Yuzuncu Yil University
Journal of Agricultural Sciences

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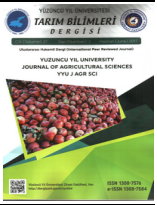

Araştırma Makalesi (Research Article)

Evaluation of Outdoor Ornamental Plants from the Viewpoint of Urban Biodiversity and Cultural Change in Terrestrial Climate: The Case of Nigde City

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Article Info

Received: 13.01.2021
Accepted: 13.09.2021
Online Published: 15.12.2021
DOI: 10.29133/yyutbd.860641

Keywords

Biodiversity,
Home gardens,
Landscape,
Plant species,
Urban Plants.

Abstract: Plant species used in urban settlements play an important role in cultural change and biodiversity determination. In the past, people have used many plant species to beautify their gardens by giving importance to flowering plants. Biodiversity can be determined by using the distribution of flowering plant species that have traditionally been preferred as species and in urban settlements. In this study, when the plants used in the settlement areas were investigated, 132 plant species belonging to 39 families were identified in a total of 200 sample areas. Five different residential areas were evaluated in the study. These can be listed as detached houses, traditional houses, villa houses, site, mass housing. It has been determined that non-natural species are used extensively in the research areas. It is observed that plant species natural plants and containing fruit are given priority in traditional gardens. It has been determined that unnatural species are used in other house types. For the continuity and protection of natural plant species, the garden order of traditional houses has been found more valuable.

Kent Biyoçeşitliliği ve Kültürel Değişim Açısından Dış Mekan Süs Bitkilerinin Değerlendirilmesi: Niğde Kenti Örneği

Makale Bilgileri

Geliş: 13.01.2021
Kabul: 13.09.2021
Online Yayınlanma: 15.12.2021
DOI: 10.29133/yyutbd.860641

Anahtar Kelimeler

Biyoçeşitlilik,
Ev Bahçeleri
Peyzaj,
Bitki Türleri,
Kent Bitkileri.

Öz: Kırsal alanlarda kullanılan bitki türleri, kültürel değişim ve biyoçeşitliliğin belirlenmesinde önemli rol oynamaktadır. Geçmiş dönemlerde, insanlar çiçekli bitkilere önem vermiş ve bahçelerini güzelleştirmek için birçok bitki türleri kullanmışlardır. Biyoçeşitlilik, geleneksel olarak tercih edilmiş olan çiçekli bitki türlerinin dağılımı kullanılarak belirlenebilir. Bu çalışmada, yerleşim alanlarında kullanılan bitkiler incelendiğinde, 200 örnek alanda 39 familyaya ait 132 bitki türü belirlenmiştir. Çalışmada, beş faklı yerleşim alanı değerlendirilmiştir. Bunlar; Müstakil evler, Geleneksel evler, villa evler, site ve toplu konut olarak sıralanabilir. Araştırma alanında doğal olmayan türlerin yoğun olarak kullanıldığı tespit edilmiştir. Geleneksel evlerde öncelikli olarak meyve veren ve doğal türlerin kullanıldığı gözlemlenmiştir. Diğer ev tiplerinde doğal olmayan türlerin kullanıldığı tespit edilmiştir. Doğal bitki türlerin sürekliliği ve korunması için geleneksel evlerin bahçe düzeni daha değerli bulunmuştur.

1. Introduction

For sustainable development, the landscape has recently gained importance and some measures are being developed at a national and global scale. CITES, Convention on Biodiversity (CBD), IUCN (The International Union for Conservation of Nature). It is aimed at the conservation of biological resources, as seen in the conventions on the protection and continuity of many plant species. Some

aromatic and ornamental plants found in nature are used in agriculture, cosmetics, and medical fields. Our negative activities on natural species, recreation and tourism activities, food resources, forest resources, medicine, and energy requirements are among the factors affecting biodiversity. We are constantly harming biodiversity to meet our identified needs. Today, due to the increasing population, food, and unemployment, many agricultural areas are being destroyed and residential areas are being expanded with the transition from rural areas to urban life.

When the statistics for the year 2000 were evaluated, the total population was approximately 6 million, while 1200 people migrated from villages and towns. In parallel with the increase in population, the diminishing green and cultural areas are damaged. Plant species are in danger of extinction. Since urban ecology is not considered during the planning and planning phase of the city, it is being destroyed due to urbanization due to many environmental problems. The continuous expansion of urban settlement areas is constantly threatened by the habitats of biodiversity. The use of traditional plants will not only ensure the protection of biodiversity where the city develops but will also be beneficial for people living in these areas. Traditional houses, detached houses, villas, and sites with gardens, especially in developed and developing cities, are important places for the continuity of the species.

Urban and countryside home gardens contribute to the functioning and sustainability of the urban ecosystem, providing benefits such as pollination, a shelter for micro- and macro-fauna, and allowing geneflow between plant populations in and out of the garden (Surat and Yaman, 2017). Home gardens can be defined as 'land-use system involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and invariably livestock within the compounds of individual houses, the whole tree-crop animal unit being intensively managed by family labor'(Kumar and Nair, 2004).

Home gardens are important as a means of maintaining PGR (plant genetic resources) (Agelet et al., 2000; Sunwar et al., 2006) as potential hotspots of agricultural biodiversity (Kumar and Nair, 2004), as natural resources for alleviating poverty (Salako et al., 2014), and can help in reducing hunger and malnutrition in the impending world food crisis, climate change, and a large number of socio–economic benefits (Cruz–Garcia and Struik, 2015; Galhena et al., 2013; Barbhuiya et al., 2016). Home gardens are places that are practiced in rural areas in many parts of the world and consist of layers of trees, shrubs, and herbs plants. Several studies integrate ecological data with socioeconomic aspects in ethnobotanical research, addressing the utilization of plants by traditional so¬cieties (Davoren et al., 2016; Palliwoda et al., 2017), people's plants' preferences (Kendal et al., 2012), or with landscape design (Petřík et al., 2019). People living in home gardens in rural areas grow cultural varieties along with native plant varieties. There are different life forms of these plant types (tree, shrub, herbaceous, etc.). Turkey due to its geographical location where there are many different plant species. In our country, many different types of ornamental plants grow naturally. However, the use of natural plants in the urban environment is limited (Richards et al., 1984; Cornelis and Hermy, 2004).

In Turkey, more recently, because longing for the green garden needed by the people is increasing day by day to homes and sites of interest. Due to the climatic characteristics that limit the diversity of plant species, many local ornamental plants and products are being given importance in cities. The importance given to ornamental plants has started to increase in vineyard houses and other house types which are also traditional in Niğde. Therefore, the main purpose of the research is to determine the diversity of plants used in traditional hoses and other house gardens and to develop recommendations to understand their importance in the preservation of food, income source, ornamental plant, and indigenous plant diversity. Since the plant species used are produced or cultivated in rural areas, indigenous species appear in the home gardens. This study will provide information about biodiversity due to plant species used in landscaping in Niğde. The plant species used in the settlement areas vary according to the type of house, the distance to the city center, and the type. In this context, it has been observed that the use of woody ornamental plants is emphasized. It is aimed to determine the relationship between the type of settlement areas and the diversity of plant species used.

2. Materials and Methods

The city of Niğde, chosen as the study area, is between the north latitudes 37° 25' - 38° 58' and the longitudes of 33° 10'- 35° 25' east. The surface area of the province is 7 400 km² (7 365 km²) and covers 4.87% of the territory of Central Anatolia (151 176) and 0.90% of the country's territory (814

578 km²) (Sever and Kopar, 2019). The research area is about 5.700 hectares (TÜİK, 2019). Niğde, 2019 Turkey is a town with 352 727 inhabitants according to data from the statistical office. The population of the city of Niğde, on the other hand, shows rapid development due to the migration reasons it receives from villages and different places. Due to migration from villages and different places, the city develops very rapidly in terms of spatial development. According to Davis et al. (1988), the boundaries of Nigde are located in the squares B4, B5, C5. Niğde Province has an altitude of 1 300 m and annual rainfall is 340.1 mm. The average annual temperature is -0.40°C in January and 22.40 °C in August. The Terrestrial climate is dominant.

As the research area, the buildings where the ornamental plants are used more in the city of Niğde were selected and classified as Niğde's traditional houses, villas, detached houses, estates, and mass housing areas. Some of the provincial land located in the Central Kızılırmak Section of the Central Anatolia Region is located in the Adana Section of the Mediterranean Region (Figure 1).

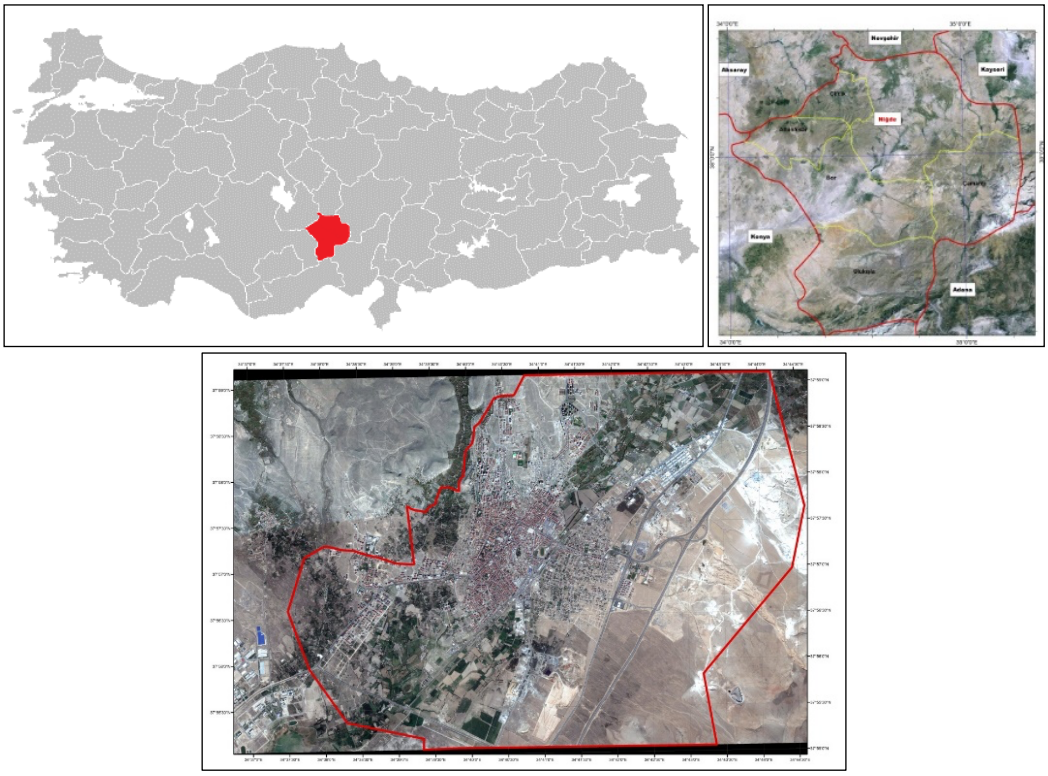

Figure 1. The site of the experiment, the Niğde province.

In the houses selected as research areas in Niğde city (detached, traditional, villa, site, mass housing), the results of the research were evaluated in two stages as used plants (biodiversity) and landscape areas. In the study area, 132 plant species belonging to 39 families were recorded in 200 sample areas.

The plant species in the study coming from the five different groups were evaluated based on the characteristics and classification listed in Table 1. The resulting data file had 24 qualitative variables for 132 entities from five groups. The entities and their group and entity codes are given in Table 2.

The data then were analyzed by using two multivariable statistical analyses, principal coordinate (PCoA) and clustering analyses. First, PCoA was carried out for quantitative data files using SAS (SAS, 1990). The same data file was subjected to a clustering analysis performed by the unweighted pair-group method using the arithmetic average (UPGMA) method with NTSYS-PC Program.

2.1. Data analysis

We have been calculated for each of them the mean diversity and occurrence values in order to characterize the structural features of each residential setting.

Different species exist in plant communities with high heterogeneity and are numerous. May (1975) concluded that Berger–Parker index was one of the most satisfactory diversity measures available. Shannon – Weiner index ($H_1 = -\sum piLn\ pi$), where pi= ni/N (ni is the number of individuals of species, i and N is the total number of individuals), was used to determine the species diversity in the research area.

Margalef measure (DM= (S_1)/Ln(N)) and the dominance indices of Berger–Parker index (d = Nmax/NT), (Nmax is total dominant species in a habitat type and NT is the proportion of the total species), was used to describe species diversity indexes and plant community characteristics. Pielou's evenness index ($J_1=H_1/\log S$), where S is the number of species) was used to measure the structural composition of the communities (Magurran, 1988, Acar et al., 2007).

Assessment of plant life type characteristics was performed in Microsoft Excel 2016.

3. Discussion and Conclusion

The results were evaluated in two parts in this study: Floral and landscape.

3.1. Floral Assessment

The study area, which consists of 200 gardens, consists of 14% traditional, 29% detached, 16% villa, 32% site, 9.5% mass housing (Figure 2).

Figure 2. Nigde villas and detached houses.

As the plant species used in the mass housing were the same, a smaller number was evaluated. As most traditional houses are empty, there is no diversity in the gardens. There are several fruit trees from the past. In order to determine the plant density used in these selected gardens, Shannon-Wiener, Margalef, and Berger-Parker analysis was applied (Figure 3). According to the results, intensive use of trees is seen.

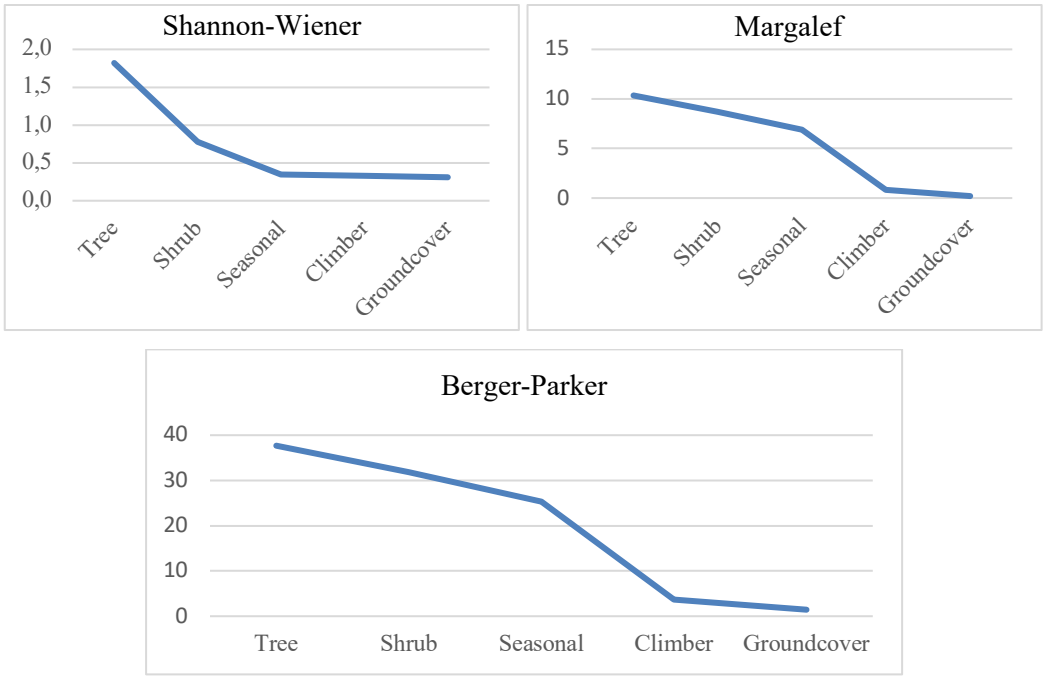

Figure 3. Use of Plant Species in Settlement Types in the Study Area.

3.2. Landscape Assessment

The distribution, richness, and diversity of plant species in Niğde City were evaluated according to houses, and their usage areas in landscaping were determined. It is thought whether the plant species used in the urban environment reflect the cultural change, and studies are needed to determine the effectiveness of socio-cultural structure in the distribution of plant species.

It is seen that traditional structures are not preserved and conservation policies are inadequate in urban areas. Identification of cultural origin buildings, protection of urban landscapes, and historical sites will contribute to the protection of biodiversity. However, this requires the development of additional research to clarify the contribution of rural landscapes to the environment, economy, and society, even though their importance has been indicated in previous research (Antrop, 2005; Agnoletti, 2014).

Landscapes are dynamic and change is one of their properties. Humans have always adapted their environment to better fit the changing societal needs and thus reshaped the landscape. All the important driving forces are related to the population growth and the lifestyle becoming increasingly more urban and more mobile (Antrop, 2005). The loss or decrease of cultural and natural areas in the 21st century is increasing today and is now worrying about people. Sustainability cannot be said to be very good when compared to the past with the conservation of biodiversity and landscape as well as cultural areas. Reproduction and sustainability of existing biodiversity can be considered as an important criterion. In addition to the ancestral values in the landscape, ornamental plants are concrete examples. In the past, the landscape may not be restored, but valuable elements and areas can be studied about how to protect.

All of the plant materials are greatly important for urban landscapes and shaping green areas (Sukopp and Werner, 1983; Sukopp, 2004; Acar et al., 2007). Our aim is to determine the interaction between humans and plants where the urban landscape is. Accordingly, the different home styles and gardens that constitute the source of the research are the sources that will inform us in monitoring and identifying the biodiversity and cultural change of the urban landscape. It will shed light on later issues with the proposed results. In the traditional houses of Niğde, the gardens were built adjacent to the high walls because of the Greeks who lived before. Care was taken to ensure that the plants used in these houses were fruiting and flowering. Rather than choosing ecologically appropriate species in the gardens of villas, detached houses, housing estates, and public housing, emphasis was placed on the use of pleasing and cultured plants (*Cupressocyparis leylandii*, *Cupressus macrocarpa*, *Dahlia hybrida*,

Matricaria chamomilla, *Celosia argentea*, *Salvia splendes*, *Osteospermum ecklonis*, *Weigela floribunda*, *Picea orientalis*, *Picea pungens*, *Morus alba pendula*).

The data from our study were subjected to multivariate analyses using principal coordinate analyses. The results of the PCoA for the 24 variables used in the analyses of outdoor ornamental plants of the different residential landscapes of Niğde are presented in Table 1. The characteristics and relevant classifications of the evaluation of outdoor ornamental plants used in the study. The second part of the table, list the correlation coefficient of the first five dimensions (D) for the variables. The first five dimensions explained 23, 11, 8, 7, and 6% of the total variation tabulating a cumulative value of 54%. The variables which had the greatest correlation coefficient with D1 were V01, V12, V16, V19, and V20. V02, V13, and V14 were the most important for D2 while V07, V09, and V15 were the most important for D3. Overall, each variable had an important contribution to the calculation of at least one dimension.

Table 1. The characteristics and relevant classifications of the evaluation of outdoor ornamental plants of the different residential landscapes of Niğde

Plant Form	Classification	Code	D1	D2	D3	D4	D5
Plant life type	Tree	V01	0.33	-0.32	0.03	-0.02	0.05
	Shrub	V02	0.05	0.55	0.00	-0.03	-0.09
	Seasonal	V03	-0.20	-0.14	0.22	-0.34	0.38
	Perennial	V04	0.19	-0.01	-0.19	0.34	-0.39
	Ground cover	V05	-0.12	0.21	-0.01	-0.12	0.02
	Climber	V06	-0.06	0.13	0.04	0.51	0.10
Aesthetic and visual	Flowers with effective	V07	-0.13	0.14	0.46	0.12	0.19
	Fruit with effective	V08	0.19	-0.04	0.25	-0.14	-0.43
	Effective with leaves	V09	0.12	-0.01	-0.41	-0.23	-0.01
	Effective with stems	V10	0.22	-0.10	-0.23	0.00	0.29
	Calligraphic effect	V11	0.20	-0.20	-0.18	-0.04	0.09
	Habitat	V12	0.33	0.12	0.01	-0.07	-0.06
	Texture	V13	0.29	0.28	0.03	-0.15	-0.03
Functional features	Hedge	V14	0.02	0.28	0.06	-0.18	-0.16
	Fruit	V15	0.13	-0.19	0.44	-0.07	-0.29
	Border	V16	0.25	0.33	-0.03	0.02	0.17
	Climber	V17	-0.12	0.04	0.03	0.49	0.04
	Direction	V18	0.22	0.18	0.26	-0.07	0.21
	Screening	V19	0.25	0.04	-0.01	0.03	0.11
	Emphasis	V20	0.29	0.12	0.00	0.19	0.13
	Shade	V21	0.25	-0.25	0.16	0.20	0.08
	Natural	V22	0.26	-0.06	0.05	0.01	0.17
Socio-economic characteristics	Regional integrity	V23	0.15	-0.09	0.29	0.03	-0.02
	Other	V24	0.06	0.06	0.03	0.07	0.35
Eigenvalue			5.60	2.54	1.89	1.63	1.43
Correlation coefficient			0.23	0.11	0.08	0.07	0.06

D1. Detached houses, D2. Traditional houses, D3. Villa houses, D4. Site, D5. Mass housing.

As a result in Table 1; when evaluated in terms of plant life type, it was observed that shrub group was preferred in traditional houses and seasonal plants were preferred in villa type. In terms of aesthetic and visual aspects, respectively, villas were classified according to effectiveness with flowers, detached houses were classified according to habitat status, traditional houses were classified according to texture. In the case of functional features, it is determined that the villas are preferred plants effective with fruit, traditional houses preferred plants as border plants.

The resulting data file had 24 qualitative variables for 132 entities from five groups. The entities and their group and entity codes are given in Table 2.

Table 2. The list of plant species, their group, and analyses code used in the evaluation of outdoor ornamental plants of the different residential landscapes of Niğde

Residential landscapes type	Species	Family	Plant life type	Origin	Group code	Code
Detached	*Abelia grandiflora*	Caprifoliaceae	Shrub	China	M60	S01
	Amygdalus communis	Rosaceae	Fruit tree	Asia	M108	S10
	Aster sp.	Compositae	Perennial	America	M15	S13
	Buddleia davidii	Buddlejaceae	Shrub	China	M50	S18
	Cotoneaster franchetii	Rosaceae	Shrub	China	M45	S26
	Cotoneaster microphylla	Rosaceae	Shrub	Asia, Himalayan	M46	S28
	Cupressocyparis leylandii	Cupressaceae	Tree	America	M101	S30
	Cupressus sempervirens var. *pyramidalis*	Cupressaceae	Tree	South Europe, Turkey, Iran	M95	S34
	Gaura lindheimeri	Onagraceae	Shrub	Texas	M61	S51
	Mahonia aquifolium	Berberidaceae	Shrub	North California	M57	S76
	Pyracantha coccinea	Rosaceae	Shrub	Asia, Italy, Turkey	M63	S107
	Robinia pseudoacacia	Fabaceae	Tree	USA	M104	S111
	Thuja orientalis	Cupressaceae	Shrub	China, Turkestan	M59	S126
	Wisteria sinensis	Fabaceae	Climbing	China	M38	S137
Traditional	*Abies bornmülleriana*	Pinaceae	Tree	Turkey	G89	S02
	Abies sp.	Pinaceae	Tree	Turkey	G70	S04
	Ailanthus altissima	Simaroubaceae	Tree	China	G84	S08
	Antirrhinum majus	Scrophulariaceae	Perennial	Mediterranean	G29	S11
	Begonia semperflorens	Begoniaceae	Perennial	Brazil	G04	S14
	Campsis radicans	Bignoniaceae	Climbing	America	G35	S20
	Celosia argentea	Amaranthaceae	Annual	Africa	G19	S22
	Cornus mas	Cornaceae	Shrub	Europe	G45	S24
	Cupressus macrocarpa	Cupressaceae	Tree	California, America	G88	S32
	Cynodon dactylon	Poaceae	Perennial	Africa	G32	S36
	Dahlia sp.	Asteraceae	Perennial	Mexico	G17	S38
	Dianthus barbatus	Caryophyllaceae	Perennial	Europe	G02	S40
	Eleagnus angustifolia	Elaeagnaceae	Fruit tree	Europe, Asia, Turkey	G85	S42
	Euryops pectinatus	Asteraceae	Perennial	Africa	G10	S45
	Festuca glauca	Poaceae	Perennial	Turkey	G33	S47
	Freesia reflecta	Iridaceae	Perennial	Africa	G01	S50
	Gladiolus sp.	Iridaceae	Perennial	Asia	G12	S53
	Gomphrena globosa	Amaranthaceae	Annual	Panama	G31	S54
	Hibiscus syriacus	Malvaceae	Tree	Pakistan	G42	S56
	Impatiens walleriana	Balsaminaceae	Perennial	Asia, America, Africa	G28	S59
	Jasminum fruticans	Oleaceae	Shrub	Mediterranean	G55	S61
	Juglans regia	Junglandaceae	Tree	Iran	G75	S63
	Kerria japonica	Rosaceae	Shrub	China	G63	S68
	Lagerstroemia indica	Lythraceae	Shrub	China	M47	S69
	Lavandula officinalis	Lamiaceae	Shrub	Mediterranean, Turkey	G61	S70

Table 2. The list of plant species, their group and analyses code used in the evaluation of outdoor ornamental plants of the different residential landscapes of Niğde (continue)

Residential landscapes type	Species	Family	Plant life type	Origin	Group code	Code
Traditional	*Lonicera involucrata*	Caprifoliaceae	Shrub	America	G37	S74
	Matricaria chamomilla	Asteraceae	Annual	Europe	G30	S78
	Morus alba	Moraceae	Fruit tree	China, Japan	G73	S80
	Narcissus sp.	Amaryllidaceae	Perennial	Mediterranean	G26	S82
	Osteospermum ecklonis	Asteraceae	Annual	Africa	G34	S84
	Pelargonium radula	Geraniaceae	Shrub	Africa	G59	S86
	Picea orientalis	Pinaceae	Tree	Turkey, Caucasian	G71	S90
	Petunia sp.	Solanaceae	Annual	America	G16	S88
	Portulaca grandiflora	Portulacaceae	Annual	Argentina	G06	S97
	Prunus armenica	Rosaceae	Fruit tree	Turkey, Europe, Iran	G80	S99
	Prunus domestica	Rosaceae	Fruit tree	Caucasian	G79	S105
	Rhus sp.	Anacardiaceae	Shrub	Anatolia, China	G43	S109
	Rosa rampicanti	Rosaceae	shrubs, climbing	Asia	G38	S113
	Rosmarinus officinalis	Labiatae	Shrub	North Africa, Mediterranean Countries, Turkey	G50	S115
	Rudbeckia hirta	Asteraceae	Annual, biennial	America	G07	S117
	Salvia splendes	Lamiaceae	Perennial	Brazil	G27	S119
	Tagetes erecta	Asteraceae	annual or perennial	Mexico	G08	S123
	Tilia tomentosa	Malvaceae	Tree	Earth Europe, Turkey	G68	S128
	Vitis vinifera	Vitaceae	Climbing	Mediterranean	G36	S135
Villa	*Acer campestre*	Aceraceae	Tree	Europe, Asia	V137	S05
	Acer negundo	Aceraceae	Tree	America, Canada	V122	S06
	Aesculus hippocastanum	Sapindaceae	Fruit tree	Balkan, Turkey, Peninsula	V124	S07
	Alcea rosea	Malvaceae	Shrub	Asia	V78	S09
	Asparagus officinalis	Asparagaceae	Perennial	Europe	V34	S12
	Betula alba	Betulaceae	Tree	Europe, Asia, Turkey	V130	S16
	Bougainvillea glabra	Nyctaginaceae	Climbing	Brazil	V43	S17
	Buxus sempervirens	Buxaceae	Shrub	Europe	V127	S19
	Corylus avellana	Betulaceae	Fruit tree	Europe, Turkey	V112	S25
	Crataegus monogyna	Rosaceae	Fruit tree	Europe, Turkey	V128	S29
	Cydonia oblonga	Rosaceae	Fruit tree	Turkey, Iran	V109	S35
	Dianthus gratianopolitanus	Caryophyllaceae	Perennial	Europe, Asia	V22	S41
	Felicia amelloides	Asteraceae	Shrub	North Africa	V89	S46
	Fraxinus exelsior	Oleaceae	Tree	Europe, Turkey	V123	S49
	Gazania rigens	Asteraceae	Perennial	Africa	V26	S52
	Hedera helix	Araliaceae	Climbing	Europe	V47	S55
	Hyacinthus sp.	Liliaceae	Perennial	Asia	V28	S57
	Ilex aquifolium	Aquifoliaceae	Shrub	Europe, Africa, China	V85	S58
	Ixora coccinea	Rubiaceae	Shrub	Asia	V97	S60
	Jasminum officinale	Oleaceae	Shrub	India	V94	S62
	Kalanchoe	Crassulaceae	Perennial	Madagascar	V10	S67
	Leucanthemum vulgare	Asteraceae	Perennial	Europe	V07	S71

Table 2. The list of plant species, their group and analyses code used in the evaluation of outdoor ornamental plants of the different residential landscapes of Niğde (continue)

Residential landscapes type	Species	Family	Plant life type	Origin	Group code	Code
Villa	*Ligustrum vulgare*	Oleaceae	Shrub	Japan	V70	S72
	Lilium sp.	Liliaceae	Perennial	China, Japan	V27	S73
	Lycium barbarum	Solanaceae	Tree	Himalayan	V96	S75
	Morus alba pendula	Moraceae	Fruit tree	China	V107	S81
	Ocimum basilicum	Lamiaceae	Annual	Asia	V23	S83
	Pelargonium peltatum	Geraniaceae	Shrub	Africa	V92	S85
	Pelargonium zonale	Geraniaceae	Shrub	Africa	V90	S87
	Philadelphus coronarius	Hydrangeaceae	Shrub	America	V60	S89
	Pinus pinea	Pinaceae	Tree	Mediterranean, Turkey, Portugal, Spain	V143	S92
	Pittosporum tobira	Pittossporaceae	Shrub	Mediterranean	V81	S93
	Pittosporum variegata	Pittossporaceae	Shrub	China	V80	S94
	Platanus orientalis	Platanaceae	Tree	Europe, Asia, Turkey	V136	S95
	Populus alba	Salicaceae	Tree	Europe, Asia, Turkey	V133	S96
	Primula sp.	Primulaceae	Perennial	China	V25	S98
	Prunus avium	Rosaceae	Fruit tree	Europe, Africa, Turkey	V115	S100
	Prunus ceracifera	Rosaceae	Tree	Europe, Anatolia	V118	S101
	Prunus cerasifera pissardii	Prunoideae	Tree	Europe, Asia	V131	S102
	Prunus cerasus	Rosaceae	Fruit tree	Caucasian Sea, Anatolia	V119	S103
	Prunus cerrulata	Prunoideae	Tree	Japan, Korea, China	V132	S104
	Prunus persica	Rosaceae	Fruit tree	China	V116	S106
	Robinia neomexicana	Fabaceae	Tree	Mexico	V139	S110
	Rubus canescens	Rosaceae	Shrub	Europe, Turkey	V77	S116
	Salix babylonica	Salicaceae	Perennial	Çin	V145	S118
	Saponaria officinalis	Caryophyllaceae	Perennial	Europe	V15	S120
	Spirae vanhouttei	Rosaceae	Shrub	Hybrid	V68	S121
	Tamarix tetrandra	Tamaricaceae	Shrub	America	V138	S124
	Teucrium chamaedrys	Lamiaceae	Shrub	Mediterranean	V35	S125
	Thymus sp.	Lamiaceae	Perennial	Europe, Asia	V24	S127
	Ulmus glabra	Ulmacea	Tree	Europe, Caucasian	V125	S129
	Vibirnum opulus	Caprifoliaceae	Shrub	North Asia, Africa, Europe, Turkey	V88	S130
	Vinca major	Apocynaceae	Ground cover	Europe	V12	S132
	Viola tricolor	Violaceae	Annual	Europe	V13	S134
	Weigela floribunda	Caprifoliaceae	Shrub	Asia	V79	S136
Sites	*Mirabilis jalapa*	Nyctaginaceae	Perennial	America	S02	S79
	Viburnum tinus	Caprifoliaceae	Shrub	Mediterranean	S20	S131
Mass housing	*Abies nordmanniana*	Pinaceae	Tree	Caucasian, Anatolia	TK42	S03
	Berberis thunbergii	Berberidaceae	Shrub	Japan	TK14	S15
	Cedrus libani	Pinaceae	Tree	Turkey, Lebanon	TK34	S21
	Cotoneaster horizontalis	Malaceae	Shrub	China	TK04	S27
	Cupressus arizonica	Cupressaceae	Tree	America	TK46	S31
	Cupressus pyramidalis	Cupressaceae	Tree	China	TK50	S33
	Deutzia longifolia	Hydrangeaceae	Shrub	Asia	S13	S39

Table 2. The list of plant species, their group and analyses code used in the evaluation of outdoor ornamental plants of the different residential landscapes of Niğde (continue)

Residential landscapes type	Species	Family	Plant life type	Origin	Group code	Code
Mass housing	*Euonymus japonica*	Celastraceae	Shrub	Japan	TK13	S43
	Forsythia × *intermedia*	Oleaceae	Shrub	Asia	TK16	S48
	Juniperus chinensis		Fruit tree	Iran	TK25	S64
	Juniperus horizontalis	Cupressaceae	Shrub	America	TK09	S66
	Malus sp.	Rosaceae	Fruit tree	Asia	TK38	S77
	Picea pungens	Pinaceae	Tree	America, Colorado	TK37	S91
	Rosa canina	Rosaceae	Shrub	Hybrid	TK22	S112
	Rosa sp.	Rosaceae	Shrub	Hybrid	TK27	S114
	Syringa vulgaris	Oleaceae	Shrub	Asia, Europe, Turkey	TK17	S122
	Zinnia elegans	Asteraceae	Shrub	Mexico	TK01	S138

The three dimensional plot of species used in principle coordinate analyses conducted by 24 qualitative characteristics in the evaluation of outdoor ornamental plants of the different residential landscapes of Niğde is presented in Figure 4. As seen in Figure 4, the species were grouped in three clusters. The same patterns were clearly confirmed by clustering analysis (Figure 5). The statistical analyses supported three groups. The species in each group are also listed in Figure 4in the order of appearance on the figure.

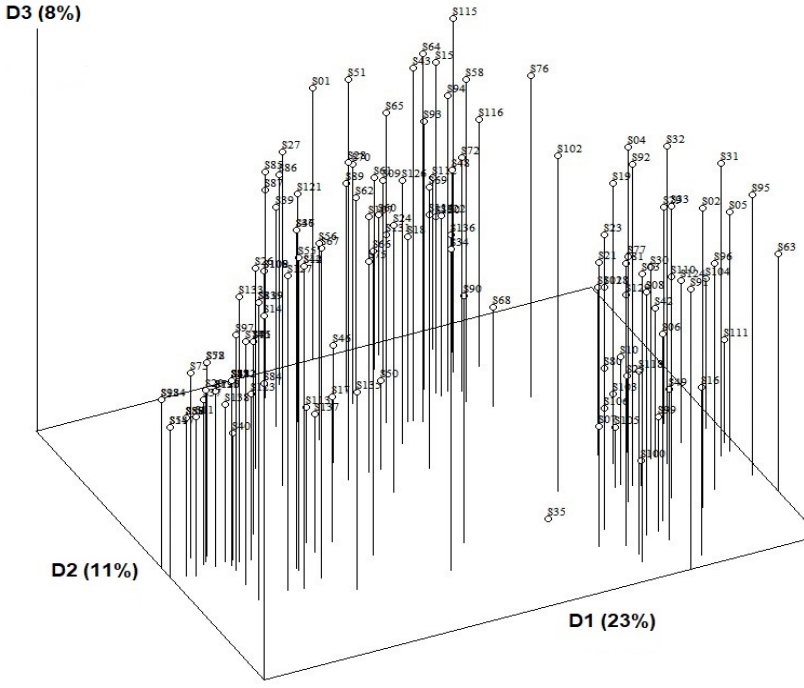

Figure 4. Three dimensional plot of species used in principle coordinate analyses conducted by 24 qualitative characteristics in the evaluation of outdoor ornamental plants of different residential landscape of Niğde.

Figure 4 clearly seen that cluster analysis, of the residential vegetation data is grouped into two main groups. The landscape of traditional residential areas and others.

Indeed, according to PCA and diversity results, vegetation structure and composition in traditional houses of the city of Niğde could be considered as a different and separate cluster of other houses.

In addition to this, as it shown in Figure 5, plant species used in the Niğde settlement area and its surroundings could be distinguished by three major functional groups by using cluster analysis. This result corresponds with area observations, surveys, and species compositions.

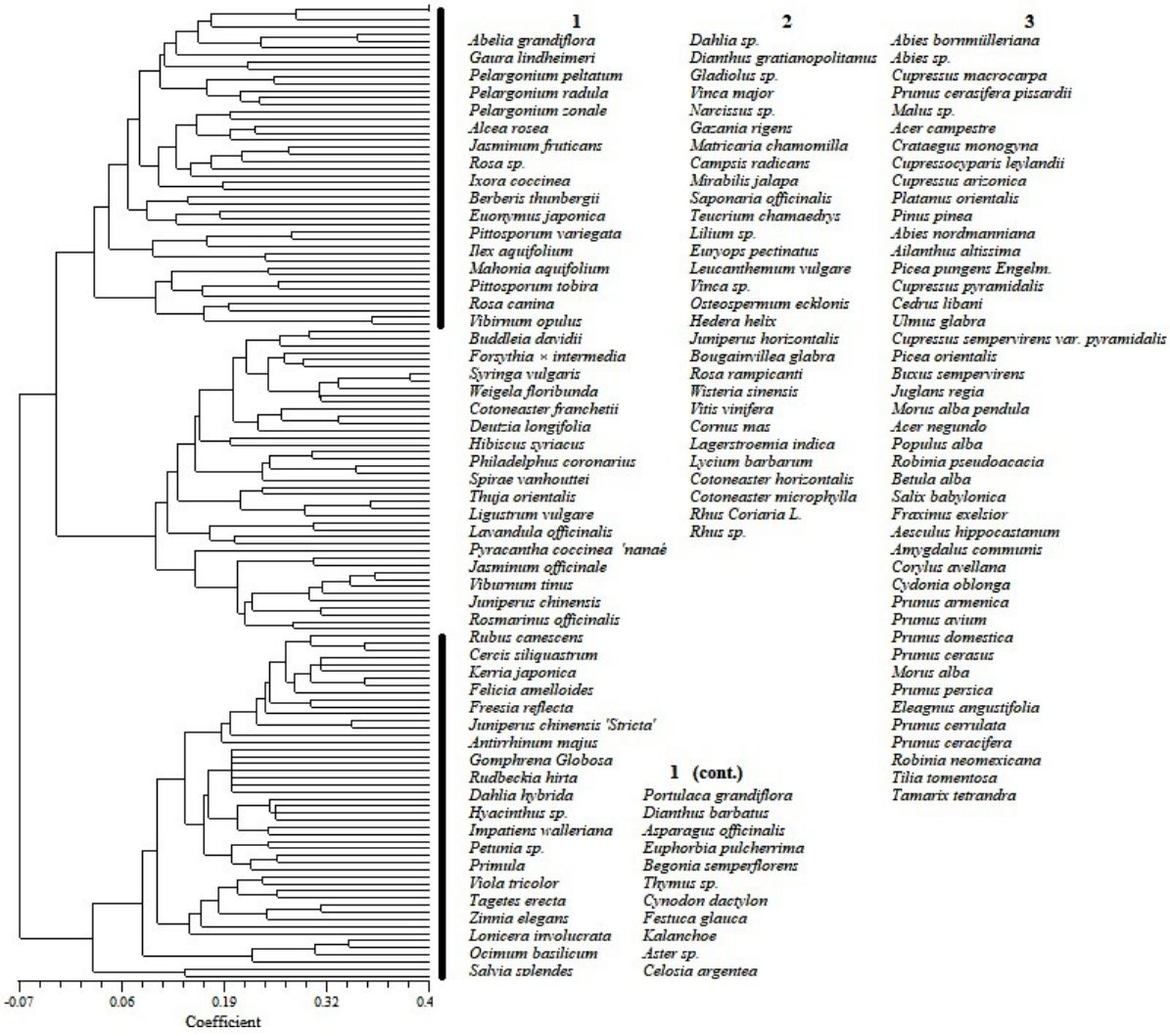

Figure 5. Dendrogram of species used in principle coordinate analyses conducted by 24 qualitative characteristics in the evaluation of outdoor ornamental plants of the different residential landscapes of Niğde.

Accordingly, it was obtained that Group 1 has shrub and groundcover, Group 2 has shrub, groundcover, and clutching stem, the other group included the trees species related with their compositions. This third group has many genera of horticultural fruit trees such as *Prunus, Malus, Eleagnus, Juglans*. The representatives of these genera were mostly used as hedge plants.

When the dendrogram was examined, some additional patterns were identified in the grouping of the plants used in Niğde. For example, it is seen that effective tree use with blossoms in Niğde is less and fruit trees use more with fruit. Leafy ornamental plants are being used for seasonal purposes. Perennial plants are frequently used in the grouping of the plants used in the Niğde landscape. Also, it was concluded that the fruit-bearing trees are frequently being used as hedge plants.

4. Conclusion

This study was conducted in Niğde province and it determined the usage, purposes, and methods of wild plants and natural plants in Detached, Traditional, Villa, Site, and Mass houses. Niğde has a

wide potential for medicinal and aromatic plants studies. A total of 32 plant species belonging to 39 families were identified in the study area.

Different plant species were used in the landscape design of the houses in the residential areas of Niğde province. The study shows that local people prefer the plants mostly seasonal plants were preferred in villa type. In terms of aesthetic and visual aspects, respectively, villas were classified according to effectiveness with flowers, detached houses were classified according to habitat status, traditional houses were classified according to texture.

It has been observed that fruit-bearing tree and shrub species that are unique to the region are more preferred in different settlements in Niğde. The use of ornamental plants in villa-style home gardens is intense.

It is seen that effective tree use with blossoms in Niğde is less and fruit trees use more with fruit. Leafy ornamental plants are being used for seasonal purposes. Perennial plants are frequently used in the grouping of the plants used in the Niğde landscape. Also, it was concluded that the fruit-bearing trees are frequently being used as hedge plants.

Native plants of the region that will meet the landscape works to be done in urban spaces in terms of aesthetics and functionality should be preferred primarily. Exotic plants generally require more water, more nutrients, and more care to adapt to the ecological conditions, sometimes even these efforts do not give positive results. The same results were obtained in Nigde province.

It is necessary to benefit from native plants not only for aesthetic studies but also for functional landscape renewals such as biological repair works.

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