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Floristic Diversity As Trees, Shrubs And Herbs Of District Sonipat, Haryana, India

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ABSTRACT

Urbanization is considered as a leading cause of species extinction and is often associated with negative impact on plant diversity, but it is also true that high levels of biodiversity may occur within cities. Over the past 30 years rapid changes have taken place in Sonipat too. In the present study, to enumerate the plant diversity of Sonipat district different places such as green space and parks, built-up areas, agricultural land-use, banks of pond, schools etc. were chosen. Regular field visits were done during the period of November, 2020-March, 2021. In this study, a total 161 species belonging to 133 genera and 54 families have been documented from the given area. Out of 54 families, 51 are from Angiosperms and 3 are from Gymnosperms. Of the recorded families, 128 species belong to 103 genera of dicotyledons,27 species belong to 24 genera of monocotyledons, 6 species of 6 genera recorded are gymnosperms. The most dominant family was Fabaceae (16 species;17%) followed by Poaceae (12 species; 13%) and Asteraceae (11 species; 12%). The present study provides current status data of plant species in Sonipat district and in future conservation strategies can be planned to protect the plant diversity of this area.

Key words: Plant diversity, Field visits, Sonipat district, Fabaceae

INTRODUCTION

The climate system, as well as natural and anthropogenic-influenced ecosystems, have been modified and altered by global change, which includes changes in atmospheric composition, climate, and land use. These changes will eventually have an impact on the world's ecosystems, particularly altering plant distribution and growth. Diversity of plants generally refers to the diversity and variability of plants in the given area. India ranks sixth among the 12 mega diversity nation of the world [1]. To know about the diversity of plants in various forms is an important goal of ecological research [2]. Now, more attention is paid to biodiversity because on the one hand there is growing awareness about its importance and on the other hand there is a depletion [3]. The knowledge of diversity of plants in a particular area play an important role for basic research as the data generated through these studies is highly helpful in ecological, biogeographic, taxonomic and evolutionary studies. Knowledge of floristic composition is important to know about the overall structure and function of the ecosystem and the diversity of plants of an area helps in assessing wealth and potentiality of that area [4]. Due to urbanization, industrialization

and other activities tremendous changes have been observed in the vegetation too in the last few years [5]. For conservation of plant diversity and sustainable development, knowledge about data of plant species becomes the prerequisite condition. Keeping this in view, an attempt has been made to assess the floristic composition and plant diversity of District Sonipat, Haryana to provide information according to their current status. The aim of present study is to provide information of vegetation in Sonipat district as per their present status and to highlight the plant diversity in the form of trees, shrubs and herbs too.

DESCRIPTION OF STUDY AREA: SONIPAT DISTRICT, HARYANA

Location: It is situated 28 kms. away from Delhi and is surrounded by the districts Rohtak, Jind and Panipat with an area of 2260 km^2at latitude 28°59.6868′ N and longitude 77°1.1622′ E. It shares an interstate boundary with district Meerut of Uttar Pradesh. The western canal of river Yamuna runs along the eastern border of the district and separates it from Uttar Pradesh. According to the 2011 census Sonipat district has a population of 1,450,001. The climate of Sonipat is dry with hot summers and a cold winter. Over most of the district, the soil is fine loam of rich colour. However, some areas have sandy soil [6].

MATERIALS AND METHODOLOGY

Field visits were carried out from November 2020 – March 2021. For the systematic study, the study area was divided into different regions. The sites selected for the study were pond banks, parks, lawns and other relevant localities of Sonipat city and adjoining village areas. Field visits were repeated in different months to get the maximum representation of different plant species frequently by bus, private vehicle like auto rickshaw and generally by foot. During field visits, small plant specimens were collected in number more than two in vegetative, flowering or fruiting stage and standard method was followed to prepare the herbarium.[7] The plants were also photographed for identification with available floras and other literature and required information was recorded in notebook to maintain the record. Final confirmation for the identification of plants was done with the help of Dr. Surender Bhardwaj, Superintendent, Botanical Garden, MDU, Rohtak, Haryana & Dr. Savina, Assistant Professor, Bhagat Phool Singh Mahila Vishwavidyalaya, Haryana.

RESULTS AND DISCUSSION

Data has been represented in the form of table and graphs. Table 1 is denoting the floristic components of District Sonipat, Haryana. In the table, the name of the family, botanical names followed by vernacular name and habit of identified plants has been stated and the families have been organized alphabetically in accordance with dicotyledons and monocotyledons respectively. Data showing various proportions has been epitomized in the form of graphs.

Table 1: List of families, botanical name of plant, local name and habit

LIST OF PLANTS THEIR FAMILIES, LOCAL NAME AND HABIT

S.no.	Family	Botanical name, local name and habit of plant
DICOTS		
1.	Acanthaceae	Adhatoda vasica (Vasa ;Shurb)
2.	Anacardiaceae	Mangifera indica L.(Aam; Tree)
3.	Annonaceae	Polyalthia longifolia (Sonn.) Thwaites (Ashoka; Tree)
4.	Amaranthaceae	Achyranthes aspera var.barbonica(willd. ex Schult) C. C. Towns(Chirchita;Herb), Alternanthera brasiliana (L.Kuntz) (Purple joyweed ; Shrub) Amaranthus viridis L. (Chaulai;Herb), ,Beta vulgaris L.(Chukandar ;Herb), Gomphrena serrata L.(Gul-e-makhmal ; Herb) , Spinacia oleracea L.(Spinach;Herb)
5.	Apiaceae	Coriandrum sativum L.(Dhania;Herb),Foeniculum vulgare Mill. Saunf;Herb), Daucus carotaL.(Gajar;Herb)
6.	Apocynaceae	Alstonia scholaris (L.) R.Br.(Saptaparni; Tree),Cascabela thevetia (L.)Lippod(Pili Kaner;Tree), Catharanthus roseus (L.) G.Don(Sada bahar;Herb), Plumeria alba L.(Plumeria;Shrub),,Nerium oleander L.(Kaner;Shrub), Tabernaemontana divaricata (L.) R. Br.ex Roem. & Schult.(Chandni;Shrub)
7.	Asclepiadaceae	Calotropis procera (Aiton) Dryand(Aak; Shrub)
8.	Asteraceae	Ageratum conyzoides (L.) (Goat weed; Herb), Cirsium arvensis (L.) Scop. (Prickly thistle; Herb), Conyza bonariensis L.(Hairy fleabane; Herb),Erigeron bonariensis L (Flax leaf fleabane; Herb)Gnaphalium polycephalum Michx.(Cudweed; Herb),Parthenium hysterophorus L.(Gajar ghas; Herb) Sonchus asper (Spiny sow thistle; Herb),Sonchus oleraceus L.(Sow thistle; Herb),Tridax procumbens(L.) L.(Tal-muriya; Herb),Vernonia cinerea L. (Vernonia; Herb),Xanthium strumarium L.(Gokhru; Herb)

9.	Brassicaceae	Brassica compestris Linn.(Sarso; Herb),,Brassica nigra L.(Kali sarso ; Herb),Brassica oleracea var. botrys(Phoolgobhi;Herb),Brassica oleracea var.capitata(Bandh Gobhi ; Herb),Lepidium didymum L.(Lesser swine cress ; Herb), Raphanus sativus L.(Radish; Herb).Sisymbrium irio L.(Khub kalan ; Herb)
10.	Cactaceae	Opuntia dillenii (Ker Gawl.) Haw.(Prickly pear; Shrub), Opuntia monacantha Haw.(Common Prickly pear; Shrub)
11.	Cannabaceae	Cannabis sativa L. (Bhang; Herb)
12.	Caricaceae	Carica papaya L. (Papita; Tree)
13.	Caryophyllaceae	Spergula arvensis L;Jangli dhania: Herb), Stellaria media (L.) Vill(Chick weed; herb)
14.	Chenopodiaceae	Chenopodium album L.(Bathua;Herb),Chenopodium murale L. Khartwa; Herb)
15.	Combretaceae	Terminalia arjuna (Roxb.ex DC.) Wight & Arn (Arjun; Tree)
16.	Commelinaceae	Tradescantia pallida (Rose) D.R. Hunt(Nilakantha; Herb)
17.	Convolvulaceae	Convolvulus arvensis L. (Hirankhuri;Herb),Ipomoea cairica (L.)(SweetMorning glory;Herb), Ipomoea carnea Jacq. (Pink morning glory;Herb)
18.	Crassulaceae	Bryophyllum pinnatum (Lam.) Taub (Patherchat; Herb)

19.	Euphorbiaceae	Codiaeum variegatum (L.) A.Juss (Fire croton;Shrub), Euphorbia hirta L.(Badi dudhi; Herb), Euphorbia milii Des moul. (Thorny Euphorbia;Herb), Euphorbia prostrata Aiton.(Choti dudhi;Herb),Euphorbia pulcherrima Willd.ex Klotzsch (Poinsettia ; Herb) Euphorbia royleana Boiss.(Danda thor;Shrub),Euphorbia tirucalli L.(Pencil plant;Shrub),Euphorbia tithymaloides L.(Christmas candle; Shrub), Jatropha integerrima L.(Jatropha ; Tree) Ricinus communis L.(Castor oil plant;Tree)
20.	Fabaceae	Acacia arabica L.(Babul;Tree),Acacia auriculiformis Benth (Auri; Tree), Acacia nilotica L. (Kikar;Tree), Albizia lebbeck(L.) Beth.(Siris;Tree),Bauhinia variegata L.(kachnar; Tree), Butea monosperma (Lam.)Taub(Dhak; Tree), Cassia fistulaL.(Amaltas; Tree),Dalbergia sissoo DC.(Shisham; Tree),Delonix regia (Hook.) Raf.(Gulmohar; Tree), Leucaena leucocephala (Lam.) de Wit. (Subabul; Tree)Pongamia pinnata (L.) Pierre (Karanj; Tree), Senna siamea (Lam.) H.S Irwin &Barneby (Kassod; Tree), Tamarindus indica L. (Imli; Tree) Lathyrus odoratus L. (Sweet pea; Herb), Melilotus indica L. (Indian sweet clover; Herb), Trigonella foenum- graecum L.(Methi; Herb)
21.	Lamiaceae	Ocimum basilicum L.(Marwa; Herb), Ocimum sanctum L.(Tulsi; Herb), Tectona grandis L.f.(Sagwan; Tree)
22.	Lythraceae	Punica granatum L.(Anar; Shrub)
23.	Malvaceae	Abutilon indicum L. (Sweet Kanghi;Shrub), Hibiscus rosa sinensis L. (Gurhal ;Shrub), Malva parviflora L.(Cheeseweed;Herb),Malvastrum coromandelianum (L.) Garcke(False mallow;Herb)
24.	Meliaceae	Azadirachta indica A Juss. (Neem; Tree)
25.	Menispermaceae	Tinospora cordifolia (Thumb) Miers (Giloy;Herb)
26.	Moraceae	Artocarpus heterophyllus Lam.(Kathal; Tree) Ficus benghalensis L.(Bargad; Tree),Ficus carica L.(Angir; Tree),Ficus racemosa L . (Gular; Tree),Ficus religiosa L. (Pipal; Tree), Morus alba L.(Shahtoot; Tree)

27.	Myrtaceae	Callistemon lanceolatus (Sm.) Sweet (Bottle brush; Tree),Eucalyptus coccifera Hook.(Safeda; Tree), Psidium guajava L. (Amrud; Tree), Syzygium cumini (L.) Skeels(Jamun; Tree)

28.	Nyctaginaceae	Boerhaavia diffusa DC.(Punarnava; Shrub)
29.	Oleaceae	Nyctanthes arbor-tristis L.(Har-singhar;Tree)
30.	Oxalidaceae	Oxalis corniculata L.(Amrul ; Herb)
31.	Papaveraceae	Argemone mexicana L. (Satyanashi; Herb),Papaver rhoeus L.(;Herb)
32.	Polygonaceae	Rumex dentatus L.(Jangli palak ; Herb)
33.	Pontederiaceae	Eichhornia crassipes Kunth (Jalkhumbi; Herb)
34.	Portulacaceae	Portulaca oleracea L.(Pigweed;Herb)
35.	Primulaceae	Anagallis arvensis L. (Neel; Herb)
36.	Phyllanthaceae	Phyllanthus emblica L.(Amla ;Tree), Phyllanthus niruri L.(Phyllanthus plant ; Herb)
37.	Rubiaceae	Ixora coccinea L. (Rugmini; Shrub)Neolamarckia cadamba (Roxb.) Bosser (Kadam ;Tree)
38.	Rutaceae	Aegle marmelos (L.) correa(Bel;Tree), Citrus limon (L.)Osbeck (Nimbu; Shrub),Citrus limetta (Mousami; Tree),Murraya koenigii (L.) Spreng.(Karipatta; Tree), Murraya paniculata(L.) Jack (Kamini, Shurb)

39.	Rhamnaceae	Ziziphus jujuba Mill.(Ber; Tree)
40.	Salicaceae	Populus alba L.(Poplar;Tree)

41.	Solanaceae:	Capsicum annuum L.(Mirch;Herb),Cestrum nocturnum L.(Raat ki rani;Shrub),Datura innoxia Mill.(Datura;Herb),Lycopersicon esculentum Mill(Tamatar;Herb), Solanum melongena L.(Baingan;Herb),Solanum nigrum L.(Mokoi;Herb),Solanum tuberosum L. (Aalu;Herb), Solanum virginianum L.(Thorny nightshade;Herb),Withania somnifera (L.) Dunal(Ashwagandha ;Shrub)
42.	Verbenaceae	Duranta erecta L.(Duranta; Shrub), Lantana camara L.(Raimuniya; Shrub)
MONOCOTS		
43.	Araceae	Epipremnum aureum (Linden & Andre) G.S. Bunting (Money plant; herb)
44.	Arecaceae	Rhapis excelsa (Thunb .) A. Henry(Lady palm;Shrub), Roystonea regia (Kunth) O.F. Cook(Royal palm;Tree), Phoenix dactylifera L.(Date palm: Tree)
45.	Amaryllidaceae	Allium cepa L.(Onion; Herb); Allium sativum L.(Lahsun ;Herb),
46.	Asparagaceae	Agave americana L.(Century plant; Shrub),Asparagus officinalis L. (Stavari; Herb), Furcraea foetida (L.) Haw.(Green aloe;Shrub),Sansevieria trifasciata Prain (Tongue plant ;Herb
47.	Asphodelaceae	Aloe arborescens Mill.(Guar pattha; Herb), Aloe vera L. (Ghritkumari ;Herb)
48.	Cyperaceae	Cyperus rotundus L.(Motha; Herb)

49.	Liliaceae	Asphodelus tenuifolius Cav.(Piyaji; Herb)
50.	Poaceae	Avena sativa L. (Jai; Herb),Cenchrus biflorus Roxb.(Bhurat; Herb),Cenchrus ciliaris L.(Buffel grass; Herb) Cynodon dactylon (L.) Pers.(Doob; Herb),Dactyloctenium aegyptium (L.)Willd(Crow foot grass; Herb),Desmostachya bipinnata (L.) Stapf.(Daabh; Herb),Digitaria ciliaris (Retz.),Koeler(Crabgrass; Herb),Imperata cylindrica (L.) Raeusch.(Dab; Herb) ,Phalaris minor Retz.(Bluri; Herb),Poa annua L.(Poa grass; Herb),Saccharum officinarum L. (Ganna; Herb),Triticum aestivum L.(Gahun; Herb)
51.	Musaceae	Musa paradisiaca L.(Kela; Tree)
Gymnosperm families		
52.	Araucariaceae	Araucaria angustifolia (Bertol) . Kuntze (Monkey puzzle Tree ;Tree)
53.	Cupressaceae	Athrotaxis cupressoides D.Don(Pencil pine;Tree), Cupressus sempervirens L.(Kupressus; Tree), Juniperus communis L. (Juniper; Tree), Thuja plicata Donn ex D.Don(Morpankhi; Shrub)
54.	Cycadaceae	Cycas revoluta Thunb (Cycas palm;Tree)

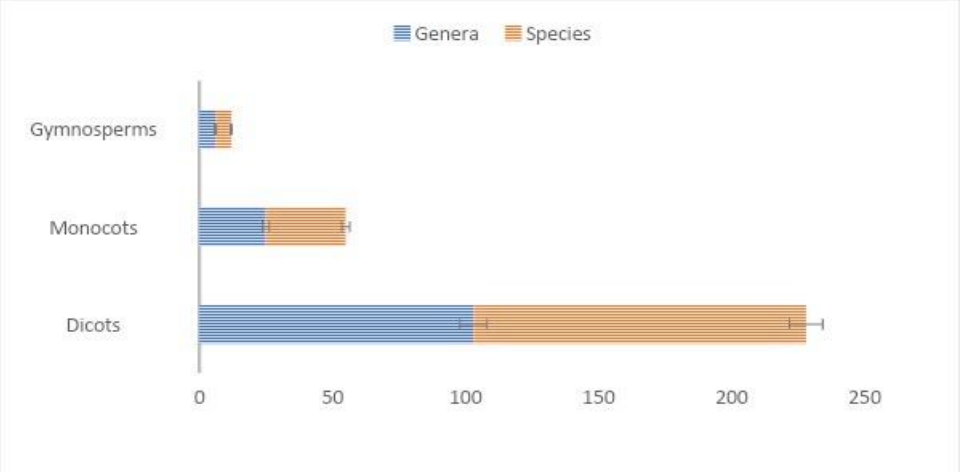

Figure 1. Proportion of number of genera and species of Dicotyledons, Monocotyledons and Gymnosperms in study area

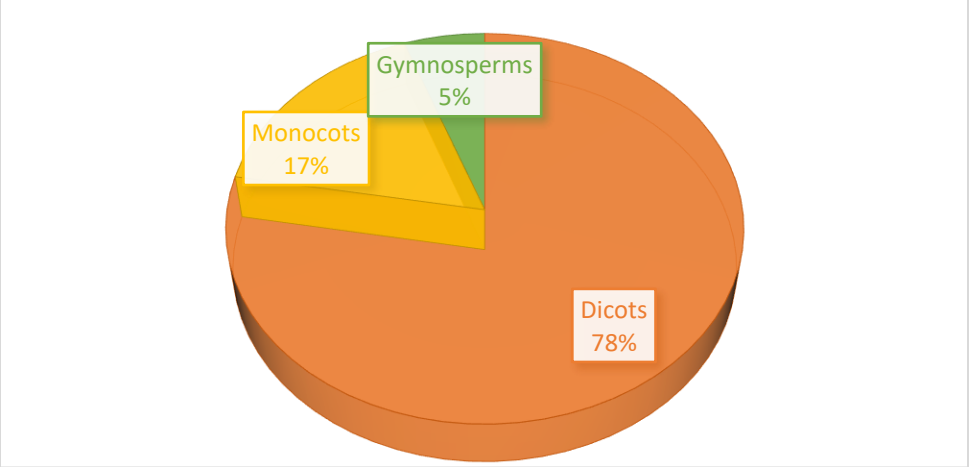

Figure 2. Percentage distribution of Dicotyledons, Monocotyledons and Gymnosperms in study area

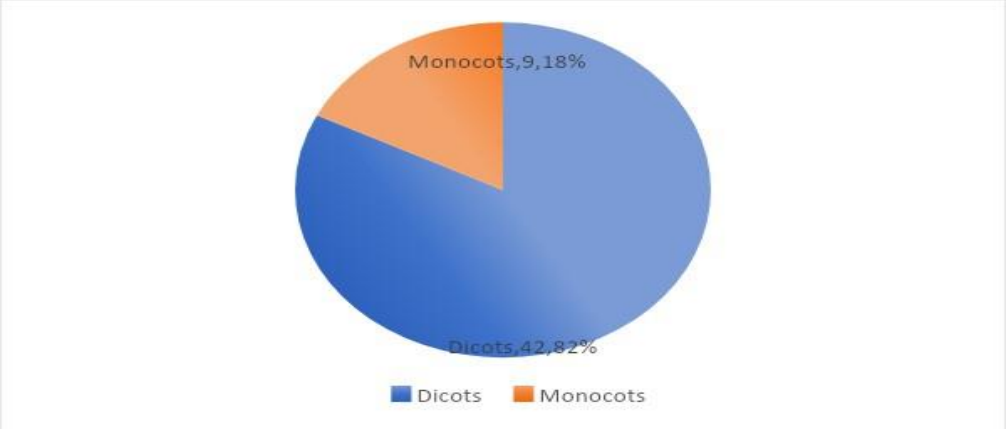

Figure 3: Proportion of Dicotyledons and Monocotyledons in angiosperms in study area

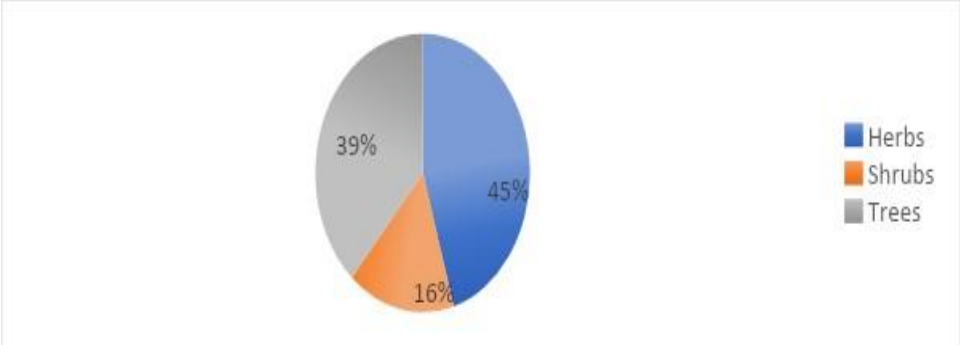

Figure 4: %age of Habit Groups in the form of herbs, shrubs and trees in total species found in study area

Figure 5: Proportion of Habit Groups in the form of herbs, shrubs and trees in angiosperms in study area

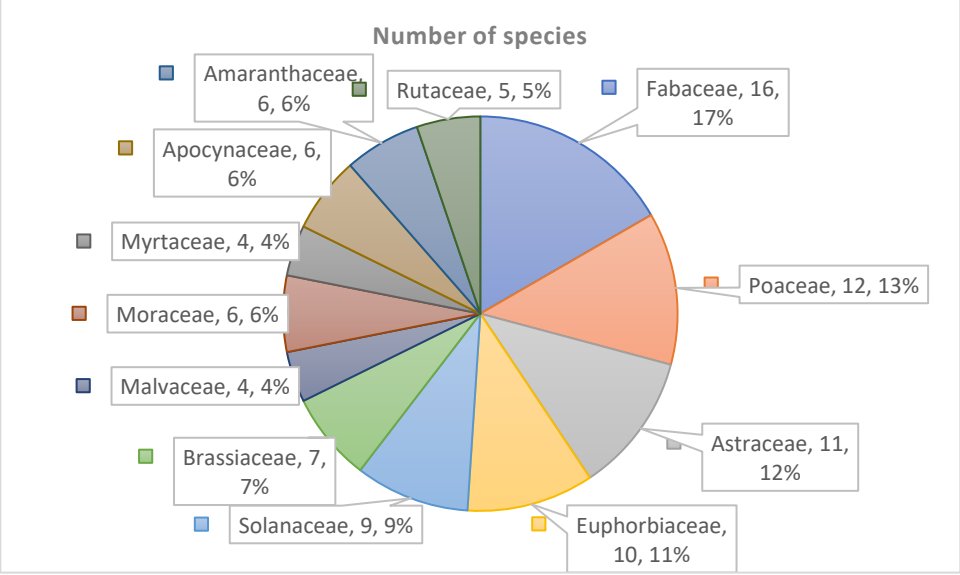

Figure 6: Proportion of number of species in major dominant families of angiosperms in study area

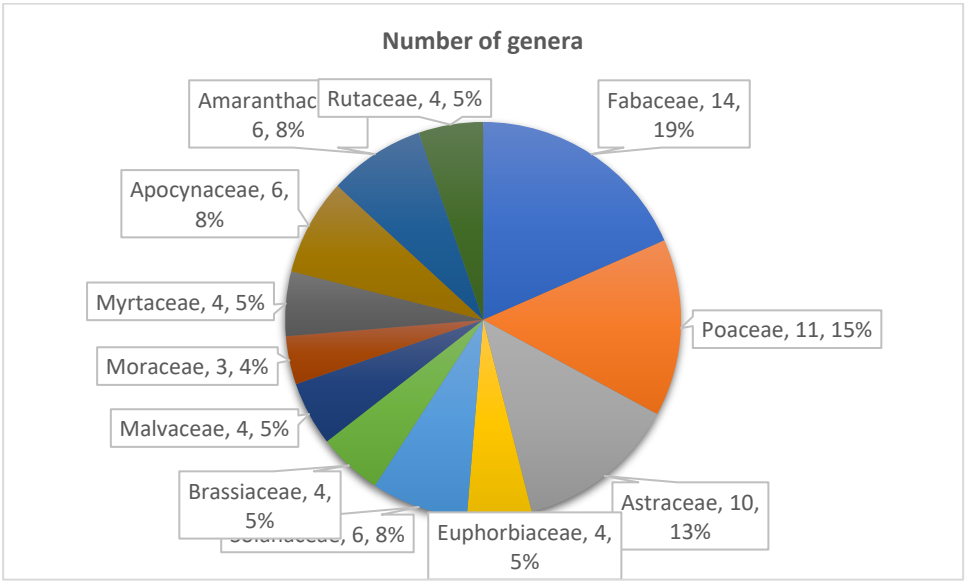

Figure 7: Proportion of number of genera in major dominant families of angiosperms in study area

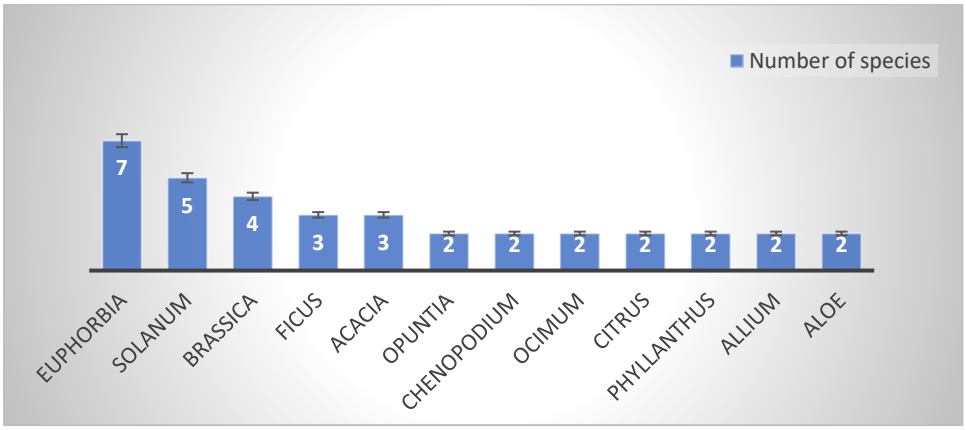

Figure 8: Number of species recorded in various genera of angiosperms in study area

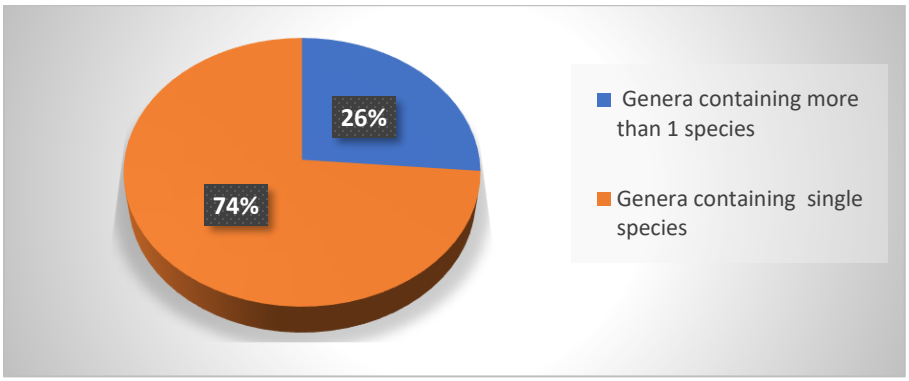

Figure 9: Proportion of number of species in various genera of total families in study area

Species Diversity

In the present study, a total 161 species belonging to 133 genera and 54 families have been documented from the District Sonipat, Haryana India, comprising 51 families from Angiosperms and 3 from Gymnosperms. Out of these recorded families, 128 species belong to 103 genera of dicotyledons,27 species to 24 genera of monocotyledons and 6 species to 6 genera of gymnosperms (Fig. 1). Angiosperms accounted for 95% of all species, with 42 dicotyledon families (78%) and 9 monocotyledon families (17%) and gymnosperms (three families) contributing for the remaining 5%(Figure 2). In angiosperms, the proportion of dicotyledon families has been found to be higher (82%) than monocotyledon groups (18%)(Figure 3). Herbs constituted the greater percentage (86 species;45 %) followed by trees (49 species; 39 %) and shrubs (26 species;16%) (Fig. 4) and in contrast to the percentage of herbs, the percentage of trees and shrubs recorded was 15.07 and 64.38 % lesser respectively in total species recorded in the selected study area (Figure 5).

Maximum number of species were recorded from family Fabaceae (16 species;17%) followed by Poaceae (12 species; 13%), Asteraceae (11 species; 12%), Euphorbiaceae(10 species; 11%) Solanaceae (9 species; 9%), Brassicaceae (7 species;7%), Moraceae, Apocynaceae and Amaranthaceae (6 species,

6% each), Rutaceae (5 species, 5%) and Malvaceae (4 species, 4%) (Figure 6) together constituting 79 % and in total making 22% of all identified families. Figure 7 is displaying the number of genera found in top twelve families of angiosperms recorded from the given study area and maximum percentage contribution was documented from family Fabaceae(14 genera;19%) followed by Poaceae (11genera; 15%), Asteraceae (10 genera; 13%), Solanaceae, Apocynaceae and Amaranthaceae (6 genera;8% each), Euphorbiaceae, Brassiceae, Malvaceae, Myrtaceae and Rutaceae (4 genera; 5% each). In our studies, maximum species were recorded from genera Euphorbia (7 species) followed by Solanum (5 species), Brassicaand Ficus (4 species each),Acacia (3 species), Opuntia, Chenopodium, Ocimum, Phyllanthus, Citrus, Allium and Aloe (2 species each)(Fig. 8) constituting 12 % and remaining 88% percent genera were represented by single species each (Fig. 9). Fabaceae amongst trees, and Poaceae among herbs was observed to be the dominant family. Species commonly found in present study are Delbergia sisso, Eucalyptus species, Cassia fistula, Melia azadirachta, Ficus sp., Alstonia scholaris, Acacia sp.etc. Some weeds most commonly found in these areas are Ageratum conyzoides, Malva parviflora, Oxalis sp., Cannabis sativa, Sonchus asper etc. A total of 125 plant species belonging to 56 families have been documented from the Temporary Academic Block (TAB) campus of Central University of Himachal Pradesh (CUHP) and Poaceae (6 genera and 6 species) among monocotyledons and Asteraceae (12 genera and 12 species) followed by Lamiaceae (09 genera and 10 species) have been found dominating among dicotyledons [8]. A total of 92 plant specieshave been documented at Aravalli Mountain Range in Haryana [9].The herbs were found dominating over shrubs, followed by trees and the Fabaceae amongst trees, Fabaceae and Malvaceae among shrubs and Poaceae among herbs were observed to be the dominant family. Similarly, during the study done in community forest ecosystems of Daya village (Hisar), Dhangar village (Fatehabad), and Bhera village (Bhiwani) of south-west Haryana, herbs were found dominating over shrubs and trees and Poaceae was found as most specious family [10]. Fabaceae has been found to be the most diverse plant family in the global context and is considered as the third largest family of angiosperms in species numbers after Asteraceae [11][12].

CONCLUSION

In many areas of Haryana, floristic diversity has been studied in recent years. Haryana, a landlocked state in northwest India, constitutes a geographical area of 1.3% of the country. The state has done development in agriculture and industrial sectors but has poor tree cover [13]. In the present data of floristic study of Sonipat district, the number of tree species recorded has been found less in number as comparison to herbs. Thirty nine percent of recorded families and 76% of recorded genera have been represented by single species in the given studied area in comparison to data documented in literature revealing the existence of much more species and genera (such as 250 genera and 2500 species in family Acanthaceae, 214 genera and 2400 species in family Asclepiadaceae, 165 genera and 2040 species in family Amaranthaceae) throughout the world. In our study Moraceae and Myrtaceae has been found comprising trees species and Fabaceae as a distinctive family comprising trees and herbs both.Data generated by this study can be used to find out the reasons for the nonexistence or containing smaller number of species in the families documented.The reasons for dominance of Fabaceae can be ruled out and knowledge generated can be utilized and incorporatedby concerned faculties for increasing the number of economically and ecologically important plant species to expand the plant diversity in the

given studied area. The present study provides an insight of the diversity of given are and whole year study too is required to know the actual in vegetation dynamics and other ecological aspects.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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