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Ornamental Plants and Cut Flower Trade in Biratnagar, Nepal

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Abstract

The study has been carried out to explore the diversity of ornamental plants along with their trade state and cut flower trade in Biratnagar Metropolitan City, Morang, Nepal. The data was collected from September 2021 to March 2022 by interviewing nursery owner and staff, cut flower retailers by preparing semi structured questionnaire and secondary data were collected by literature review and books. The study has documented about 90 species of ornamental plants belonging to 54 genera and 27 families, and their trade quite good in state. Among all, *Chalathea ornata, Chamaendorea elegans, Dracaena angolensis, Monstera adansoni, Gymnocalcium mihanvichii, Neprolepis exaltata, Curio herreanus* etc. were highest price, whereas *Petunia axillaris, Petunia integrifolia, Petunia exserta, Chrysanthemum indicum, Dahlia hybrid, Dahlia pinnata* were least expensive. As for cut flowers, nine genera were found and their trade was also in good condition. During off-season, most of the cut flowers are imported from India.

Keywords: Angiosperm, Araceae, Floriculture, Garden plants, Indoor plants.

Introduction

Plants are integral part of human life as well as our surrounding. They serve not only structural elements but also bringing life and adding beauty to the environment. Their beauty has profoundly influenced human culture and evolution making them essential for our survival. (Relf & Lohr, 2003) flowers are inseparable to human beings and are mention numerous times in mythology and religion, indicating their value. In Greek mythology flower often represent youth, beauty, and pleasure, but they can also represent fragility and the abrupt transition from life to death. Egyptian used the blue lotus, the dwarf palm, the papyrus as motives in temples and

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building as early 2800 BC. The famous Babylonian gardens were considered as one of the seven world marvels (Finkel, 1988).

Floriculture is a specialized field of horticulture that involves not only the cultivation of flowers, leaves, climbers, trees, shrubs, cacti, succulents, and other plants, but also their marketing and the manufacturing of value-added goods from them (Sarkar, 2019). Floriculture is special branch of horticulture on producing flowering and foliage plants for decorative use. Now a days, floriculture is emerging as a high-tech, interdisciplinary field of research with a solid scientific foundation. The combined efforts of floriculture scientists have driven its development both scientifically and commercially. As a rapidly growing and competitive industry, floriculture is expanding quickly, with scientific method of flower cultivation techniques driving its growth in different regions around the world (Datta, 2019).

Ornamental plants or garden plants are plants that are primarily grown for their beauties. Ornamental plants are defined as plants produced for decorative purpose in gardens, home gardens, landscape design projects, square, parks, street trees, interior plants and cut flower in the broadest sense (Li & Zhou, 2005; Oloyede, 2012). Ornamental plants elicit "pleasant feelings" and provide a sense of "well-being," that is why we preserve urban parks, surround our homes with gardens, and consider flowers to be the most common gift for weddings, births, birthdays, and funerals (Kravanja, 2006; Hopkins, 2007; van den Eynden, 2013).

Cut flowers are components of plants, which typically include the blooms or inflorescences and certain plant materials that are linked to the plant but do not include the roots or soil. In addition to being used as gifts on special occasions like Mother's Day and Valentine's Day, fresh cut flowers are also utilized as decorations for formal events like bouquets and vase arrangements, wedding and funeral arrangements, and times of illness (Gauchan et al., 1970).

Flowers are used in many aspects of life, including greetings, marriages, and funerals, as well as religious activities, primarily among Buddhists and Hindus. Flowers have an important part in human life by enhancing the atmosphere and serving as a representation of sentiments, and the majority of perfumes used around the world are made from oils of Jasmin and Roses (Zeb et al., 2007).

Nepal holds significant potential in the cut flower industry, but the country struggles to produce enough flowers to meet market demand. To advance floriculture, substantial contributions from the public sector and government are essential (Gauchan et al., 1970). Flowers have long been used by Nepalese to present deity and goddess, as a garland to deities or fellow humans, or as a floral decoration during festivals. As a result, while flower cultivation and consumption in Nepal may date back to time immemorial, cut flower industry in Nepal is relatively new (Pun, 2019). Commercial cut flower production in Nepal began in the late 1980s. Mr. Rajendra Rai, an educationist by profession and a keen gardener, was Nepal's first commercial cut flower grower. Mr. Rai began working on parijat in 1988 (Pun, 2007).

Different studies have been carried out to assess the business of ornamental plants and cut flower all over the world including Nepal. Such as in Indonesia (Efawati & Harmon, 2018), India

(Shreeram & Leelavati, 2017; Sarkar, 2019), South Africa (Reinten et al., 2011), Sri Lanka (Padmini & Kodagoda, 2017) and Nepal (Chhetri, 1999; Anonymous, 2002; Gauchan et al., 2010; Pun, 2019). Although some medicinal plants have been studied (Paudel et al., 2018), no research on ornamental plants has been reported from Biratnagar. Therefore, considering this gap, a study was designed to assess the diversity of ornamental plants and cut flower trade as well as the status and development of floriculture trade in Biratnagar Metropolitan City, Morang district of Nepal.

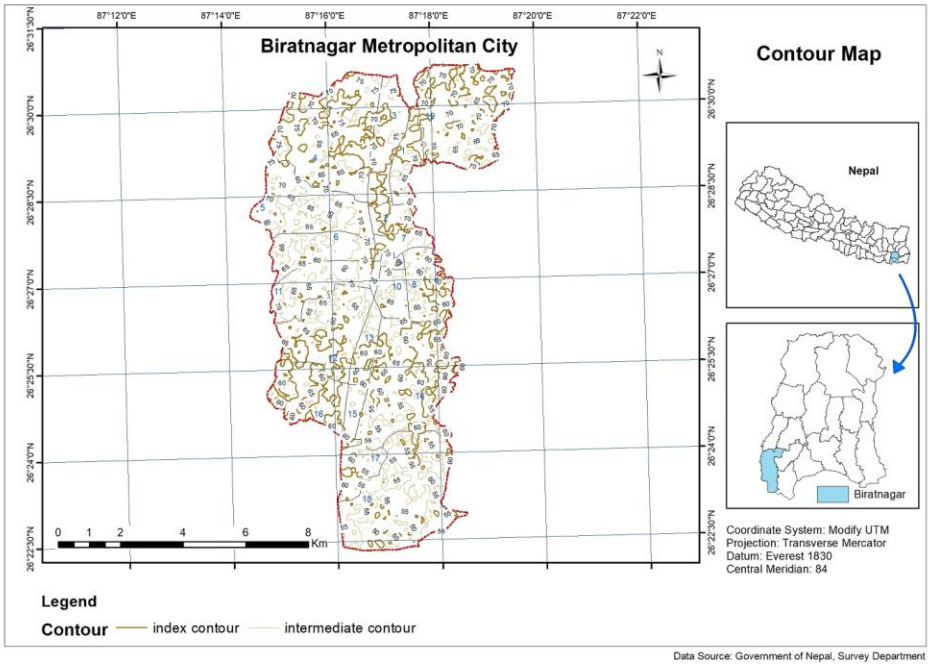
Methods and Materials

Study Area

Biratnagar Metropolitan deceives in the Morang district of Koshi Province in eastern Nepal (Fig. 1).The city is located in the south-west corner of Morang district at latitudes of $26^0$23' – $26^0$30' N and longitudes of $87^0$14' – $87^0$18' E. The city is bounded on the west and north by the Kesalia River, on the east by the Singhiya River, and Biratnagar Metropolitan deceives in the Morang district, of eastern Nepal (Fig. 1).The city is on the south by Jogbani (India). It was established on May 22, 2017. This city is located at an elevation of 80 meters above sea level. The climate is warm and temperate, with an annual temperature of 24.2°C. The annual rainfall averages roughly 1670mm. The city comprises of 19 Administrative Wards and the population of Biratnagar is 244,750 (Population Census, 2021) and the population density is 3200 km^2.

Figure1

Map of Biratnagar Metropolitan city, Morang.



(Source: https://biratnagarmun.gov.np/sites/biratnagarmun.gov.np/files/gallery/Contour%20map.jpg).

Data collection

The research was carried out in the Biratnagar Metropolitan City from September to November, 2021. The data for this study were gathered from both primary and secondary sources. Information on the diversity of ornamental plants and cut flowers, as well as popular varieties, was obtained from secondary sources by reviewing related floriculture literature, as well as from nursery owners and retailers. Data were gathered in two ways: through a review of related literature (Llamas, 2003) and the distribution of questionnaires to people involved in various aspects of the ornamental plant and cut flower business. Several questionnaires were prepared, and people who were actively involved in this business were interviewed.

During these visits the information was collected for knowing the varieties of ornamental plants like cactus, marigold, roses, dahlia, gerbera, lucky bamboo, salvia ornamental fern etc. and the cut flowers, including carnations, gladiolus, gerberas, and roses. Information was obtained through in-person interviews and visits to local nurseries, wholesalers, and other retail establishments.

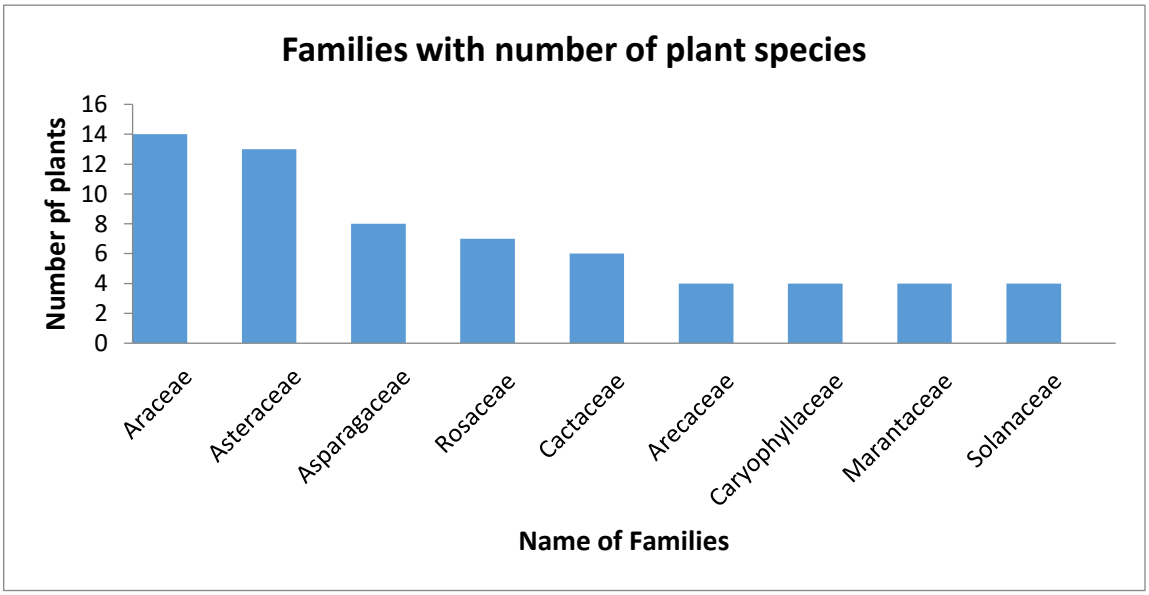
Results and Discussion

Ornamental plants

In the present study, legally established 11 floriculture (Horticulture) nurseries and 11 cut flower shops were recorded. The nurseries are responsible for the production of ornamental plants, while cut flower shops fulfill the demand of cut flower in the study area. Total 90 species of plants which belongs to 54 genera and 28 families of ornamental plants has been reported. The highest number of species (14 species) is represented by Family Araceae which is followed by Asteraceae (13 species), Asparagaceae (8 species) etc. as shown on bar diagram. Commenlinaceae, Utricaceae, Begoniaceae etc. have least species number which is not included in table.

Figure 2

Highest number of Family with Species



The study reported 90 species of ornamental plants belongs to 54 genera and 28 families. The families are arranged on the basis of Angiosperm Phylogeny Group (APG IV 2016) and generic and species are arranged in alphabetical order. The common name, price per plant and sources of ornamental plants are shown on the table 1.

Table1

List of ornamental plants, APG IV number, family, common name, price and source

S. N.	Scientific name	APG IV	Family	Common name	Price (Rs.)	Source (Import)
1	*Aglaoniema commutatum* Schott	28	Araceae	Pink aglonima	350	India
2	*Aglaonima modestum* Schott	28	Araceae	Chinese evergreen	350-550	India
3	*Aglaoniema widuri* Shott	28	Araceae	Red peacock	450	India
4	*Alocasia sanderiana* (Schott) G.Don	28	Araceae	kris plant	250	Brt, India
5	*Anthurium andraeanum* Schott	28	Araceae	Flamingo lily/Painters palette	350-1250	Brt, India
6	*Caladium bicolor* (Aiton) Vent.	28	Araceae	Heart of Jesus	500	Brt, India
7	*Dieffenbachia seguine* (Jacq.) Schott	28	Araceae	dumb cane	250	Brt, India
8	*Epipremnum aureum* (Linden & André)	28	Araceae	Golden photos	250-8000	Brt, India
9	*Monstera adansoni* Schott	28	Araceae	Adansons monstera	1250	Brt, India
10	*Monstera deliciosa* Liebm.	28	Araceae	Monstera	400-1500	India
11	*Philodendron birkin* Schott	28	Araceae	White wave	450	India
12	*Singunium podophyllum* Schott	28	Araceae	Arrowhead plant	350	Brt, India
13	*Spathiphyllum cochlearispathum* (Leibm.)Engl	28	Araceae	Peace lily	350	Brt, India
14	*Zamioculcas zamiifolia* (Lodd)Engl.	28	Araceae	Zanzibar gem	350-550	India
15	*Orchid spp*	61	Orchidaceae	Sunakhari	3000	India
16	*Chlorophytum comosum* (Thunb.) Jacques	74	Asparagaceae	Spider plant	150-250	Brt, India
17	*Dracaena angolensis* (Welw. ex Carrière) Byng & Christenh	74	Asparagaceae		1250	Brt, India
18	*Dracaena marginata* L	74	Asparagaceae	Dragon tree	350	Brt, India
19	*Dracaena reflexa* Lam	74	Asparagaceae	son of India	150-250	Brt, India
20	*Dracaena sanderiana* Mast.	74	Asparagaceae	Lucky bamboo	550-7500	Brt, India
21	*Dracaena trifasciata* (Prain) Mabb.	74	Asparagaceae	snake plant	350-650	Brt, India
22	*Yucca angustissima Engelm. ex Trel*	74	Asparagaceae	Narrow leaf Yucca	1750	India
23	*Yucca filamentosa* L	74	Asparagaceae	Adams needle	450	Brt, India
24	*Chamendorea elegans* Mart	76	Arecaceae	Bamboo palm	750	Brt, India

25	*Dypsis lutescens* (H.Wendl.) Beentje & J.Dransf.	76	Arecaceae	Areca	250-400	Brt, India
26	*Livistona chinensis* (Jacq.) R.Br. ex Mart.	76	Arecaceae	Chinese fan palm	150	Brt, India
27	*Pheonix* L	76	Arecaceae	Palm tree	550	Brt, India
28	*Tradescantia zebrina (Schinz) D. R. Hunt*	78	Commenlinaceae	Zebrina pendula	450	Brt, India
29	*Calathea makoyana*(É.Morren) Borchs. & S.Suárez	87	Marantaceae	Peacock plant	350-550	Brt, India
30	*Calathea orbifolia* (Linden) H.Kenn.	87	Marantaceae	Round leaf plant	350-550	Brt, India
31	*Calathea ornata* (Linden) Borchs. & S.Suárez	87	Marantaceae	Pin-stripe	2500	India
32	*Calathea zebrina* (Sims) Lindl.	87	Marantaceae	Zebra plant	350-650	Brt, India
33	*Cupressus macrocarpa* Wilma	98	Cupressaceae	Golden Cypress	250-550	Brt, India
34	*Juniperus chinensis* L	98	Cupressaceae	Juniper/ ball dhupi	250	Brt, India
35	*Thuja occidentalis* L	98	Cupressaceae	White cedar	250	Brt, India
36	*Echeveria desmetiana* De Smet	130	Crassulaceae	Mexican peacock	1250	India
37	*Echeveria elegans* De Smet	130	Crassulaceae	Mexican gem	1250	India
38	*Rosa chinensis* Jacq.	143	Rosaceae	Mutabilis	180	Brt, India
39	*Rosa grandiflora*	143	Rosaceae	Iceberg	150	Brt, India
40	*Rosa hybrida*	143	Rosaceae		1500	India
41	*Rosa indica* Tratt.	143	Rosaceae	Rose	150	Brt, India
42	*Rosa 'KORbin'*	143	Rosaceae	Rose lime	200	Brt, India
43	*Rosa polyanta* Thunb	143	Rosaceae	Lovely fair	250	India
44	*Rosa santana*	143	Rosaceae	Red climbing rose	250	Brt, India
45	*Ficus elastica* Roxb. ex Hornem.	150	Moraceae	Rubber plant	450	Brt, India
46	*Ficus lyrata Warb.*	150	Moraceae	Fiddle leaf fig	150-600	Brt, India
47	*Ficus retusa* L.	150	Moraceae	Indian laurel	1250	India
48	*Pilea microphylla* (L.) Liebm.	151	Utricaceae	Artillery plant	350-550	Brt, India
49	*Begonia coccinea* Hook	166	Begoniaceae	Scarlet begonia	350	India
50	*Euphorbia pulcherrima* Willd. ex Klotzsch	204	Euphorbiaceae	Lalupate/poinsetia	250	Brt, India
51	*Pelargonium zonale* (L.) L'Hér. ex Aiton	212	Geraniaceae		70	Brt, India
52	*Pelargonium × hortorum* L.H.Bailey	212	Geraniaceae		70	Brt, India
53	*Pelargonium inquinans* (L.) L'Hér.	212	Geraniaceae		80-350	Brt, India
54	*Muraya paniculata* (L.) Jack	241	Rutaceae	Orange jasmine	800-2500	Brt, India

55	*Hibiscus rosa-sinensis* L	247	Malvaceae	Gibre Flower	150-250	Brt, India
56	*Brassica oleraceae* L	274	Brassicaceae	Kale/Ornamental cabbage	50-150	Brt, India
57	*Dianthus barbatus* L	295	Caryophyllaceae	carnation/ sweet willium	35-70	Brt, India
58	*Dianthus caryophyllus* L	295	Caryophyllaceae	Pink clove	75	Biratnagar
59	*Dianthus chinenssis* L	295	caryophyllacae	Rainbow pin	70	Biratnagar
60	*Dianthus gratianopolitanus* L	295	Caryophyllaceae	Cedar pink	80	Biratnagar
61	*Bougainvillea glabra* Choisy	308	Nyctaginaceae	Paper Flower	150-300	Brt, India
62	*Bougainvillea spectabilis* Willd	308	Nyctaginaceae		250	Brt, India
63	*Parodia magnifica* (F.Ritter) F.H.Brandt	314	Cactaceae	ball cactus	250	Brt, India
64	*Cereus repandus* Mill	314	Cactaceae	Perupian apple	450	Brt, India
65	*Cylindropuntia fulgida* Engelm.	314	Cactaceae	Jumping cholla	550	Brt, India
66	*Echinocactus grusoni* Hildm	314	Cactaceae	Golden barrel cactus	550-1200	Brt, India
67	*Echinopsis calochlora K.Schum.*	314	Cactaceae	ball cactus	550	Brt, India
68	*Gymnocalycium mihanovichii* (Fric ex Gürke) Britton & Rose	314	Cactaceae	Moon cactus	1250	Brt, India
69	*Ixora coccinea* L	352	Rubiaceae	Jungle geranium	100-400	Brt, India
70	*Petunia integrifolia* (Hook.) Schinz & Thell.	360	solanaceae	Garden petunia	35-80	Brt, India
71	*Petunia axillaris* L	360	solanaceae	Garden petunia	35-80	Brt, India
72	*Petunia exserta* Stehm	360	solanaceae	Garden petunia	35-80	Brt, India
73	*Petunia inflata* R.E.Fr.	360	solanaceae	Garden petunia	35-80	Brt, India
74	*Pyrostegia venusta* (Ker Gawl.)Miers	378	Bignoniaceae	Flame vine venusta	225-350	Brt, India
75	*Salvia coccinea*Buc'hoz ex Engl.	383	Lamiaceae		70	Brt, India
76	*Calendula meritima Guss. (Giovanni Gussone)*	403	Asteraceae	Sea marigold	100-150	Brt, India
77	*Tagetes erecta* L	403	Asteraceae	Marigold	100-250	Brt, India
78	*Calendula officinalis* L.	403	Asteraceae	Pot marigold	350	Brt, India
79	*Chrysanthemum indicum* L.	403	Asteraceae		70	Brt, India
80	*Chrysanthemum morifolium*	403	Asteraceae	Godawari	40-70	Brt, India
81	*Curio herreanus H.Jacobsen & P.V.Heath*	403	Asteraceae	Strings of watermelon	1250	India
82	*Dahlia hybrida*	403	Asteraceae	Laure flower	35-70	Brt, India
83	*Dahlia pinnata* Cav.	403	Asteraceae	Laure flower	25-70	Brt, India
84	*Gazania linearis* (Thunb.) Druce	403	Asteraceae	Treasure flower	100-250	Brt, India
85	*Gazania rigens* L	403	Asteraceae		150-250	Brt, India

86	*Gerbera aurantiaca* Sch.Bip	403	Asteraceae	Hilton daisy	100-250	Brt, India
87	*Gerbera jamesonii* Bolus ex Hooker	403	Asteraceae	Barbaton daisy	70-250	Brt, India
88	*Gerbera viridifolia* (DC.) Sch.Bip.	403	Asteraceae		70-250	Brt, India
89	*Aralia elata (*Miq.) Seem.	414	Araliaceae	Angelica	350-500	India
90	*Nephrolepis exaltata* (L.) Schott		Nephrolepidaceae	Bostern fern	1250	India

Cut flower:

All together 11 cut flower shops have been recorded in the study area. According to cut flower shop owner/ retailers, most of the cut flowers were imported from nearby cities of India such as Siliguri and Kolkata. Some of cut flowers were imported from different district of Nepal such as Kathmandu, Sunsari and Dhankuta. During seasonal time the demand of cut flowers was full field by local flower grower but during unseasonal time, most of the cut flowers were imported from India by paying high cost.

Table 2

List of cut flower shop and their location

S.N.	The name of cut flower shop	Location
1.	Ram Sita Flower and Decoration	Saat Ghumti, Biratnagar
2.	New Siligudi Flower Decoration	Main road, Biratnagar-7
3.	Maa Pathibhara Flower decoration	Main road, Biratnagar-7
4.	Siligudi Flower Decoration	Main road, Biratnagar-7
5.	Maa Serawali Flower and Decoration	Main road, Biratnagar-9
6.	Maa Durga Flower and Decorator	Main road, Biratnagar-8
7.	New kalkatta Flower and Decorator	Main road, Biratnagar
8..	Saraswati Flower Decorator	Main road, Biratnagar-7
9.	Jay Maa Kali Flower Decorator	Main road, Biratnagar-9
10.	Radha Krishna Flower and Decoration	Main road, Biratnagar-7
11.	Jay Maa Laxmi Flower Decorator and Shivum Tent House	Main road, Biratnagar-9

Table 3

List of cut flower with their price and source (import)

S.N	Name of cut flower	Price (NRs)/plant	Source (Import)
1.	Carnation	20-30 per piece	Brt, Ktm,India
2.	Chrysanthemum	20-30 per piece	Brt, Ktm,India
3.	Dahlia	20-30 per piece	Brt, Ktm,India
4.	Gerbera	40-60 per piece	Brt, Ktm,India
5.	Gladiolus	30-40 per stick	India
6.	Gypsy	100 per bundle	India

7.	Rose	20-80 per piece	Brt, Ktm,India
8.	Tagates (marigold)	40-60 per garland	Brt, Ktm,India
9.	Tuberose	20-25 per stick	India
10.	Cherry gold + marigold	60 per garland	Brt, Ktm,India
11.	Cherry gold + rose	300 above per garland	India
12.	Rose + Tuberose	750 above per garland	India
13.	Booke	300-350 per piece	Nepal/India
14.	Basket	400-600 per piece	Nepal/India

(Note: Brt.= Biratnagar; Ktm.= Kathmandu)

The study identified 11 legally registered cut flower shops and 11 floriculture (horticulture) nurseries within the research area. The cut flower shops are in charge of meeting the demand for cut flowers, while nurseries focus on cultivating ornamental plants. A total 90 plant species were documented in the region, representing 54 genera and 28 families. The families with highest number of species were Asteraceae (13 species), Asparagaceae (8 species), and Araceae (14 species). In contrast, families like Commenlinaceae, Utricaceae, Begoniaceae, and other were represented by fewer species.

Biratnagar, as one of Nepal's largest and most industrially developed cities, is well-placed to lead the ornamental and cut flower trade. The region's favorable climate, with ample sunlight and moderate rainfall, supports the growth of various plant species, including both indigenous and exotic varieties. Popular ornamental plants cultivated in and around Biratnagar include marigolds, roses, and chrysanthemums, as well as foliage plants such as ferns, palms, and succulents. In recent years, there has been a rise in indoor plants like snake plants and ZZ plants, which are preferred for their resilience and air-purifying qualities. The ornamental plant and cut flower trade in Biratnagar, Nepal, is a growing sector that holds significant promise for local economic development and cultural enrichment. Over recent years, demand for ornamental plants and fresh flowers has surged due to increasing urbanization, rising interest in interior and landscape design, and the cultural importance of flowers in Nepalese rituals and festivals. This trend has led to the establishment of nurseries, flower farms, and retail outlets across Biratnagar, contributing to both employment opportunities and the city's aesthetic appeal.

Despite these positive developments, the ornamental and cut flower industry in Biratnagar faces several challenges. A major issue is the lack of adequate infrastructure for flower preservation and cold storage facilities, which results in significant post-harvest losses. Flowers are perishable and require careful handling and timely transportation to retain their freshness. Without efficient supply chain mechanisms, many traders struggle to meet the demands of the market, particularly during peak seasons. Furthermore, limited access to high-quality seeds, fertilizers, and technical knowledge restricts the potential for improved yields and the diversification of plant varieties. By addressing these infrastructural and knowledge deficiencies, Biratnagar has potential to emerge as a leading floricultural hub in Nepal, driving both economic growth as well as aesthetic enhancement in the region.

Conclusions

The study has documented altogether about 90 species and 54 genera of ornamental plants belonging to 27 families. This exploration of floriculture business is the first attempt to record the ornamental plants diversity and cut flower trade in Biratnagar, Nepal. The present study shows that, people can get any varieties of ornamental plants according to their will with reasonable price from nurseries. Whenever we need cut flower for wedding, birthday party and other celebrations, we can easily obtain them from cut flower shop at a reasonable price. So, the floriculture business is in fairly good condition, but a significant issue is that most cut flowers and new varieties of ornamental plants (hybrids) are imported from India. If local communities or others in our country were to cultivate these plants, it could significantly reduce the financial losses caused by importing large quantities of cut flowers and ornamental plants from abroad. While the floriculture business is lucrative profession, but due to limited knowledge of modern cultivation technology for production of ornamental and cut flower and insufficient of government support, they lag behind other agricultural sectors.

To improve the local economy and enhance the economic status of local people, the government can play a significant role by promoting the floriculture business. This can be achieved through organizing educational seminars and workshops on modern technology, by offering low-interest loans to farmers and entrepreneurs in the floriculture sector can provide them with the necessary financial support to start or expand their businesses and by encouraging and facilitating the export of floriculture products. By providing these facilities, the government can significantly boost the floriculture industry, leading to improved livelihoods for local communities and overall economic growth of the country.

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Appendix A Photographs