversity of medicinal plants of Panjab University, Chandigarh, India-A review. Journal of Biodiversity and Ecological Sciences,2011:1(3):213-219.
17. Sharma ML, Jerath N, Chadha J. Angiosperms Biodiversity in the Shiwalik Ecosystem of Punjab. Punjab Science and Technology Department, Chandigarh, 2006, 256-450.

18. Manhas RK, Singh L, Vasistha HB, Negi M. Floristic Diversity of Protected Ecosystems of Kandi Region of Punjab, India. New York Science Journal,2010:3(4):96-103.
19. Rawat L, Manhas RK, Kholiya D, Kamboj SK. Floristic diversity of Kandi region of Hoshiarpur, Punjab, India. Applied Ecology and Environmental Sciences,2013:1(4):49-54.
20. Kaur K. Evaluation of Angiosperm Flora and Use of Traditional Medicinal Plant Remedies in Doaba Region of Punjab. PhD thesis, Panjab University, Chandigarh, 2014, 31-50.