Inventory of plant species in commercial plant nurseries and home gardens of Ilam and Jhapa districts of Nepal

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Abstract

Globally, exotic plants form a major part of the ornamental horticulture industry. A survey was conducted in some commercial nurseries and home gardens of Ilam and Jhapa districts of Nepal to understand the diversity of plant species. This study focused on the composition of different types of ornamental plants (trees, shrubs, herbaceous perennials, herbaceous annuals, cacti and succulents). The plants composition varied among commercial nurseries or home gardens. However, among trees, the availability of tree types in commercial nurseries was either fruit or ornamental trees. However, in home garden, domination was of fruit trees. Overall, domination of exotic species in all types of plants was observed in commercial nurseries as well as in home gardens of both the districts.

Keywords: Plants, exotic, nurseries, home gardens

Introduction

Floriculture industry of Nepal began as an organized sector from early 1990s after the formation of Floriculture Association of Nepal (FAN). The sector, until the formation of FAN, was mostly represented by palace gardeners. In the early 1990s, the local nurseriesmostly grew few annuals and depended on the supply of herbaceous annuals, herbaceous perennials, shrubs and sometimes trees from Indian suppliers (Pun, 1997). Three decades later, the industry has been consistently making a steady growth (Pun et al., 2019) with a sudden setback in 2020. However, the industry still depends on the importation of planting materials for cut flowers, seed for annuals, herbaceous perennials, shrubs and trees. In 1990s, the import of ornamental plants was contributing about 90 percent of the local demand (Pun, 1997) and in 2020s, the import of ornamental plants is still high and ranges around 50 percent.

Globally, exotic ornamental plants dominate the ornamental horticulture industry because it represents 75 percent of the plants in homes and 93 percent in botanical gardens (van Kluenen et al., 2018). The spread was more intense during the 17th and 18th century (van Kluenen et al., 2018) and most naturalized and invasive

alien plant species were originally introduced for horticulture purposes (Haeuser et al., 2018). In Nepal, the trend may be similar, but the status of exotic species and native species in the local landscape is not studied yet. This research is focused on assessing the composition of plants in commercial nurseries or private home gardens of the Ilam (temperate) and Jhapa (tropical) districts of Province1. This is to the knowledge of the authors is the first study of its kind in the country.

Materials and Methods

The present study was carried between November 2020 to January 2021 to identify the composition of plant species in the commercial plant nurseries and home gardens of Ilam and Jhapa district of Province no 1.Primary information was collected from the 10 commercial nurseries and 22 home gardens by using the standard set of a semi-structured questionnaire. The information regarding the composition of plant species based on their aesthetic and functional uses, growth habit, life cycle and origin were collected. The composition of plants is categorized as trees, shrubs, herbaceous perennials, herbaceous annuals, cacti and succulents. Furthermore, the ratio of exotic and native species in each group of plants was also compared. Secondary information was collected from the desk study and publication of Floriculture Association Nepal (FAN), Floriculture Development Centre (FDC) and journal articles. The collected data were tabulated, examined and analyzed. Data analysis was carried out by using Microsoft excel 2016and analyzed data were presented on their average value. The results were interpreted based on primary information and assisted by secondary information.

Results and Discussion

Composition of different species of plants in nurseries:

Nurseries of Jhapa were found to have a wider range of tree and herbaceous perennial types as compared with Ilam (Table 1). The average number of trees in Jhapa nurseries was 27.6 types as compared with 9.5 types in Ilam. Similarly, average number of herbaceous perennials was 15.6 types in Jhapa as compared with 10.7 types in Ilam. In contrast, Ilam nurseries were found to have a wider range of cacti and succulent than Jhapa. The average number of Cacti in Ilam was 8 types as compared with 1.3 types in Jhapa. Similarly, average number of succulents was 7.2 types in Ilam as compared with 0.6 types in Jhapa. The variation in shrubs and herbaceous was similar in these districts.

In Ilam district, tree, shrub and herbaceous perennials types of plants had similar variation (average 7.2 to 10.7 types) whereas herbaceous annual, cacti and succulents had similar variation (7.2 to 8.2 types) (Table 1). In contrast, in Jhapa, very high variation was observed in trees (27.6 types), herbaceous perennials (15.6 types), shrubs (10.1 types) followed by herbaceous annual (8.3 types). The least variation was observed in cacti (1.3 types) and succulents (0.6 types). The availability of a higher variety of trees and herbaceous perennial in Jhapa nurseries are most likely because the nurseries are older, and more people buy plants in a warmer urban area for landscaping. However, in Ilam nurseries, it was interesting to find higher varieties of cacti and succulent which perhaps could be influenced by the massive cultivation and availability of cacti and succulent in the Darjeeling district of India. Besides, cacti and succulents have huge variation, beautiful and easy to maintain.

Table 1: Composition of different species of plants in nurseries of Ilam and Jhapa (2020/21)

Ilam	Tree	Shrub	Herbaceous perennial	Herbaceous annual	Cacti	Succulents
1	13	11	16	10	10	10
2	8	10	6	7	5	6
3	10	13	12	9	9	7
4	7	7	9	7	8	6
Average	**9.5**	**10.2**	**10.7**	**8.2**	**8.0**	**7.2**
Jhapa						
1	32	11	21	10	1	1
2	37	13	22	12	2	1
3	39	12	22	11	3	1
4	15	8	4	2	0	0
5	22	10	14	9	1	1
6	21	7	10	6	1	0
Average	**27.6**	**10.1**	**15.6**	**8.3**	**1.3**	**0.6**

Composition of different species of plants in home gardens of Ilam and Jhapa:

Ilam home gardens had a wider variation of cacti (3.2 types:0.7 types) and succulents (3.6 types:0.3 types) than Jhapa home gardens (Table 2). Similarly, slightly more variation was observed in Ilam home gardens in trees (4.3 types) and herbaceous annuals (4.8 types) whereas Jhapa home gardens had a slightly higher variation of herbaceous perennials. Shrubs were found in similar number in home gardens of both the districts (5.3 types:5.7 types).

In Ilam home gardens, maximum variation was observed in shrub (5.3 types), herbaceous annual (4.8 types), herbaceous perennial (4.4 types), Tree (4.3 types), succulent (3.6 types) and cacti (3.2 types). However, in Jhapa home gardens, maximum variation was observed in shrub (5.7 types), herbaceous perennial (5.4 types),herbaceous annual (3.3 types) and tree (2.9 types). The variation in cacti and succulents was low and was found 0.7 types and 0.3 typesrespectively. The Ilam home garden owners preferred to have more trees than their counterparts in Jhapa although there was more availability of tree types in Jhapa. The preference of cacti and succulent by Ilam home garden owners could be influenced by its beauty, minimum maintenance and less need for water. The higher plant diversity (preference of more tree types, cacti and succulents) in the Ilam home garden plays an important role as indicators regarding urban biodiversity (Cengiz et al.,2007).

Table 2: Composition of different species of plants in home gardens of Ilam and Jhapa (2020/21)

Ilam	Tree	Shrub	Herbaceous perennial	Herbaceous annual	Cacti	Succulent
1	5	6	5	8	5	5
2	5	8	4	5	4	5
3	3	4	5	4	3	5
4	4	5	5	5	3	3
5	5	5	3	5	3	3
6	3	5	4	5	3	3

Ilam	Tree	Shrub	Herbaceous perennial	Herbaceous annual	Cacti	Succulent
7	5	5	4	4	3	3
8	5	4	5	5	3	3
9	4	5	4	4	2	3
10	4	6	5	5	3	3
Average	**4.3**	**5.3**	**4.4**	**4.8**	**3.2**	**3.6**
Jhapa						
1	4	5	9	1	1	0
2	0	1	2	2	2	1
3	2	6	5	1	3	0
4	0	5	4	4	0	0
5	0	2	2	0	0	0
6	1	5	9	4	1	1
7	4	7	6	5	0	0
8	1	8	8	7	1	0
9	8	7	2	1	0	0
10	8	9	5	6	0	1
11	2	5	8	5	1	1
12	5	9	5	5	0	0
Average	**2.9**	**5.7**	**5.4**	**3.3**	**0.7**	**0.3**

Use of trees as fruit, ornamental, religious or economic species in nurseries of Ilam and Jhapa:

Ilam nurseries had less variation of trees used as fruit (4.2 types:7.6 types), ornamental (3.8 types:14.6 types), religious (0.2 types: 1 types) or economic (0.5 types:4 types) than Jhapa nurseries (Table 3). Although, the trend showsthe domination of the use of fruit or ornamental in the nurseries of thedistrict,yet the variation of fruit (7.6 types)and ornamental (14.6 types) was higher in Jhapa. The higher variation of fruit types available in Jhapa could be due to the demand of the people to plant various types of fruit trees and ornamentals. The variation of fruit or ornamental tree was similar in Ilam nurseries whereas in Jhapa nurseries the variation was the highest in ornamental tree. This showed demand for the ornamental tree is more in Jhapa.

Table 3: Use of tree as fruit, ornamental, religious or economic species in nurseries of Ilam and Jhapa (2020/21)

Ilam	Fruit	Ornamental	Religious	Economic
1	8	4	0	1
2	3	3	1	1
3	1	6	0	0
4	5	2	0	0
Average	**4.2**	**3.8**	**0.2**	**0.5**
Jhapa				
1	7	20	0	5

2	9	22	2	4
3	12	21	2	4
4	6	6	1	2
5	6	10	1	5
6	6	11	0	4
Average	**7.6**	**14.6**	**1**	**4**

Use of trees as fruit, ornamental, religious or economic species in home gardens of Ilam and Jhapa:

Ilam home gardens had a higher variation of trees for fruit (3.1 types) whereas home gardens in Jhapa had a higher variation of trees for ornamental (1.7 types) (Table 4). In either district, trees with fruit or ornamental parts were preferred due to the desire of people for beautiful flowering as well as fruit trees in their home garden.

Table 4: Use of tree as fruit, ornamental, religious or economic species in home gardens of Ilam and Jhapa (2020/21)

Ilam	Fruit	Ornamental	Religious	Economic
1	4	1	0	0
2	3	2	0	0
3	3	0	0	0
4	3	1	0	0
5	4	1	0	0
6	2	1	0	0
7	3	1	0	1
8	4	1	0	0
9	3	1	0	0
10	2	2	0	0
Average	**3.1**	**1.1**	**0**	**0.1**
Jhapa				
1	0	4	0	0
2	0	0	0	0
3	0	2	0	0
4	0	0	0	0
5	0	0	0	0
6	0	1	0	0
7	0	4	0	0
8	0	0	1	0
9	3	2	2	1
10	3	3	1	1
11	0	2	0	0
12	2	3	0	0
Average	0.6	1.7	0.3	0.1

Composition of native or exotic species of plant species in commercial nurseries of Ilam and Jhapa:

The composition of exotic species in all types of plants in commercial nurseries was dominant across either district (Table 5). In Ilam, the domination was more in succulent (0.5 types:7.0 types), cacti (0 types:8.0 types), herbaceous annual (0.8 types:8.0 types) and tree (1.5 types:8.5 types) whereas the domination in Jhapa was more in herbaceous perennial (0.8 types:14.5 types), herbaceous annual (0.6 types:7.6 types), shrub (1 types:9.1 types) and tree (5.1 types:22.5 types). The availability of cacti and succulent was more prevalent in Ilam as compared to Jhapa.The domination of exotic species over native species is the scenario of the world (van Kluenen et al., 2018) which is inconsistent with the present finding.In addition to this, the plants in some parks of Kathmandu valley (warm temperate) showed domination of exotic species (Maharjan and Pun, unpublished).

Table 5: Composition of native orexotic species of plant species in commercial nurseries of Ilam and Jhapa (2020/21)

Ilam	Tree		Shrub		Herbaceous perennial		Herbaceous annual		Cacti		Succulent	
	N	E	N	E	N	E	N	E	N	E	N	E
1	211		1	11	2	14	1	9	010		1	9
2	2	6	2	8	2	4	1	6	05		0	6
3	010		2	11	2	10	1	8	09		1	6
4	1	6	2	5	27		07		08		06	
Average	**1.5**	**8.5**	**2.0**	**8.3**	**2.3**	**8.8**	**0.8**	**8.0**	**0.0**	**8.0**	**0.5**	**7.0**
Jhapa												
1	8	24	1	11	0	21	1	9	0	1	0	1
2	5	32	2	11	1	21	1	11	0	2	0	1
3	8	31	2	10	2	20	1	10	0	3	0	1
4	3	12	0	8	0	4	0	2	0	0	0	0
5	3	19	1	9	2	12	1	8	0	1	0	1
6	4	17	0	6	0	11	0	6	0	1	0	0
Average	**5.122.5**		**1**	**9.1**	**0.8**	**14.5**	**0.67.6**		**0**	**1.3**	**0**	**0.6**

N: Native species, E: Exotic species

Composition of native or exotic species of plant species in home gardens of Ilam and Jhapa:

The composition of exotic species in all plant types was dominant across home gardens in either districts (Table 6). In Ilam, the domination was more in cacti (0 types:3.2 types), succulent (0.1 types:3.5 types), herbaceous annual (0.5 types:4.5 types), shrub (0.7 types: 4.6 types) and tree (0.8 types:3.6 types). Similarly, in Jhapa, also domination of exotic plants was more in cacti (0 types:0.7 types), succulent (0 types:0.3 types), shrubs (0.3 types:4.5 types), herbaceous perennial (0.9 types:4.4 types), herbaceous annual (0.6 types:2.6 types) and tree (0.8 types:2.4 types). The domination of exotics in the home garden is due to the preference of people to have something new (exotics) which are not available in nature. Besides, garden books, public gardens, botanical gardens all primarily document and display exotics. There

is no space or very small space for native plants in public gardens or botanical gardens in Nepal. It is thus important to identify beautiful native ornamental plants, domesticate them and introduce them into the landscape (Malla et al., 2017).

Table 6: Composition of native orexotic species of plant species in home gardens of Ilam and Jhapa (2020/21)

Ilam	Tree		Shrub		Herbaceous perennial		Herbaceous annual		Cacti		Succulent	
	N	E	N	E	N	E	N	E	N	E	N	E
1	1	4	1	5	2	3	1	7	05		1	4
2	1	4	1	7	2	2	1	4	04		0	5
3	0	3	1	3	1	4	0	4	0	3	0	5
4	0	4	1	4	2	3	1	4	0	3	0	3
5	0	5	1	4	2	1	0	5	0	3	0	3
6	3	5	0	5	1	3	0	5	0	3	0	3
7	1	4	0	5	2	2	0	4	0	3	0	3
8	1	4	1	3	2	3	1	4	0	3	0	3
9	0	4	0	5	1	3	1	3	0	2	0	3
10	0	4	1	5	0	5	0	5	0	3	0	3
Average	**0.8**	**3.6**	**0.7**	**4.6**	**1.5**	**2.9**	**0.5**	**4.5**	**0**	**3.2**	**0.1**	**3.5**
Jhapa												
1	0	4	1	4	1	8	1	0	0	1	0	0
2	0	0	0	1	0	2	1	1	0	2	0	1
3	0	2	1	5	1	4	0	1	0	3	0	0
4	0	0	0	5	0	4	1	3	0	0	0	0
5	0	0	0	2	0	2	0	0	0	0	0	0
6	0	1	0	5	2	7	1	3	0	1	0	1
7	1	3	1	5	1	5	1	4	0	0	0	0
8	0	1	16		0	8	0	6	0	1	0	0
9	3	5	0	7	1	1	0	1	0	0	0	0
10	2	6	0	8	1	4	1	5	0	0	0	1
11	0	2	0	5	2	6	1	4	0	0	0	1
12	1	4	1	8	2	3	1	4	0	0	0	0
Average	**0.58**	**2.41**	**0.55.25**		**0.91**	**4.5**	**0.67**	**2.67**	**0**	**0.75**	**0**	**0.34**

Conclusion

The variation of plant composition in trees and herbaceous perennials was found much higher in Jhapa than in Ilam. In contrast, variation in plant composition of cacti and succulent was found much higher in Ilam than in Jhapa. Availability and planting of trees were dominated by fruit types in Ilam whereas in Jhapa it was dominated by ornamental types followed by fruit types. Exotic plant species dominated all types of plants at the commercial nurseries as well as home gardens in both the districts. It was important to identify important native ornamental plants, domesticate them and make them available in the market so as to create a proper balance of native species in the private or public landscape.

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