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Floral diversity in a science communication and outreach facility (Pushpa Gujral Science city) in Punjab (India)

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Abstract

Pushpa Gujral Science City, Kapurthala is one of the biggest science parks of its kind in North India. The campus is rich in both floral and faunal diversity. With times, this diversity has been modified and tried to sustain itself in changing circumstances. Therefore the present study was conducted to examine and document the floral diversity of the campus. Documentation of biodiversity of the campus helps to determine the existing resources and to set target for future improvements. The study involve monthly field visits to the campus of an area of 72 acres for assessment of higher plants. It comprises 168 species belonging to 144 genera and 58 families as per the APG III classification. Five dominant families in term of number of species are Fabaceae, Apocynaceae, Bignoniaceae, Moraceae and Arecaceae. The campus was dominated by angiosperms (96%) and tree species (54%). Study on tree species with respect to the relative abundance & density indicate that *Alstonia scholaris* is the most dominant species with relative abundance of 0.101 and Density of 3.86 per acre followed by *Chukrasia tabularis*, *Jacaranda acutifolia*, *Mimusops elengi* with relative abundance/density of 0.084/3.22, 0.045/1.74, 0.041/1.58, respectively. The species of exotic plants were well represented in the study area. The outcome of the study would be useful in providing planning recommendations for protecting urban biodiversity as well as natural ecosystem.

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Introduction

Ecologists are emphasizing on documentation and conservation of biodiversity in the face of unprecedented habitat loss and extinction rates under the present scenario of climatic variability. Floristic surveys are then vital & probably the only means for the assessment of phytodiversity to promote its conservation & management and sustainable utilization (Jayanthi and Rajendran, 2013). They also provide clues of changing floristic patterns, new invasions, current status, rare, endemic and threatened taxain a phyto-geographical area and form the primary basis of resource management and planning activities at the local, regional and global levels. In this regard, documentation of urban flora is also of immense importance (Padalia *et al.*, 2004) since, it provides information of introduced species and act as an interphase for the urban masses to interact with native. Institutional areas with rich biodiversity can thus play an important role in creating awareness among the masses in general, and students in particular so that they can understand the functioning of ecosystems and participate towards

planning strategies for its conservation at the local and regional levels. This assumes significance in light of enactment of the Biological Diversity Act, 2002 and efforts by the government to set up Biodiversity Management Committees throughout the country for implementing an effective access and benefit sharing mechanism. Floristic studies in the past have analyzed the floral composition in several areas of Punjab (Sharma, 1990; Jerath *et al.* 2006; Sharma *et al.*, 2009; Manhas *et al.* 2010; Rawat *et al.*, 2013; Kaur, 2014), but studies in urban areas are generally lacking.

The present study is an attempt to assess the floristic diversity of an institutional area which can be effectively used to raise public sensitivity on this important issue through edutainment.

Methodology

Study area

Pushpa Gujral Science City is located on Jalandhar – Kapurthala Road (Figure 1) spread over an area of 72 acres at 31.356 Latitude and 75.437 Longitude.



Fig. 1. Location of PGSC campus.

It is one of the biggest science parks of its kind in North India. Science City was established with the concept of edutainment to create excitement about science and technology amongst visitors of all ages and groups. The Science City inculcating creativity in young minds and building scientific temper in the society. The major subject areas covered include physical, applied, natural and social sciences and engineering, technology, agriculture, health sciences, energy, industries, human evolution and civilization, the environment, ecosystems, evolution as well as frontier areas like space, nuclear science, information technology, robotics and Bio-technology.

The campus of Pushpa Gujral Science City, Kapurthala is rich in both floral and faunal diversity. The present study was conducted to examine and document the floral diversity of the Pushpa Gujral Science City, Kapurthala, India. The outcome of the study would be useful in providing a framework for future environment related programmes and creating awareness about its importance and value among the common people.

Field study

Punjab Biodiversity Board (PBB) in collaboration with Pushpa Gujral Science City (PGSC) conducted the study of floral diversity of its campus for one year from October, 2014 to October, 2015. During the study, monthly field surveys were conducted to document floral diversity, whereon taxonomic recording to trees, shrubs & herbs was carried out. The campus was divided into 27 sectors for the study. Collection of specimens was avoided in biodiversity conservation point of view, but their photographs were taken in their natural habitat. Following methods were adopted to document the flora of PGSC campus.

Table 1. Flora of PGSC campus.

| Scientific Name | Common name | Habit | Native /Introduced | Life Span |
|----------------------------|---------------|-------|--------------------|-----------|
| Family : Agavaceae (3) | | | | |
| <i>Agave americana</i> | Agave | Herb | Introduced | Perennial |
| <i>Furcaria foetida</i> | Giant Cabuya | Herb | Native | Perennial |
| <i>Yucca aloifolia</i> | Adam's Needle | Shrub | Introduced | Perennial |
| Family : Amaranthaceae (2) | | | | |

Trees

Trees in whole campus were documented by direct counting using census method and their number was also recorded.

Herb, Shrub, Climber & Creepers

These life forms were enlisted by direct observation but their number was not recorded.

The photographs of plant species were also taken in their natural habitat.

Identification of plant species was made by consulting different literature including (Flora of Punjab by Nair, 1978; Checklist of Punjab Plants by Sharma, 1990), (Plants of Harike Wetland by Ladhar *et al*, 2003; Biodiversity in the Shiwalik Ecosystem of Punjab by Jerath *et al*, 2006; Tree Directory of Chandigarh by Kohli *et al*, 1994; Tree Directory of Punjab by Singh *et al*, 2014), research papers, thesis, online websites etc.

Nomenclature of the plant species were made up to date by using APG III classification.

Ecological studies like, relative abundance and species diversity index of tree species was also calculated.

Results and discussions

The floral biodiversity study of PGSC-Kapurthala revealed the presence of 168 species of higher plants belonging to 144 genera and 58 families (Table No. 1 & Figure 2).

| | | | | |
|-----------------------------------|----------------------|---------|------------|-----------|
| <i>Achyranthes aspera</i> | Prickly Chaff Flower | Herb | Native | Perennial |
| <i>Zephyranthes candida</i> | Rain Lily | Herb | Introduced | Perennial |
| Family : Anacardiaceae (1) | | | | |
| <i>Mangifera indica</i> | Mango | Tree | Native | Perennial |
| Family : Annonaceae (1) | | | | |
| <i>Polyalthea longifolia</i> | False Ashok | Tree | Native | Perennial |
| Family : Apocynaceae (9) | | | | |
| <i>Adenium obesum</i> | Desert Rose | Shrub | Introduced | Perennial |
| <i>Allamanda blanchetii</i> | Purple Allamanda | Climber | Introduced | Perennial |
| <i>Allamanda cathartica</i> | Golden Trumpet Vine | Climber | Introduced | Perennial |
| <i>Alstonia scholaris</i> | Devil's tree | Tree | Native | Perennial |
| <i>Nerium oleander</i> | Oleander | Shrub | Native | Perennial |
| <i>Pachypodium namaquanum</i> | Elephant's trunk | Shrub | Introduced | Perennial |
| <i>Plumeria acutifolia</i> | Plumeria | Tree | Introduced | Perennial |
| <i>Tabernaemontana divaricata</i> | Pinwheel Flower | Shrub | Native | Perennial |
| <i>Thevetia peruviana</i> | Yellow Oleander, | Tree | Introduced | Perennial |
| Family : Araceae (1) | | | | |
| <i>Syngonium podophyllum</i> | Arrowhead vine | Herb | Introduced | Perennial |
| Family : Araucariaceae (1) | | | | |
| <i>Araucaria cookie</i> | Christmas tree | Tree | Introduced | Perennial |
| Family : Arecaceae (8) | | | | |
| <i>Bismarckia nobilis</i> | Bismarck Palm | Tree | Introduced | Perennial |
| <i>Caryota urenus</i> | Fishtail palm | Tree | Native | Perennial |
| <i>Dyopsis lutescens</i> | Butterfly Palm | Tree | Introduced | Perennial |
| <i>Livistona rotundifolia</i> | Footstool palm | Tree | Introduced | Perennial |
| <i>Phoenix sylvestris</i> | Wild Date palm | Tree | Native | Perennial |
| <i>Rhapis excelsa</i> | Lady Palm | Shrub | Introduced | Perennial |
| <i>Roystonea regia</i> | Royal Palm | Tree | Introduced | Perennial |
| <i>Trachycarpus fortunei</i> | Windmill palm | Tree | Native | Perennial |
| Family : Asparagaceae (2) | | | | |
| <i>Asparagus racemosus</i> | Wild Asparagus | Climber | Native | Perennial |
| <i>Beaucarnea recurvata</i> | Ponytail palm | Tree | Introduced | Perennial |
| Family : Asphodelaceae (1) | | | | |
| <i>Aloe humilis</i> | Spider Aloe | Herb | Introduced | Perennial |
| Family : Asteraceae (5) | | | | |
| <i>Bidens pilosa</i> | Spanish needl | Herb | Introduced | Annual |
| <i>Erigeron bonariensis</i> | Flax-leaf Fleabane | Herb | Introduced | Annual |
| <i>Parthenium hysterophorus</i> | Congress grass | Shrub | Introduced | Annual |
| <i>Tridax procubens</i> | Tridax Daisy | Herb | Native | Annual |
| <i>Wedelia trilobata</i> | Yellow Dots | Herb | Introduced | Perennial |
| Family : Bignoniaceae (9) | | | | |
| <i>Adenocalymma alliaceum</i> | Garlic vine | Climber | Introduced | Perennial |

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|---------------------------------|--------------------------|---------|------------|-----------|
| <i>Campsis grandiflora</i> | Chinese Trumpet Vine | Climber | Introduced | Perennial |
| <i>Heterophragma roxburghii</i> | Waras | Tree | Native | Perennial |
| <i>Jacaranda acutifolia</i> | Blue Jacaranda | Tree | Introduced | Perennial |
| <i>Kigelia africana</i> | Sausage Tree | Tree | Introduced | Perennial |
| <i>Millingtonia hortensis</i> | Indian Cork Tree | Tree | Native | Perennial |
| <i>Tabebuia aurea</i> | Caribbean Trumpet Tree | Tree | Introduced | Perennial |
| <i>Tecoma compensis</i> | Cape honeysuckle | Shrub | Introduced | Perennial |
| <i>Tecoma stan</i> | Yellow bells | Tree | Introduced | Perennial |
| Family : Bombacaceae (1) | | | | |
| <i>Bombax ceiba</i> | Semal | Tree | Native | Perennial |
| Family : Boraginaceae (1) | | | | |
| <i>Cordia dichotoma</i> | Indian Cherry | Tree | Native | Perennial |
| Family : Cactaceae (4) | | | | |
| <i>Cleistocactus winteri</i> | Golden rat tail | Herb | Introduced | Perennial |
| <i>Mammillaria elongata</i> | Ladyfinger cactus | Herb | Introduced | Perennial |
| <i>Notocactus haselbergii</i> | Crested Scarlet Ball | Herb | Introduced | Perennial |
| <i>Opuntia ficus-indica</i> | Barbary fig | Shrub | Introduced | Perennial |
| Family : Cannabaceae (1) | | | | |
| <i>Cannabis sativa</i> | Hemp | Herb | Native | Annual |
| Family : Cannaceae (1) | | | | |
| <i>Canna indica</i> | Indian Sho | Herb | Introduced | Perennial |
| Family : Casuarinaceae (1) | | | | |
| <i>Casuarina equisetifolia</i> | Whistling Pine | Tree | Native | Perennial |
| Family : Combretaceae (4) | | | | |
| <i>Quisqualis indica</i> | Rangoon creeper | Climber | Native | Perennial |
| <i>Terminalia arjuna</i> | Arjun Tree | Tree | Native | Perennial |
| <i>Terminalia chebula</i> | Chebulic Myrobalan | Tree | Native | Perennial |
| <i>Terminalia belerica</i> | Bastard myrobalan | Tree | Native | Perennial |
| Family : Commelinaceae (3) | | | | |
| <i>Commelina benghalensis</i> | Bengal Dayflower | Herb | Native | Annual |
| <i>Tradescantia flumiensis</i> | White Spiderwort | Herb | Introduced | Perennial |
| <i>Tradescantia zebrina</i> | Inch plant | Herb | Introduced | Perennial |
| Family : Convolvulaceae (1) | | | | |
| <i>Ipomoea pes-tigridis</i> | Tiger Foot Morning Glory | Climber | Native | Annual |
| Family : Crassulaceae (3) | | | | |
| <i>Bryophyllum pinnatum</i> | Air plant | Herb | Introduced | Perennial |
| <i>Crassula imperialis</i> | Giant Watch Chain | Herb | Introduced | Perennial |
| <i>Kalanchoe tomentosa</i> | Chocolate soldier | Herb | Introduced | Perennial |
| Family : Cupressaceae (1) | | | | |
| <i>Juniperus chinensis</i> | Drooping Juniper | Tree | Native | Perennial |
| Family : Cycadaceae (2) | | | | |
| <i>Cycas circinalis</i> | Queen Sago | Shrub | Introduced | Perennial |

| | | | | |
|--|------------------------|---------|------------|-----------|
| <i>Cycas revoluta</i> | Sago palm | Tree | Introduced | Perennial |
| Family : Dioscoreaceae (1) | | | | |
| <i>Dioscorea deltoidea</i> | Nepal Yam | Climber | Native | Perennial |
| Family : Euphorbiaceae (6) | | | | |
| <i>Acalypha hispida</i> | Cat's tail | Shrub | Introduced | Perennial |
| <i>Euphorbia hirta</i> | Asthma Weed | Herb | Native | Annual |
| <i>Euphorbia milii splendens</i> | Orchid Crown of Thorns | Shrub | Introduced | Perennial |
| <i>Euphorbia prostrata</i> | Prostrate Sandmat | Herb | Introduced | Annual |
| <i>Jatropha curcus</i> | Jatropha | Tree | Introduced | Perennial |
| <i>Sapium sebiferum</i> | Chicken Tree | Tree | Introduced | Perennial |
| Family : Fabaceae (24) | | | | |
| <i>Acacia auriculiformis</i> | Australian wattle | Tree | Introduced | Perennial |
| <i>Acacia catechu</i> | Cutch tree | Tree | Native | Perennial |
| <i>Albizia odoratissima</i> | Black Siri | Tree | Native | Perennial |
| <i>Albizia procera</i> | White Siri | Tree | Native | Perennial |
| <i>Alysicarpus rugosus</i> | Red moneywort | Herb | Native | Perennial |
| <i>Bauhinia × blakeana</i> | Bohenia | Tree | Introduced | Perennial |
| <i>Bauhinia acuminata</i> | Dwarf white bauhinia | Tree | Native | Perennial |
| <i>Bauhinia purpurea</i> | Purple Orchid Tree | Tree | Native | Perennial |
| <i>Butea monosperma</i> | Flame of forest | Tree | Native | Perennial |
| <i>Caesalpinia pulcherrima</i> | Peacock Flower | Shrub | Native | Perennial |
| <i>Calliandra haematocephala</i> | Red Powder Puff | Shrub | Introduced | Perennial |
| <i>Cassia fistula</i> | Golden shower tree | Tree | Native | Perennial |
| <i>Cassia glauca</i> | Scrambled Egg Bush | Tree | Native | Perennial |
| <i>Cassia javanica</i> | Java Cassia | Tree | Native | Perennial |
| <i>Cassia renigera</i> Benth. | Cassia | Tree | Introduced | Perennial |
| <i>Cassia occidentalis</i> | Coffee Senna | Herb | Native | Annual |
| <i>Cassia siemia</i> | Cassod tree | Tree | Native | Perennial |
| <i>Dalbergia sissoo</i> | Indian rosewood | Tree | Native | Perennial |
| <i>Delonix regia</i> | Flame Tree | Tree | Introduced | Perennial |
| <i>Erythrina indica</i> | Indian Coral tree | Tree | Native | Perennial |
| <i>Leucaena leucocephala</i> | Wild Tamarind | Tree | Introduced | Perennial |
| <i>Milletia ovalifolia</i> | Moulmein Rosewood | Tree | Introduced | Perennial |
| <i>Pongamia pinnata</i> | Pongam Tree | Tree | Native | Perennial |
| <i>Prosopis cineraria</i> | Jhand | Tree | Native | Perennial |
| <i>Saraca asoca</i> | Ashoka Tree | Tree | Native | Perennial |
| Family : Liliaceae (1) | | | | |
| <i>Chlorophytum comosum variegatum</i> | Spider plant | Herb | Introduced | Perennial |
| Family : Lythraceae (5) | | | | |
| <i>Cuphea hyssopifolia</i> | Mexican Heather | Herb | Introduced | Annual |
| <i>Lagerstroemia indica</i> | Crape myrtle | Tree | Native | Perennial |
| <i>Lagerstroemia speciosa</i> | Pride of India | Tree | Native | Perennial |

| | | | | |
|-----------------------------------|------------------------|---------|------------|-----------|
| <i>Lawsonia inermis</i> | Heena | Shrub | Native | Perennial |
| <i>Punica granatum</i> | Pomegranate | Shrub | Native | Perennial |
| Family : Magnoliaceae (1) | | | | |
| <i>Magnolia grandiflora</i> | Magnolia | Tree | Introduced | Perennial |
| Family : Malpighiaceae (1) | | | | |
| <i>Galphimia gracilis</i> | Gold shower | Shrub | Introduced | Perennial |
| Family : Malvaceae (4) | | | | |
| <i>Hibiscus-rosa-sinensis</i> | China rose | Shrub | Native | Perennial |
| <i>Malvastrum coromendalianum</i> | False Mallow | Herb | Native | Annual |
| <i>Thespesia populnea</i> | Indian tulip tree | Tree | Native | Perennial |
| <i>Urena lobata</i> | Caesarweed | Shrub | Introduced | Perennial |
| Family : Meliaceae (5) | | | | |
| <i>Azadirachta indica</i> | Neem | Tree | Native | Perennial |
| <i>Chukrasia tabularis</i> | Indian Redwood | Tree | Native | Perennial |
| <i>Melia azadirachta</i> | China Tree | Tree | Native | Perennial |
| <i>Swietenia mahagoni</i> | West Indian mahogany | Tree | Introduced | Perennial |
| <i>Toona ciliata</i> | Red cedar | Tree | Native | Perennial |
| Family : Menispermaceae (2) | | | | |
| <i>Cissampelos pareira</i> | Velvet Leaf | Climber | Introduced | Perennial |
| <i>Tinospora cordifolia</i> | Indian Tinospora | Climber | Native | Perennial |
| Family : Moraceae (9) | | | | |
| <i>Artocarpus heterophyllus</i> | Jack fruit | Tree | Native | Perennial |
| <i>Ficua benjamina</i> | Weeping Fig | Tree | Native | Perennial |
| <i>Ficus benghalensis</i> | Banyan Tree | Tree | Native | Perennial |
| <i>Ficus benjamina variegata</i> | Variegated weeping fig | Tree | Native | Perennial |
| <i>Ficus elastic</i> | Rubber Tree | Tree | Native | Perennial |
| <i>Ficus infectoria</i> | White Fig | Tree | Native | Perennial |
| <i>Ficus panda</i> | Golden Ficus. | Tree | Introduced | Perennial |
| <i>Ficus religiosa</i> | Peepal | Tree | Native | Perennial |
| <i>Morus alba</i> | Indian Mulberry | Tree | Native | Perennial |
| Family : Myrtaceae (4) | | | | |
| <i>Eucalyptus sp.</i> | Forest Red Gum | Tree | Introduced | Perennial |
| <i>Melaleuca bracteata</i> | Golden bottle Brush | Tree | Introduced | Perennial |
| <i>Psidium guajava</i> | Guava | Tree | Native | Perennial |
| <i>Syzygium cumini</i> | Java Plum | Tree | Native | Perennial |
| Family : Nyctaginaceae (2) | | | | |
| <i>Boerhavia diffusa</i> | Red hogweed | Climber | Native | Perennial |
| <i>Bougainvillea sps.</i> | Bougainvillea | Climber | Introduced | Perennial |
| Family : Oleaceae (3) | | | | |
| <i>Jasminum humile</i> | Yellow jasmine | Shrub | Native | Perennial |
| <i>Jasminum sambac</i> | Belle of India | Shrub | Native | Perennial |
| <i>Nyctanthes arbor-tristis</i> | Queen of the night | Shrub | Native | Perennial |

| | | | | |
|--------------------------------|------------------------|-------|------------|-----------|
| Family : Oxalidaceae (1) | | | | |
| <i>Oxalis corniculata</i> | Creeping Wood Sorre | Herb | Introduced | Perennial |
| Family : Phyllanthaceae (1) | | | | |
| <i>Phyllanthus emblica</i> | Indian gooseberry | Tree | Native | Perennial |
| Family : Pinaceae (1) | | | | |
| <i>Pinus roxburghii</i> | Pine Tree | Tree | Native | Perennial |
| Family : Plumbaginaceae (1) | | | | |
| <i>Plumbago auriculata</i> | Plumbago | Shrub | Introduced | Perennial |
| Family : Proteaceae (1) | | | | |
| <i>Gravelia robusta</i> | Silver Oak | Tree | Introduced | Perennial |
| Family : Pteridaceae (1) | | | | |
| <i>Pteris vittata</i> | Chinese brake | Herb | Native | Perennial |
| Family : Putranjivaceae (1) | | | | |
| <i>Putranjiva roxburghii</i> | Putranjiva | Tree | Native | Perennial |
| Family : Rhamnaceae (1) | | | | |
| <i>Ziziphus mauritiana</i> | Indian jujube | Tree | Native | Perennial |
| Family : Rosaceae (3) | | | | |
| <i>Eriobotrya japonica</i> | Japanese medlar | Tree | Introduced | Perennial |
| <i>Prunus persica</i> | Peach | Tree | Introduced | Perennial |
| <i>Rosa sps.</i> | Rose | Shrub | Native | Perennial |
| Family : Rubiaceae (2) | | | | |
| <i>Gardenia jasminoides</i> | Gardenia | Shrub | Native | Perennial |
| <i>Hamelia patens</i> | Firebush | Shrub | Introduced | Perennial |
| Family : Ruscaceae (1) | | | | |
| <i>Sansevieria trifasciata</i> | Snake Plant | Herb | Introduced | Perennial |
| Family : Rutaceae (3) | | | | |
| <i>Aegle marmelos</i> | Bael | Tree | Native | Perennial |
| <i>Citrus limon</i> | Lemon | Tree | Native | Perennial |
| <i>Murraya paniculata</i> | Orange Jasmine | Shrub | Native | Perennial |
| Family : Sapindaceae (3) | | | | |
| <i>Koelreuteria elegans</i> | Flamegold | Tree | Introduced | Perennial |
| <i>Sapindus mukorossi</i> | North Indian soapnut | Tree | Native | Perennial |
| <i>Schleichera oleosa</i> | Kusum Tree | Tree | Native | Perennial |
| Family : Sapotaceae (3) | | | | |
| <i>Madhuca latifolia</i> | Indian Butter Tree | Tree | Native | Perennial |
| <i>Manilkara zapota</i> | Sapodilla plum | Tree | Native | Perennial |
| <i>Mimusops elengi</i> | Spanish Cherry | Tree | Native | Perennial |
| Family : Scrophulariaceae (1) | | | | |
| <i>Russelia equisetiformis</i> | Coral plant | Herb | Introduced | Perennial |
| Family : Solanaceae (2) | | | | |
| <i>Cestrum diurnum</i> | Day jasmine | Shrub | Native | Perennial |
| <i>Cestrum nocturnum</i> | Night blooming jasmine | Shrub | Native | Perennial |

| | | | | | |
|-----------------------------------|-------------------------|---------|------------|-----------|--|
| Family : Sterculiaceae (2) | | | | | |
| <i>Pterospermum acerifolium</i> | Maple-leaved Bayur tree | Tree | Native | Perennial | |
| <i>Sterculia alata</i> | Buddha Coconut | Tree | Native | Perennial | |
| Family : Verbenaceae (4) | | | | | |
| <i>Clerodendron splendus</i> | Flaming Glorybower | Climber | Introduced | Perennial | |
| <i>Duranta erecta 'Variegata'</i> | Golden Dewdrop | Shrub | Native | Perennial | |
| <i>Duranta goldiana</i> | Golden Duranta | Shrub | Introduced | Perennial | |
| <i>Lantana camera</i> | Lantana | Shrub | Introduced | Perennial | |
| Family : Zygophyllaceae (1) | | | | | |
| <i>Tribulus terrestris</i> | Yellow Vine | Climber | Native | Perennial | |

Major flora of PGSC is Angiosperms (96%) (Figure 3) which is represented by 19% herbs, 18% shrub, 54% tree species and 9% climbers (Figure 4).

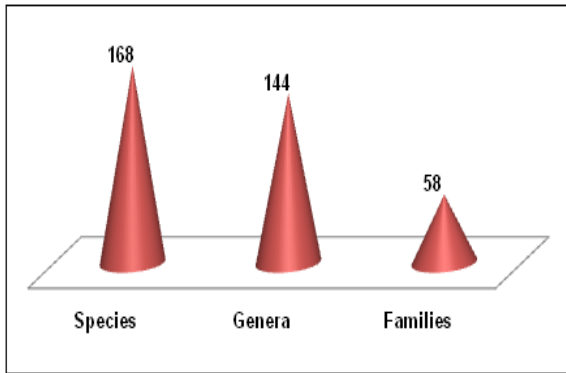


Fig. 2. Number of Species, Genera and Families.

The detailed list is at Table 1. The most dominant family of the campus is Fabaceae (25 species), followed by Apocynaceae, Bignoniaceae, Moraceae (9 species each) and Arecaceae (8 species). Similar results have been reported by Sidhu *et al.* (2011) for flora of Panjab University Campus and Kaur (2014) for Doaba region of Punjab.

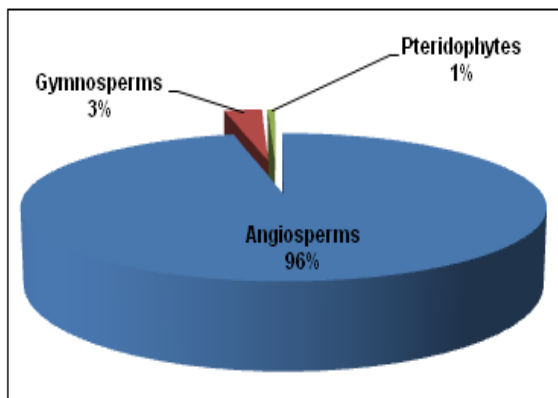


Fig. 3. Distribution of higher plants.

The Dominant genera are *Ficus* (with 7 species), *Cassia* (with 6 species) and *Bauhinia*, *Euphorbia* and *Terminalia* represented 3 species each. Some of these plants have been brought here from different areas of the country & cultivated over here.

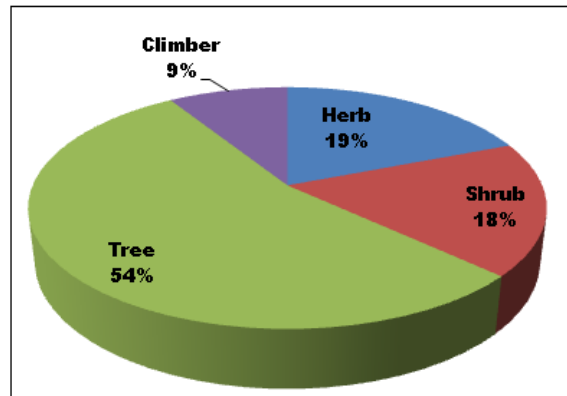


Fig. 4. Habit-wise distribution of plants in the campus.

Out of 168 species documented from the PGSC campus, 92 are of native species while 76 are introduced (Figure 5) as ornamentals.

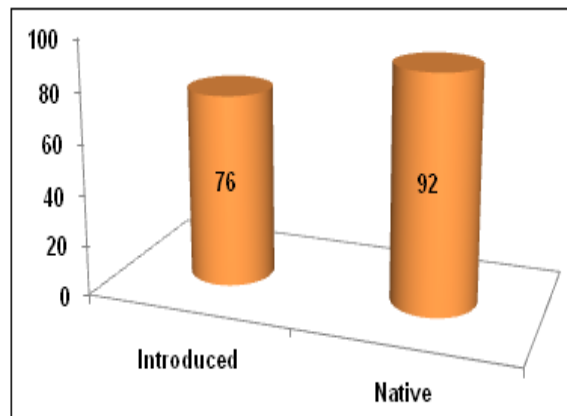


Fig. 5. Status of Native/Introduced Species.

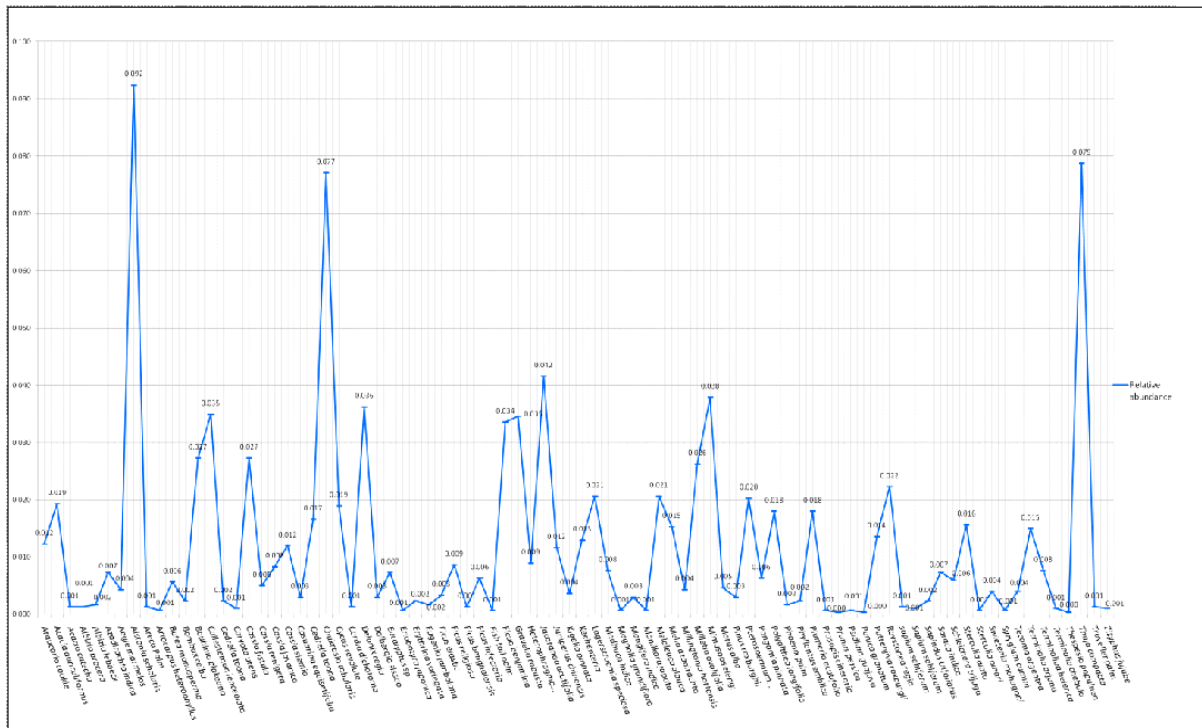


Fig. 6. Relative Abundance of tree species.

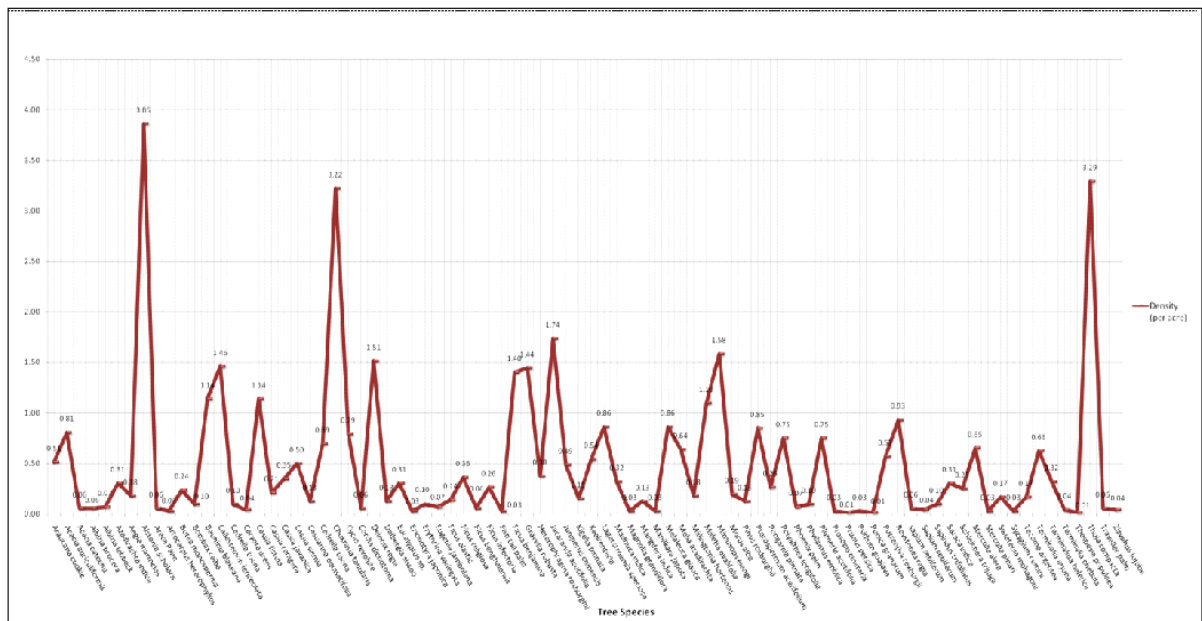


Fig. 7. Distribution Density (per acre) of trees of PGSC campus.

Study on tree species w.r.t. relative abundance & density indicate that *Alstonia scholaris* is the most dominant species with relative abundance of 0.101 and Density of 3.86 per acre followed by *Chukrasia tabularis*, *Jacaranda acutifolia*, *Mimusops elengi*, *Gravelia robusta*, *Ficus benjamina* with relative abundance/density of 0.084/3.22, 0.045/1.74,

0.041/1.58, 0.038/1.44, 0.037/1.40, respectively (Fig. 6 & 7).

Conclusion

Present study deals with the floristic analysis of higher plants of Pushpa Gujral Science City-Kapurthala.

Collected data was tabulated and it shows the presence of 168 species of higher plants belonging to 144 genera and 58 families. The most dominant family of the campus is Fabaceae (25 species), followed by Apocynaceae, Bignoniaceae, and Moraceae (9 species each). Most of the area of the campus is in the form of arboretum, as large number of tree species (54%) are grown in the campus. The biodiversity of the campus hold great potential in term of conservation and in future, any development process is planned according to the vegetation composition in the particular region of the campus. The above study indicates the wide diversity of flora in a small 72 acre area in Kapurthala District of Punjab. Besides the various ecological elements, the area can be effectively used for communicating basic concepts of biodiversity, ecology & sustainable development to the masses, especially students.

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