HSPI The Open Access Publisher

J P S P JOURNAL OF PLANT SCIENCE AND PHYTOPATHOLOGY
ISSN 2575-0135

Research Article

Inventorization and Exploration of Floral Diversity in Metropolitan Cities of India for Their Suitability in Floriculture of Kashmir

Sheikh Abdul Shakoor[1]*, Shoufar Farooq[1], Muskan Tareq[1], Iqra Rashid[1], Uzmeena Amin[1], Tehseen Manzoor[2], Nimra Mukhtar[3], Tabiya Altaf[4], Anjum Tehseen[5] and Nazir Ahmad Malla[1]

[1]Government Degree College, Bijbehara, Kashmir, India
[2]Government Degree College, Kokernag, Kashmir, India
[3]Government Degree College (Women), Nawakadal, Kashmir, India
[4]Islamia College of Science and Commerce, Srinagar, Kashmir, India
[5]Government Degree College, Ganderbal, Kashmir, India

More Information

***Address for correspondence:** Sheikh Abdul Shakoor, Government Degree College, Bijbehara, Kashmir, India, Email: shakoorshiekh9@gmail.com

Submitted: November 08, 2024
Approved: November 15, 2024
Published: November 18, 2024

How to cite this article: Shakoor SA, Farooq S, Tareq M, Rashid I, Amin U, Manzoor T, et al. Inventorization and Exploration of Floral Diversity in Metropolitan Cities of India for Their Suitability in Floriculture of Kashmir. J Plant Sci Phytopathol. 2024; 8(3): 121-130. Available from: https://dx.doi.org/10.29328/journal.jpsp.1001144

Keywords: Union territory; Floral; Ornamental; Diversity; Metropolitan

Abstract

Floriculture is the branch of horticulture that deals with the cultivation and management of flowers and ornamental plants and has blossomed into commercial activity with considerable growth and a useful crop diversification option, particularly for small farmers over the past three decades. It is a global industry with significant economic, social, and aesthetic values. Globally 171 countries practice floriculture. India occupies 51st position in terms of exports and contributes Rs. 455 crores which is 0.06% of global trade.

The present study was carried out during the College on Wheels project organized by the Higher Education Council, Union Territory of Jammu & Kashmir, and was aimed to explore the floral and ornamental plant diversity of major metropolitan cities like Delhi, Goa, Bengaluru, Mumbai, etc. of India for evaluating their suitability for introduction in floriculture of Union Territory of Jammu & Kashmir.

The floral and ornamental plant species were explored, photographed, evaluated, identified, and inventorised. A total of 51 species belonging to 23 different families of floral and ornamental plants were explored and evaluated in terms of parameters like climate, soil type, photoperiod requirements, watering needs, and maintenance requirements for their cultivation. It was found that some of the explored species of ornamental plants were already introduced into the Union Territory of Jammu and Kashmir because the parameters for the successful growth and thriving of these species match with the existing climatic and other conditions in the Union Territory of Jammu and Kashmir. Besides, the climatic and other requirements of some of the explored species were found in conformity with the climatic and other parameters available in the Union Territory of J&K for the successful establishment and growth of plants. Thus, there is an urgent need to introduce these explored species into the region to enhance the floral diversity of ornamental plants, beautify the landscape, and promote tourism and the generation of better livelihood. The Department of Floriculture should take a lead role in this direction to import these floral and ornamental plant specimens from pan India.

Introduction

The term "floriculture" is derived from the Latin words "floris" meaning flower and "cultura" meaning cultivation, emphasizing its core objective of cultivating flowers. Floriculture is the study of the efficient production of plants that produce showy, colorful flowers and foliage for human enjoyment and the human environment. It is a commercially successful branch of horticulture and agriculture throughout the world [1].

Floriculture is an international, multi-billion dollar industry. Aptly named as the 'Sunshine Industry of India', as it offers self-employment and good remuneration for the small and marginal farmers [2].

It includes a wide array of plant species ranging from annuals, biennials, and perennials to trees, shrubs, climbers, and herbaceous perennials [3].

The scope of floriculture is broad and diverse, covering a wide range of flowering crops, including cut flowers, loose flowers, potted plants, bedding plants, shrubs, and avenue trees used for landscaping and gardens. It also involves the production of various ornamental plants such as cacti, succulents, bromeliads, climbers, foliage plants, orchids, and

palms. Additionally, floriculture encompasses the cultivation and management of grasses, ferns, and other flora used in the creation and maintenance of gardens [4].

Floriculture plays a crucial role in enhancing the aesthetic appeal of spaces, whether it be private gardens, public parks, commercial landscapes, or interior spaces. The beauty and fragrance of flowers have a profound impact on the human senses, creating a positive and visually pleasing environment. Flowers also hold cultural and symbolic significance, being used in ceremonies, celebrations, and rituals across different cultures (Dar & Bhat [5].

The significance of floriculture extends beyond the mere cultivation of flowers and plants. It also involves the processing and value addition of floral products, such as essential oils, pigments, and dried flowers, which find applications in perfumery, cosmetics, the food industry, and handicrafts. Floriculture is a highly dynamic and market-oriented industry that caters to the demands of various sectors, including the floral trade, event management, hospitality, and gifting [6].

The practice of floriculture takes place in a variety of settings, ranging from open fields to controlled environments such as greenhouses. With advancements in technology, high-tech floriculture has emerged as a significant aspect of the industry, allowing for year-round cultivation under controlled conditions to meet the demands of both domestic and international markets [7].

Commercially, floriculture is an age-old farming activity in India and has great self-employment opportunities for the poor and marginal Indian farmers. Owing to the diverse climatic conditions in India, there is scope for growing a variety of commercial flowers [8].

J&K is the most colourful state in India and is located between 32°17' and 37°06' North latitude and 73°26' and 80°36' East longitude, falling in the Western Himalayan region of the country.

The state is endowed with ample natural resources including soil, water, diversity in topography, climatic conditions, and rich natural flora facilitating the cultivation of a wide range of flowers [9].

The floriculture is encouraging to generate more employment avenues and many earn foreign exchange. As per official figures, J&K imports around 90% of its flowers from outside states which indicates that till now we are producing only 10% of flowers which clearly determines the need for the domestic production of flowers [10,11].

Keeping in view the importance of Floriculture in employment generation, the present project aimed to explore, inventory, identify, and evaluate the different floral & ornamental plants growing in different metropolitan cities of India for their incorporation in Floriculture of Jammu & Kashmir.

Materials & methods

The floral and ornamental plants of major cities of India were explored, identified, inventoried, and evaluated for their suitability of incorporation in floriculture of Union Territory of J&K. The study was based on the following methodological steps:

Area of study

The present study was undertaken under a special initiative entitled "College on Wheels Programme" organized by the Higher Education Department of Union Territory of J&K in collaboration with the University of Jammu. During the Programme, the college and university students of different universities and their affiliated colleges were taken on board to visit major Indian cities like Delhi, Ahmadabad, Mumbai, Goa, Bengaluru, and Wardha (Figure 1).

The cities cover almost all climate types ranging from temperate to tropical conditions. The present study involves the exploration and inventorization of different floral and ornamental plants in these major cities of India that were visited during the programme.

Exploration of plant specimens

The different floral and ornamental plants of the major cities of India were explored during the visit. Different easily observable parameters of these plants like habitat, habit, phyllotaxy, leaf shape and size, inflorescence, colour of flowers, etc. were recorded.

Photography of plant specimens

The explored plant specimens were photographed using iPhone 13 with a Global Positioning System software extension

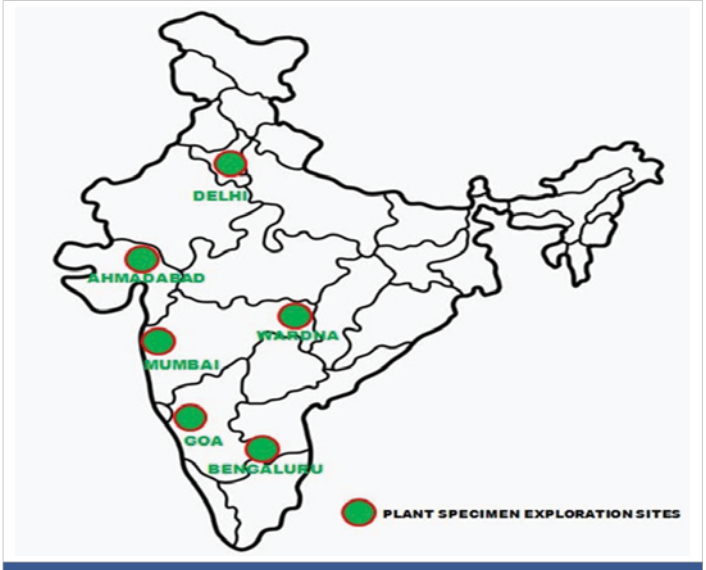

Figure 1: Floral and Ornamental plant specimen exploration sites.

to record the actual location of the plant specimens in terms of their Altitude, latitude, and longitude.

Identification of plant specimens

The photographed plant specimens were identified on the basis of their diagnostic features. The identification of the specimens was further evaluated and unravelled by their character comparison with the information and pictorial representations available in some online databases and floras like Tropicos [12], The Plant list [13], World Flora Online [14] and recently developed eFloraofIndia [15].

Recording of phenology

The phenological parameters of the explored and photographed plant specimens were recorded to evaluate their suitability for incorporation in the floriculture of the Union Territory of J&K.

Layout of photographic plates

The photographed plant specimens were suitably designed and presented in a systematic manner using MS PowerPoint (2007) software. The layout of the photographic plate enhances the presentability as well as the readability of plant specimens.

Statistical analysis

Descriptive statistical analysis of different parameters of the plant specimens explored was carried out using MS Excel (2007). The various steps in methodology have been presented sequentially in the flow chart (Figure 2).

Results

Diversity of taxa

The present study aimed to explore the floral and ornamental plant diversity of major cities of India to evaluate their suitability for introduction in floriculture of the Union Territory of Jammu & Kashmir during the College on Wheels project.

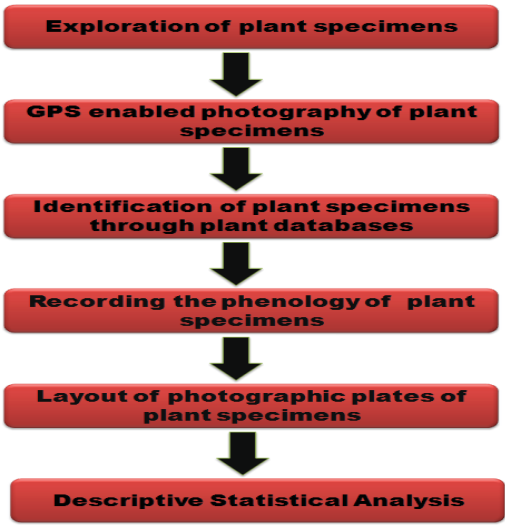

Figure 2: Flow chart of steps in methodology adopted during present study.

A total of 51 species of floral and ornamental plants were explored from different cities during the visit and GPS-enabled photographs of specimens were taken (Figures 3-6).

The majority (50) of the specimens belonged to Angiosperms and a single specimen belonged to Gymnosperms. Further, specimens belonged to 23 different families, 22 families from Angiosperms and 1 family, Aurucariaceae from Gymnosperms (Figure 7). The maximum number of specimens (6) were from the family Asparagaceae followed by Apocynaceae and Araceae with (four) 4 specimens from each family (Figure 6). The genera *Bougainvillea*, *Dracaena,* and *Hibiscus* were the most abundant genera with three species each while the genus Chrysanthemum was represented by two species (Table 1).

Similarly, the plant specimens belonged to all the habit types ranging from herbs, and shrubs to trees. The majority of specimens were herbs (45%) followed by shrubs (41%) and trees (14%) (Figure 8).

As per the life span analysis, the specimens were either annuals or perennials with perennials alone contributing 75% of the total specimens (Figure 9).

The area-wise distribution of the specimens explored showed that the major specimens were explored from Delhi and Goa with a percent value of 27% each followed by Goa & Wardha with a percent value of 14%. The least number of samples were explored from Mumbai with a percent value of 2% (Figure 10).

Phenology of explored plant taxa

The various phonological parameters like climate, soil type, photoperiod requirements, watering needs, and maintenance requirements of explored floral and ornamental plant specimens from different cities of visit were tabulated after through literature review (Table 2). From Table 2, it is clear that the majority of the explored plant species grow in the temperature and humidity range of 25 °C to 35 °C and 40 to 60% respectively. Similarly, the majority of species grow in a pH range of 5.5 to 7.0 and require moderate maintenance and watering once a week. Additionally, the majority of species require a photoperiod of 6 to 8 hours.

The status of the explored plant species was investigated through an extensive literature review (Table 3). It is clear from the tabulated data that the majority of explored plant species have not been reported or introduced in the Union Territory of Jammu & Kashmir. The explored species of floral and ornamental plants that have been reported in the Union Territory of Jammu & Kashmir have been reported from Jammu region of the Union Territory. However, some of the species like *Chrysanthemum indicum*, *C. grandiflorum*, *Combretum indicum,* etc have been reported from both the regions of the Union Territory of Jammu & Kashmir.

Figure 3: Photographs of explored floral & ornamental plants. *Chrysanthemum indicum* (a) *Pentas lanceolata* (b) *Senna surattensis* (c) *Bougainvillea glabra* (d) *Hymenocallis littoralis* (e) *Furcrea foetida* (f) *Chrysanthemum grandiflorum* (g) *Ixora coccinea* (h) *Dracaena fragrans* (i) *Calliandra surinamensis* (j) *Dracaena angustifolia* (k) *Spathiphyllum blandum* (l) *Bougainvillea glabra* (m) *Coleus decurrens* (n) *Tecoma stans* (o) *Combretum indicum* (p) *Catharanthus roseus*(q-r) *Adenium obesum* (s) *Celosia dracula*(t).

Figure 4: Photographs of explored floral & ornamental plants. *Cordia sebestena* (a) *Baeleria cristata* (b) *Ixora chinensis* (c) *Hippeastrum striatum*(d) *Lantana camara* (e) *Nerium oleander* (f) *Plumeria obtuse* (g) *Ipomoea pes-caprae* (h) *Canna indica* (i) *Cordyline fruticosa* (j) *Alocasia macrorrhizos* (k) *Caladium bicolor* (l) *Agave vivipara* (m) *Philodendron burle-marxii* (n) *Dieffenbachia seguine* (o) *Codiaeum variegatum* (p).

Figure 5: Photographs of explored floral & ornamental plants. *Jatropha integerrima* (a) *Hibiscus fragilis* (b) *Bougainvillea spectabilis* (c) *Draconian fragrans* (d) *Cuphea hyssopifolia* (e) *Asystasia gangetica* (f) *Turnera ulmifolia* (g) *Cosmos caudatus* (h) *Hibiscus schizopetalus* (i) *Tradescantia spathacea* (j) *Iresine diffusa* (k) *Hibiscus sabdariffa* (l) *Tabernaemontana divaricata* (m) *Euphorbia tirucalli* (n) *Dieffenbachia seguine* (o) *Araucaria heterophylla* (p).

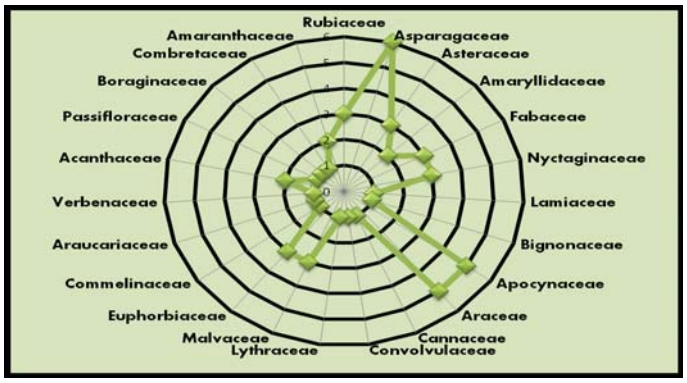

Figure 6: Family wise distribution of explored floral and ornamental plant specimens.

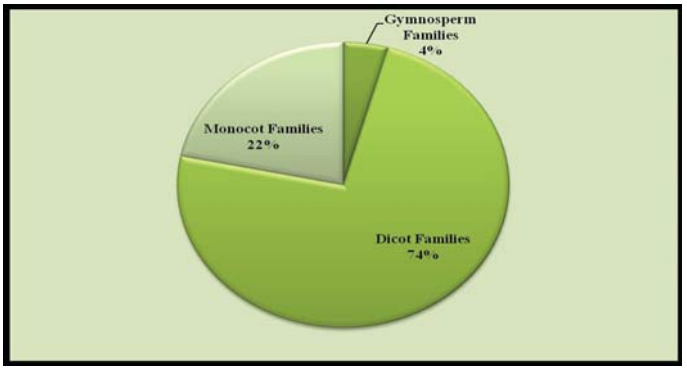

Figure 7: Plant group wise distribution of explored floral and ornamental plant specimens.

Discussion

India is one of the seventeen megadiverse nations of the world harbouring 8.1% of global species including 45000 plant species [16]. The present study was an attempt to explore the floral and ornamental plants that are used in Floriculture and Landscape Gardening in major cities of India. During the study, different plant species belonging to gymnosperms as well as angiosperms were explored. The majority of the plants explored were from angiosperms possibly because angiosperms are more diverse and abundant than gymnosperms as well as due to the presence of attractive habits and variously colored showy flowers [17]. A number of ornamental flowering trees, shrubs, climbers, annuals, biennials, herbaceous perennials, bulbous plants, and others were introduced into the state from England and other European countries, mainly by the Englishmen, civil servants and individual amateurs [18].

The union territory is endowed with ample natural resources including soil, water, diversity in topography, climatic conditions, and rich natural flora facilitating the cultivation of a wide range of flowers (Gupta, 2019). This diversity in parameters like temperature and pH ranges along with the photoperiod requirements offer a scope for the introduction of the species from the explored cities to the

Table 1: List of species of different ornamental and floral plants explored in different cities of India.

S.No.	Name of the species	English name	Family	Habit	Life Span	Location	Fig. No.
1	*Chrysanthemum indicum*	Indian chrysanthemum	Asteraceae	Herb	Annual	Delhi	1a
2	*Pentas lanceolata*	Egyptian star clusture	Rubiaceae	Herb	Annual	Delhi	1b
3	*Senna surattensis*	Glsscy shower	Fabaceae	Tree	Perennial	Delhi	1c
4	*Bougainvillea glabra*	Bougainvillea	Nyctaginaceae	Tree	Perennial	Delhi	1d
5	*Hymenocallis littoralis*	Beach spider lilly	Amaryllidaceae	Herb	Annual	Delhi	1e
6	*Furcrea foetida*	Mauritius hump	Asparagaceae	Herb	Perennial	Delhi	1f
7	*Chrysanthemum grandiflorum*	Mums or Chrysanths	Asteraceae	Herb	Annual	Delhi	1g
8	*Ixora coccinea*	Jangal geranium	Rubiaceae	Herb	Perennial	Delhi	1h
9	*Dracaena fragrans*	Cornstalk dracaena	Asparagaceae	Shrub	Perennial	Delhi	1i
10	*Calliandra surinamensis*	Powder puff plant	Fabaceae	Tree	Perennial	Delhi	1j
11	*Dracaena angustifolia*	Rainbow tree	Asparagaceae	Herb	Perennial	Delhi	1k
12	*Spathiphyllum blandum*	Peace lilly	Araceae	Herb	Annual	Delhi	1l
13	*Bougainvillea glabra*	Bougainvillea	Nyctaginaceae	Shrub	Perennial	Delhi	1m
14	*Coleus decurrens*	Coleus	Lamiaceae	Herb	Annual	Delhi	1n
15	*Tecoma stans*	Yellow bells	Bignoniaceae	Shrub	Perennial	Ahmadabad	1o
16	*Combretum indicum*	Rangoon creeper	Combretaceae	Shrub	Perennial	Ahmadabad	1p
17	*Catharanthus roseus*	Madagascar periwinkle	Apocynaceae	Herb	Perennial	Ahmadabad	1q-r
18	*Adenium obesum*	Desert rose	Apocynaceae	Shrub	Perennial	Nagpur	1s
19	*Celosia dracula*	Wool flower	Amaranthaceae	Herb	Annual	Ahmadabad	1t
20	*Cordia sebestena*	Geranium tree	Boraginaceae	Tree	Perennial	Mumbai	2a
21	*Baeleria cristata*	Philippine violet	Acanthaceae	Shrub	Perennial	Wardha	2b
22	*Ixora chinensis*	Chinese ixora	Rubiaceae	Shrub	Perennial	Goa	2c
23	*Hippeastrum striatum*	Stripped Barbados Lily	Amaryllidaceae	herb	Annual	Goa	2d
24	*Lantana camara*	Lantana	Verbenaceae	Shrub	Perennial	Goa	2e
25	*Nerium oleander*	Oleander	Apocynaceae	Shrub	Perennial	Goa	2f
26	*Plumeria obtusa*	Frangipani	Apocynaceae	Tree	Perennial	Goa	2g
27	*Ipomoea pes-caprae*	Bayhops	Convolvulaceae	Herb	Perennial	Goa	2h
28	*Canna indica*	Indian shot	Cannaceae	Herb	Perennial	Goa	2i
29	*Cordyline fruticosa*	Cabbage palm	Asparagaceae	Shrub	Perennial	Goa	2j
30	*Alocasia macrorrhizos*	Giant taro	Araceae	Herb	Perennial	Goa	2k
31	*Caladium bicolor*	Angel wings	Araceae	Herb	Perennial	Goa	2l
32	*Agave vivipara*	Garden sisal	Asparagaceae	Herb	Perennial	Goa	2m
33	*Philodendron burle-marxii*	Philodendron Burle Marx	Araceae	Herb	Perennial	Goa	2n
34	*Dieffenbachia seguine*	Dumb cane	Araceae	Herb	Perennial	Goa	2o
35	*Codiaeum variegatum*	Variegated croton	Euphorbiaceae	Shrub	Perennial	Goa	2p
36	*Jatropha integerrima*	Peregrina	Euphorbiaceae	Shrub	Perennial	Ahmadabad	3a
37	*Hibiscus fragilis*	Mandrinette	Malvaceae	Shrub	Perennial	Wardha	3b
38	*Bougainvillea spectabilis*	Great bougainvillea	Nyctaginaceae	Shrub	Perennial	Ahmadabad	3c
39	*Draconian reflexa*	Song of India	Asparagaceae	Shrub	Perennial	Bengaluru	3d
40	*Cuphea hyssopifolia kunth*	Elfin Herb	Lythraceae	Herb	Annual	Bengaluru	3e
41	*Asystasia gangetica*	Chinese violet	Acanthaceae	Herb	Annual	Wardha	3f
42	*Turnera ulmifolia*	Ramgoat dashalong	Passifloraceae	Shrub	Perennial	Wardha	3g
43	*Cosmos caudatus*	Sulphur cosmos	Asteraceae	Herb	Annual	Wardha	3h
44	*Hibiscus schizopetalus*	Coral hibiscus	Malvaceae	Shrub	Perennial	Bengaluru	3i
45	*Tradescantia spathacea*	Moses-in-the-cradle	Commelinaceae	Herb	Perennial	Bengaluru	3j
46	*Iresine diffusa*	Jubas-bush	Amaranthaceae	Shrub	Annual	Bengaluru	3k
47	*Hibiscus sabdariffa*	Indian-sorrel	Malvaceae	Shrub	Perennial	Wardha	3l
48	*Tabernaemontana divaricata*	Crape-jasmine	Apocynaceae	Shrub	Perennial	Wardha	3m
49	*Euphorbia tirucalli*	Milkbush	Euphorbiaceae	Shrub	Annual	Nagpur	3n
50	*Calliandra haematocephala*	Powderpuff tree	Fabaceae	Tree	Perennial	Bengaluru	3o
51	*Araucaria heterophylla*	Cook's pine	Araucariaceae	Tree	Perennial	Bengaluru	3p

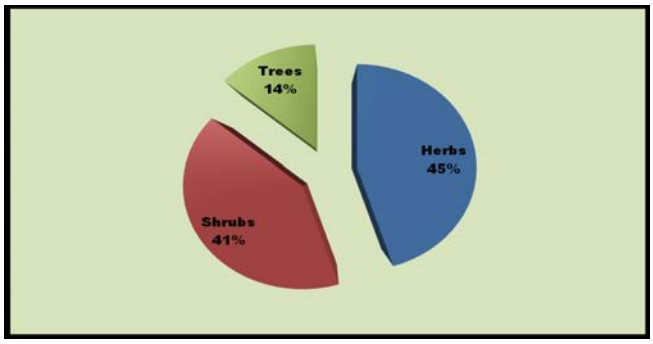

Figure 8: Habit wise distribution of explored floral and ornamental plant specimens.

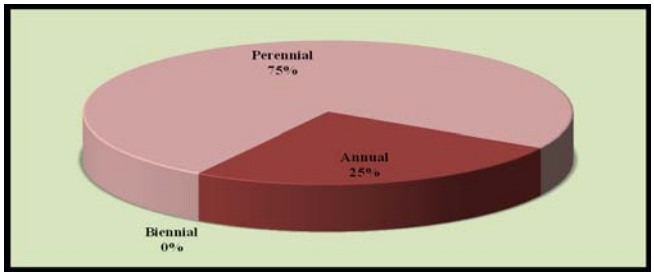

Figure 9: Lifespan wise distribution of explored floral and ornamental plant specimens.

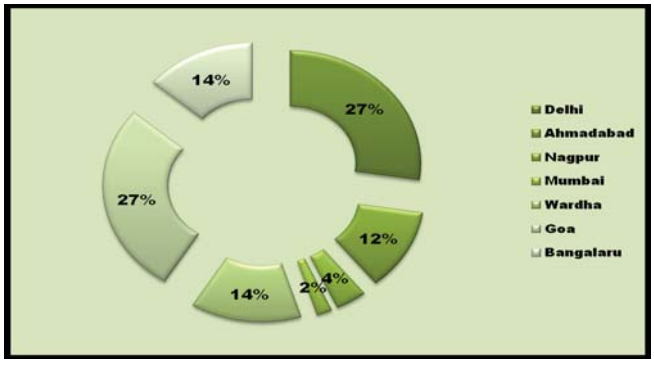

Figure 10: Area-wise distribution of explored floral and ornamental plant specimens.

union territory of J&K. The evaluated parameters of explored species particularly the temperature and pH ranges match with the existing parameters in Jammu and Kashmir. This is the main reason that some of the explored floral and ornamental plant species of the present study have been reported either in the Jammu or Kashmir region of Union Territory or in both regions.

Additionally, we are living in the era of global climate change during which we have witnessed the shifting of climatic regions [19]. Shifting of climatic regions offers an opportunity to test the floral plants beyond their normal tolerance ranges in terms of their establishment and growth. Therefore, there is an urgent need to harness this global climatic change for the introduction and better adaptability of the plants of different climatic regions. However, in Kashmir regions, we witness snowfall and chilling winters that may hamper the growth of the introduced plants during the winters. This can be overcome by the use of polygreen houses during the winter season. The government should provide suitable floriculture infrastructural facilities to floriculturists like high-tech poly-green houses so that diverse germplasm of floral and ornamental plants can be evaluated for their successful establishment and growth for incorporation into the floriculture of the Union territory of Jammu and Kashmir [6].

Besides, The Department of Floriculture should have to take a lead role in this direction to import floral and ornamental plant specimens from pan India. This shall not only help in promoting tourism but shall also help in engaging youth in this enterprise for their better livelihood.

Table 2: Phenological parameters of Explored Floral and Ornamental species.

S. No.	Name of the Species	Climate	Soil Type	Sunlight Requirement	Watering Need	Maintenance Requirement
01.	*Chrysanthemum indicum*	15 ^{0}C - 20 ^{0}C 30% - 40% humidity	Rich in organic matter 5-6.5 pH	8-10 hours	Once a week	Moderate maintenance
02.	*Pentas lanceolata*	25 ^{0}C- 30 ^{0}C 30% - 40% humidity	Gritty soil 6-7 pH	7-9 hours	Occasional watering	Moderate maintenance
03.	*Senna surattensis*	25 ^{0}C – 35 ^{0}C 40% - 50% humidity	Moist soil 6.5-7 pH	6 hours	3-4 times a week,	Moderate maintenance
04.	*Bougainvillea glabra*	13 ^{0}C - 24 ^{0}C 40% - 50% humidity,	Sandy soil can grow in all pH	6-9 hours	Once per week	Moderate maintenance
05.	*Hymenocallis littoralis*	24 ^{0}C – 25 ^{0}C Normal room humidity	Fertile soil with a pH of 6-7.	8 hours	Once per week	Low maintenance
06.	*Furcrea foetida*	25 ^{0}C – 32 ^{0}C, best suited to humid tropical climate	Moderately fertile with a pH of 6-8.	6-9 hours	Needs good rainfall and good drainage system.	Moderate maintenance
07.	*Chrysanthemum grandiflorum*	28 ^{0}C – 38 ^{0}C 50% humidity	fertile soil rich in organic content pH of 6-8.	6-8 hours	3-4 times a week	Moderate maintenance
08.	*Ixora coccinea*	15 ^{0}C – 20 ^{0}C, High humidity	Rich in organic matter 5-6.5 pH	8-10 hours	Once a week	Moderate maintenance

09.	*Dracaena fragrans*	Drought tolerant, as low as 25^0 F, semi-humid	Gritty soil, 6-7 pH	6-9 hours	Once in two weeks	Moderate maintenance
10.	*Calliandra surinamensis*	28 ^{0}C – 40 ^{0}C 40% - 50% humidity	Moist soil, 6.5-7 pH	6 hours	3-4 times a week	.Moderate maintenance
11.	*Dracaena angustifolia*	13 ^{0}C - 24 ^{0}C, 40% - 50% humidity	Sandy soil can grow in all pH	6-8 hours	Once per week	Moderate maintenance
12.	*Spathiphyllum blandum*	24 ^{0}C – 25 ^{0}C, normal room humidity	Fertile soil 6.5-7 pH	8 hours	Once per week	Low maintenance
13.	*Bougainvillea glabra*	25 ^{0}C -32 ^{0}C, humid tropical climate	Moderately fertile soil 6.5-8.5 pH	8 hours	Once per week	Moderate maintenance
14.	*Coleus decurrens*	28 ^{0}C – 40 ^{0}C 50% humidity	Fertile Soil 6.5-7 pH	6-8 hours	Twice per week	Moderate maintenance
15.	*Tecoma stans*	28 ^{0}C – 40 ^{0}C 50% humidity	Slightly acidic soil 5.5–6 pH	6 hours	Once per week	Regular maintenance
16.	*Combretum indicum*	20 ^{0}C – 30 ^{0}C 50% – 70% humidity	Moderately fertile soil 6-7 pH	6-8 hours	Once in a month	Low maintenance
17.	*Catharanthus roseus*	25 ^{0}C – 32 ^{0}C, 90% - 95% humidity	Rocky soil 6-8 pH	6-9 hours	Once per week	Low maintenance
18.	*Adenium obesum*	25 ^{0}C – 35 ^{0}C normal room humidity	Fertile Soil 6-7 pH	6 hours	Once per week	Low maintenance
19.	*Celosia dracula*	18 ^{0}C – 27 ^{0}C 40% - 50% humidity	Loamy soil 5-8 pH	6 hours	Twice per week	Moderate maintenance
20.	*Cordia sebestena*	18 ^{0}C – 27 ^{0}C 40% -50% humidity	Moist soil 6.0-7.5pH	6-8 hours	Twice per week	Moderate maintenance
21.	*Baeleria cristata*	25 ^{0}C – 35 ^{0}C prefer humid environment	Sandy Loam to Clay Loam 5.5 -6.5 pH	5-8 hours	Twice per week	Low maintenance
22.	*Ixora chinensis*	At least 18 ^{0}C,	Fertile soil 6-6.5. pH	5-8 hours	Once per week	High maintenance
23.	*Hippeastrum striatum*	16 ^{0}C – 24 ^{0}C	6-6.5 pH	6-8 hours	Once per week	Low maintenance
24.	*Lantana camara*	20 ^{0}C -30 ^{0}C	Acidic soil 6-6.5 pH	8-10 hours	Once per week	Low maintenance
25.	*Nerium oleander*	20 ^{0}C – 35 ^{0}C	Acidic soil 5.5-6.5 pH	6-8 hours	Once per week	Low maintenance
26.	*Plumeria obtusa*	20 ^{0}C – 25 ^{0}C, 45% - 50% humidity	Humiferous, and light soil. 5.5 - 7.5 pH	6 hours	Once per week	Low maintenance
27.	*Ipomoea pes-caprae*	hot and humid climates	5.0–5.5 pH	8-10 hours	Twice per week	Moderate maintenance
28.	*Canna indica*	20 ^{0}C – 35 ^{0}C 50% to 60% humidity	Loamy soil 5.7 - 6.3 pH	6-8 hours	Once per week	Moderate maintenance
29.	*Cordyline fruticosa*	23 ^{0}C – 28 ^{0}C	Sandy to clay soil 5.6–6.5 pH	6-8 hours	Twice per week per month.	Moderate maintenance
30.	*Alocasia macrorrhizos*	25 ^{0}C – 35 ^{0}C 50% to 60% humidity	Fertile soil 5.5 - 7 pH	6-9 hours	Once per week	Moderate maintenance
31.	*Caladium bicolor*	25 ^{0}C - 35 ^{0}C 30% to 50% humidity	Sandy and slightly acidic Soil	6-8 hours	Once per week	Low maintenance
32.	*Agave vivipara*	24 ^{0}C – 35 ^{0}C 50 to 60% humidity	neutral to acidic pH	6-8 hours	Once per week	Moderate maintenance
33.	*Philodendron burle-marxii*	24 ^{0}C – 35 ^{0}C 40 to 60% humidity	5.5-6.5 pH	6-8 hours	Once per week	Moderate maintenance
34.	*Dieffenbachia seguine*	24 ^{0}C – 35 ^{0}C	Grow in acidic-alkaline, sandy and loamy soils.	6-8 hours	Once per week	Low maintenance
35.	*Codiaeum variegatum*	25 ^{0}C – 35 ^{0}C 20% - 30% humidity	slightly acidic soil	5-7 hours	Once per week.	Low maintenance
36.	*Jatropha integerrima*	25 ^{0}C – 35 ^{0}C 20% - 40% humidity	slightly acidic soil	6-8 hours	Once per week.	Moderate maintenance
37.	*Hibiscus fragilis*	25 ^{0}C – 35 ^{0}C 20% - 40% humidity	Sandy soil 6 pH	4-6 hours	Once per week.	Moderate maintenance
38.	*Bougainvillea spectabilis*	tropical to semi-tropical climates	well-drained, gritty soil.	6 hours	Once per week.	Moderate maintenance
39.	*Draconian reflexa*	loves warm climates	Slightly acidic soil 5.5 -6.5 pH	6-8 hours	Once per week	Low maintenance

40.	*Cuphea hyssopifolia kunth*	Tropical and sub-tropical climates	Clay to sandy soil 4.5-6.5 pH	6-8 hour	Once per week	Low maintenance
41.	*Asystasia gangetica*	18 ^{0}C – 30 ^{0}C	Slightly acidic soil 5.5-6.5 pH	6-8 hour	Once per week	Low maintenance
42.	*Turnera ulmifolia*	25 ^{0}C – 40 ^{0}C	Loamy to Sandy Soil 6-8 pH	6-8 hour	Once per week	Low maintenance
43.	*Cosmos caudatus*	25 ^{0}C – 35 ^{0}C	Slightly acidic soil 5–6.5 pH	6-8 hour	Once per week	Moderate maintenance
44.	*Hibiscus schizopetalus*	25 ^{0}C – 35 ^{0}C	6-8 pH	6-8 hour	Once per week	Low maintenance
45.	*Tradescantia spathacea*	18^{0}C – 30^{0}C	6-8 pH	6-8 hour	Twice per week	High maintenance
46.	*Iresine diffusa*	20 ^{0}C – 35 ^{0}C	Loam and sandy soil 5.5-6.5pH	6-8 hour	Once per week	Moderate maintenance
47.	*Hibiscus sabdariffa*	21^0 to 24 ^{0}C	6-7 pH	4-6 hour	Once per week	High maintenance
48.	*Tabernaemontana divaricata*	25 ^{0}C – 35 ^{0}C	5.5-8.6 pH	6-8 hour	Once per week	High maintenance
49.	*Euphorbia tirucalli*	20^0 – 32 ^{0}C,	6.-7.5 pH	6-8 hour	Once per week	Low maintenance
50.	*Calliandra haematocephala*	20^0 to 36 ^{0}C,	Loamy soil 7-9 pH	6-8 hours	Once per week	High maintenance
51.	*Araucaria heterophylla*	25^0 to 35 ^{0}C 40% humidity,	Clayey 6-8 pH	6 hours	Once per week	Low maintenance

Table. 3: Status of explored floral & ornamental plant species in Jammu and Kashmir.

S.No.	Name of the species	Status in Jammu and Kashmir	
		Jammu	Kashmir
1	*Chrysanthemum indicum*	Reported	Reported
2	*Pentas lanceolata*	Not reported	Not reported
3	*Senna surattensis*	Reported	Not reported
4	*Bougainvillea glabra*	Reported	Not reported
5	*Hymenocallis littoralis*	Not reported	Not reported
6	*Furcrea foetida*	Not reported	Not reported
7	*Chrysanthemum grandiflorum*	Reported	Reported
8	*Ixora coccinea*	Not reported	Not reported
9	*Dracaena fragrans*	Not reported	Not reported
10	*Calliandra surinamensis*	Reported	Not reported
11	*Dracaena angustifolia*	Not reported	Not reported
12	*Spathiphyllum blandum*	Not reported	Not reported
13	*Bougainvillea glabra*	Reported	Not reported
14	*Coleus decurrens*	Not reported	Not reported
15	*Tecoma stans*	Not reported	Not reported
16	*Combretum indicum*	Reported	Reported
17	*Catharanthus roseus*	Reported	Not reported
18	*Adenium obesum*	Not reported	Not reported
19	*Celosia dracula*	Reported	Not reported
20	*Cordia sebestena*	Reported	Not reported
21	*Baeleria cristata*	Reported	Reported
22	*Ixora chinensis*	Not reported	Not reported
23	*Hippeastrum striatum*	Not reported	Not reported
24	*Lantana camara*	Reported	Not reported
25	*Nerium oleander*	Reported	Not reported
26	*Plumeria obtusa*	Not reported	Not reported
27	*Ipomoea pes-caprae*	Reported	Reported
28	*Canna indica*	Not reported	Not reported
29	*Cordyline fruticosa*	Not reported	Not reported
30	*Alocasia macrorrhizos*	Not reported	Not reported
31	*Caladium bicolor*	Reported	Reported
32	*Agave vivipara*	Not reported	Not reported
33	*Philodendron burle-marxii*	Not reported	Not reported
34	*Dieffenbachia seguine*	Not reported	Not reported
35	*Codiaeum variegatum*	Not reported	Not reported
36	*Jatropha integerrima*	Reported	Not reported
37	*Hibiscus fragilis*	Not reported	Not reported
38	*Bougainvillea spectabilis*	Not reported	Not reported
39	*Draconian reflexa*	Not reported	Not reported
40	*Cuphea hyssopifolia kunth*	Not reported	Not reported
41	*Asystasia gangetica*	Not reported	Not reported
42	*Turnera ulmifolia*	Not reported	Not reported
43	*Cosmos caudatus*	Not reported	Not reported
44	*Hibiscus schizopetalus*	Not reported	Not reported
45	*Tradescantia spathacea*	Reported	Reported
46	*Iresine diffusa*	Not reported	Not reported
47	*Hibiscus sabdariffa*	Not reported	Not reported
48	*Tabernaemontana divaricata*	Reported	Not reported
49	*Euphorbia tirucalli*	Not reported	Not reported
50	*Calliandra haematocephala*	Not reported	Not reported
51	*Araucaria heterophylla*	Reported	Reported

Conclusion

Floriculture is an international, multi-billion dollar industry. Aptly named as the 'Sunshine Industry of India', as it offers self-employment and good remuneration for the small and marginal farmers. Keeping in view the importance of floriculture in employment generation, the present project aimed to explore, inventory, identify, and evaluate different floral and ornamental plants that are used in Floriculture and Landscape Gardening in major cities of India for their suitability of introduction in Floriculture of Jammu & Kashmir.

During the study, a total of 51 different species belonging to 23 different families of angiosperms and gymnosperms were explored and identified. The species were evaluated in terms of their phonological parameters so as to ascertain their suitability for introduction and establishment in floriculture of the Union Territory of Jammu & Kashmir.

The explored plant species revealed more or less uniform requirements of phenological parameters like climate, soil type, photoperiod requirements, watering needs, and

maintenance requirements. These phenological parameters match with the existing conditions in the Union Territory of Jammu and Kashmir enabling some of the explored floral and ornamental plant species of the present study to thrive in the Jammu or Kashmir region of the Union Territory or in both regions. There is an urgent need to introduce the rest of the explored species into the region so as to evaluate their establishment which shall not only enhance the landscape of the Union Territory but shall also help in promoting tourism and the generation of better livelihood among the common masses. The Department of Floriculture should take a lead role in this direction to import floral and ornamental plant specimens from pan India.

Acknowledgement

The authors are highly thankful to the Jammu and Kashmir Higher Education Council (JKHEC) and the University of Jammu for organizing this unique "College on Wheels" programme for students. We are also thankful to the Director Colleges (UT of J&K) and Nodal Principal Kashmir Division for our selection.

The mentor is highly thankful to the Principal GDC, Bijbehara for support and encouragement.

The GDC, Bijbehara is also thankful to the parents of the students for allowing them to participate in the project.

References

1. Saiema A, Wani MA, Singh H. Economic viability of floriculture in Kashmir Himalayas: A geographical study of Greater Srinagar. J Hum Soc Sci. 2017;22:66-71. Available from: https://iosrjournals.org/iosr-jhss/papers/Vol.%2022%20Issue10/Version-3/J2210036671.pdf

2. Paswan MK. Marketing of flowers: A case study of Bansphatak flower market. Department of Agricultural Economics, BHU: Varanasi. 2015.

3. Desh Raj. Floriculture at a glance. In: Importance of ornamental horticulture. Ludhiana: Kalyani Publishers; 2016;17.

4. Raina V, Nain MS, Sharma R, Khajuria S, Kumbhare NV, Bakshi M. Floriculture in Jammu and Kashmir: Performance, problems and prospects. J Pharmacogn Phytochem. 2007;1:287-293. Available from: https://www.phytojournal.com/special-issue/2017.v6.i6S.2584/floriculture-in-jammu-and-kashmir-performance-problems-and-prospects

5. Dar AA, Bhat MA. Marketing challenges of horticulture sector in Jammu and Kashmir: A case study of district Pulwama. Nat J Multidiscip Res Dev. 2018;3(1):1144-1146. Available from: https://newresearchjournal.com/assets/archives/2018/vol3issue1/3-1-337-744.pdf

6. Chawla SL, Patil S, Ahlawat TR, Agnihotri R. Present status, constraints and future potential of floriculture in India. In: Patel NL, Chawla SL, Ahlawat TR, editors. Commercial Horticulture. New Delhi: New India Publishing Agency; 2016. p. 29-38. Available from: https://www.researchgate.net/publication/311910156_Present_Status_Constraints_and_Future_Potential_of_Floriculture_in_India

7. Datta SK. Present status of research on floriculture in India. Int J Life Sci. 2019;8:71-93. Available from: http://dx.doi.org/10.5958/2319-1198.2019.00006.X

8. Choudhary ML. Flowers for trade. In: Sheela VL, editor. Flowers for Trade. Vol. 10. New Delhi: New India Publishing Agency; 2008. Available from: https://books.google.co.in/books/about/Flowers_for_Trade.html?id=RGa2VeA8HiMC&redir_esc=y

9. Zeerak NA, Wani SA. Diversity of irises from Kashmir Himalaya. J Ornamental Hortic. 2007;10(2):115-118. Available from: https://www.indianjournals.com/ijor.aspx?target=ijor:joh&volume=10&issue=2&article=009

10. Khuroo AA, Irfan R, Reshi Z, Wafai BA. The alien flora of Kashmir Himalayas. Biol Invasions. 2007;9:269-292. Available from: https://link.springer.com/article/10.1007/s10530-006-9032-6

11. Gupta SK. Floriculture scenario in district Udhampur, Jammu & Kashmir. J Agroecol Nat Resour Manag. 2019;6:207-209. Available from: https://krishisanskriti.org/vol_image/13Mar2020090355z02%20%20%20%20Sanjeev%20Kumar%20Gupta%20%20%20%20%20207-209.pdf

12. Tropicos.org. Missouri Botanical Garden. 14 Nov 2024. Available from: https://tropicos.org

13. The Plant List. Version 1. Published on the Internet. Available from: http://www.theplantlist.org/

14. WFO. World Flora Online. Published on the Internet. Available from: http://www.worldfloraonline.org

15. eFloraofIndia (BSI). Database of plants of Indian Subcontinent. Available from: https://efloraofindia.com/

16. Champion H, Seth SK. A revised survey of forest types of India. New Delhi: Government of India Press; 1968. Available from: https://books.google.co.in/books/about/A_Revised_Survey_of_the_Forest_Types_of.html?id=ZdMsAQAAMAAJ&redir_esc=y

17. Beaulieu JM, Smith S, Leitch IJ. On the tempo of genome size evolution in angiosperms. J Botany. 2010;2010:989152. Available from: https://doi.org/10.1155/2010/989152

18. Sheikh MQ, Bhat ZA, Siddique AMM, Singh KP, Saha TN. Present status and prospects of floriculture in Jammu and Kashmir. ICAR-DFR Bulletin No. 13. ICAR-Directorate of Floricultural Research, College of Agriculture Campus, Shivajinagar, Pune - 411 005 (Maharashtra), India; 2015.

19. Sethi SS, Vinoj V. Urbanization and regional climate change-linked warming of Indian cities. Nat Cities. 2024;1:402-405. Available from: https://www.nature.com/articles/s44284-024-00074-0