



Inventory and Qualitative Evaluations of Woody Plants in Forest Nurseries of Marmara Region

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Abstract

In this study, examining the production of plants made in nursery gardens connected to Regional Directorates of Forestry is aimed. In this context, forest nurseries located in the Marmara Region, where construction activities continue intensively, are chosen as the area of the study. Within the scope of the study, plant stocks and varieties of forest nursery plants in Marmara Region have been revealed and analyses about the packaging environments and the size of seedlings were made. As a result, in the Marmara Region forest nurseries, which are the subjects of our study, it is observed that the production of native plants is less than the exotic species. This shows us that the natural vegetation is not sufficiently exploited. Within this study desired plant species for any forestation or landscaping project in Marmara Region can be obtained in the fastest and most economical way; and also the size of these plants and the type of packaging can be easily learned.

Keywords: Plant production, nurseries, landscape designs.

Marmara Bölgesi Orman Fidanlıklarının Odunsu Bitki Envanteri ve Niteliksel Olarak Değerlendirilmesi

Öz

Bu çalışmada, Orman bölge müdürlüklerine bağlı fidanlıklarda yapılan bitki üretiminin değerlendirilmesi amaçlanmıştır. Bu kapsamda inşaat faaliyetlerin yoğun olarak sürdüğü Marmara Bölgesi'nde bulunan orman fidanlıkları çalışma alanı olarak belirlenmiştir. Çalışma kapsamında Marmara Bölgesinde bulunan orman fidanlıklarının bitki stokları ve tür çeşitlilikleri ortaya konmuş olup, bu bitkilerin ambalaj ortamları ve fidan büyüklükleri hakkında analizler yapılmıştır. Sonuç olarak, Marmara Bölgesi orman fidanlıklarında, yerli bitki üretiminin egzotik türlerden daha az olduğu görülmektedir. Bu bize doğal bitki örtüsünün yeterince kullanılmadığını göstermektedir. Bu çalışma ile, Türkiye'nin Marmara Bölgesi'nde yapılacak olan herhangi bir ağaçlandırma veya peyzaj düzenlemesi çalışmasında istenilen bitki türü en hızlı ve ekonomik açıdan elde edilebilecek ve bu bitkilerin hangi büyüklükte, hangi ambalaj çeşidinde olduğuna kolayca ulaşılabilecektir.

Anahtar Kelimeler: Bitki üretimi, fidanlık, peyzaj düzenlemeleri.

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1. Introduction

In recent years, a large number of plant materials are needed by private enterprises and public institutions in big cities, for arrangements of major structures, street, road, intersection, refuge and squares arrangements, in building various hotels, holiday villages and coastal cities, in decoration of coasts, parks and gardens and in building sports and recreation facilities. Ornamental plants are not only plant taxa that offer aesthetic pleasure, but they can also improve the environment and the quality of our lives. Our country's conditions allow to cultivate many species of indigenous and foreign plants with the excess demand of herbal material (Akintoye et al., 2018; Toscano et al., 2019; Ürgenç, 1998).

In general, planting can be carried out with a wide variety of materials such as seeds, steels, onions, tubers, rhizomes, stolons, seedlings, saplings and transplanted mature plants. In urban landscaping arrangements, seeds are used in the formation of grass fields, onions, tubers, and rhizomes are used in the first plantation of species with these characteristics. Other herbaceous and woody species, which constitutes a large part of the plantings are subject to planting as seedlings and grown saplings. In addition, seeds and vegetative materials in question form the main production source of seeds grown in nursery gardens. Plantings based on transport of raised plants are generally limited applications. For these reasons, detailed analysis of seedling material, which is the main element of planting has particular importance for in terms of projecting in landscape arrangements and success of applications (Akintoye et al., 2018; Dirik, 2008; Hulme et al., 2017).

“Nurseries” are indoor and outdoor spaces for cultivating seedlings needed to be planted elsewhere afterwards for a specific purpose. The main purpose in nurseries is to ensure continuity, and high quality seedlings obtained from high quality seeds with a specific origin are of great importance for landscaping arrangements. In this respect, seed and seedling production is the basis of success in forestation and landscaping projects. Today, concept of quality saplings is defined as a suitable saplings (Gültekin, 2014). In order to achieve this aim, qualitative properties and yield capabilities of the seed to be used should be known in advance and seedlings obtained from seeds with very good properties should be used in production. For this reason, the most important consideration in planting is to use quality seedlings obtained from well-qualified seeds providing high growth. The physiological (such as plant water potential, root regeneration ability, resistance to cold, growth and sleep rhythm) and morphological properties (such as diameter, height, multiplicity, age) can be effective on planting success (Colombo et al., 2001; Dirik, 2008; Genç and Yahyaoglu, 2007; Mattsson, 1997; Ritchie and Landis, 2005; 2006; Simpson, 1990). Especially in arid and semi-arid regions, since the morphological and physiological properties, types, living percentage of seedlings are effective on growth properties of seedlings, studies to increase the quality of seedlings have also increased in our country in recent years (Hartman et al., 1997).

When the production areas of ornamental plant production in the world are examined, China ranked first with 936,337 ha in 2016, followed by USA with 195,457 ha, Italy with 32,258 ha, Germany with 28,494 ha, Japan with 27,027 ha, Spain with 26,383 ha, Holland with 24,908 ha and France with 17,720 ha. In Turkey, the production of ornamental plants is carried out only in an area of 3,239 hectares (Kazaz, 2016). At first, nurseries in our country has emerged as institutions of ministry that produce all kinds of seedlings according to demand. Later, nursery enterprises began to specialize (Gültekin, 2014). In the outdoor ornamental plants sector, the highest production is in Marmara Region. While the Marmara Region establishes nearly 56% of total production, the ratio of the Aegean Region in production is around 25%. Although it ranks third, production in the Mediterranean Region is much smaller than Marmara and Aegean Regions (URL 1, 2012).

The first forest nursery belonging to government in Turkey is the Ankara Nursery which was established in a 21 hectare area in 1925. This was followed by Karşıyaka Nursery in 1930, Eskişehir Nursery established in 1937, Elazığ Nursery established in 1938 and Sivas and Çankırı Nurseries established in 1939. Nowadays, the capacity of forest nurseries has been able to produce 500 million pieces of saplings or ornamental plant saplings of 300 species. In addition, there are dozens of private sector nurseries that produce 30-50 million pieces of seedlings annually (Gültekin, 2014).

Today, there are a large number of forest nursery sites that are affiliated to 27 Forest Regional Directorates; but no production is being made in 4 of them (Yer and Ayan, 2013). The need for indoor and outdoor ornamental plants, which increases day by day is mostly met by public nurseries and private nurseries. The fact that the forest nurseries belong to the state is of great importance since the plants grown here are used in the afforestation works and public landscaping arrangements.

In this context, in this study, the inventory study of the plant taxa in the nurseries belonging to the public forest

directorates in 5 provinces of the Marmara region (Istanbul, Bursa, Canakkale, Balıkesir, Sakarya), where the green field works have been carried out most intensively, has been carried out. An inventory study was carried out by identifying plant taxa in the nurseries, and at the same time, the differences between the provinces were put forward and recommendations for the development of the sector were developed.

2. Material and Method

2.1. Material

The study material consists of 13 Forest Nurseries belonging to 5 General Directorate of Forestries in Marmara Region. The General Directorate of Forestries and its related nurseries are given below. (Figure 1).

1. Nurseries belonging to Istanbul Regional Directorate; Bahçeköy Nursery, Çobançeşme Nursery and Göktürk Nursery,
2. Nurseries belonging to Balıkesir Regional Directorate; Merkez Nursery, Dursunbey Nursery, Gölçük Nursery, Sındırgı Nursery and Sünnü Nursery,
3. Nurseries belonging to Bursa Regional Directorate; Merkez Nursery, Yenişehir Nursery,
4. Nurseries belonging to Çanakkale Regional Directorate; Kalkım Nursery, Ezine Nursery,
5. Nurseries belonging to Sakarya Regional Directorate; Sakarya Hendek Nursery.

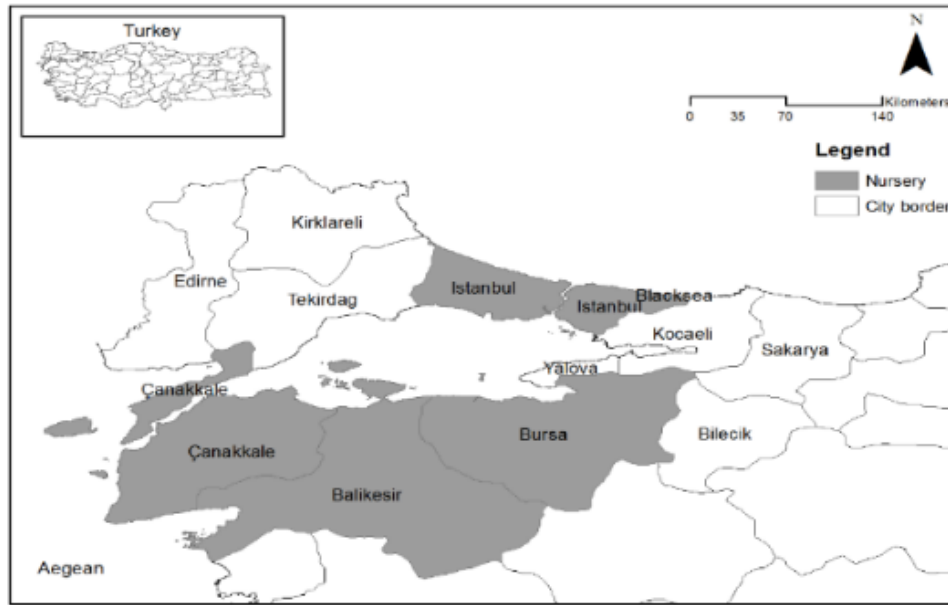


Figure 1. Study area

2.2. Method

Data collection, observation and evaluation methods have been used in this study. In the data collection stage, plant stock information of forest nurseries were obtained by visiting forest nurseries and by using seedling plant system. In this study, current data of the years 2017-2018 were used. Plant taxa found in forest nurseries were examined in two stages consisting of plant diversity and qualitative studies. In terms of plant diversity, taxonomic groups were evaluated in terms of their lifespan and natural/exotic characteristics. Within the scope of qualitative evaluations related to seedling material, seedling types and body perimeter lengths were questioned (Dirik, 2008; Erduran Nemutlu, 2013; Genc and Yahyaoglu, 2007; Hartman et al., 1997; Yer and Ayan, 2013; Zencirkiran and Akdeniz, 2017).

Statistical analyzes were performed with SPSS 22 software. Frequencies and One Way Anova were used, different groups were identified at $p \leq 0.05$ error level using Duncan Test (Özdamar, 2002).

3. Results and Discussions

3.1. Evaluation of Plant Diversity

In the scope of the research, 170 plant taxa were produced in forest nurseries located in Marmara Region. In terms of the number of plant taxa, İstanbul ranks first with 28,10%. This was followed by Balıkesir with 21,57%. The least taxa were found in Çanakkale with 13,73% (Figure 2). Table 1 shows the plant taxa produced in the forests of Marmara Region and the provinces where they were produced.

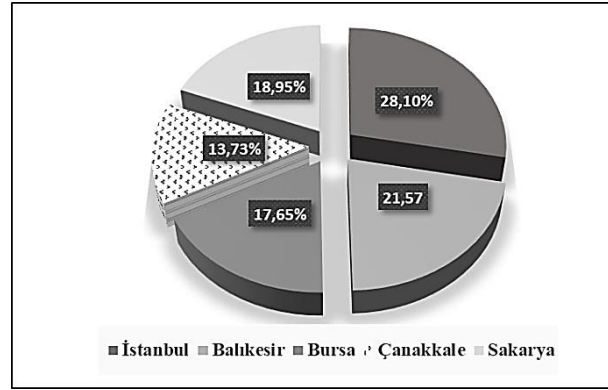


Figure 2. Distribution of plant taxa in terms of the cities in the forest nurseries of Marmara Region

Table 1. Plant taxa grown in forest nurseries of Marmara region

Bitki Adı	İstanbul	Balıkesir	Bursa	Çanakkale	Sakarya
<i>Abelia x grandiflora</i>	✓	✓		✓	✓
<i>Abies bornmülleriana</i>	✓	✓			✓
<i>Abies cilicica</i>		✓			
<i>Abies equi-trojani</i>	✓		✓	✓	
<i>Abies pinsapo</i>	✓				✓
<i>Acer campestre</i>	✓				✓
<i>Acer negundo</i>	✓	✓	✓	✓	✓
<i>Acer palmatum</i>	✓	✓	✓	✓	✓
<i>Acer platanoides</i>	✓	✓		✓	✓
<i>Acer pseudoplatanus</i>	✓	✓	✓	✓	✓
<i>Acer saccharum</i>	✓			✓	
<i>Aesculus hippocastanum</i>	✓	✓	✓		✓
<i>Aesculus x carnea</i>	✓	✓	✓		
<i>Agapanthus sp.</i>	✓				
<i>Albizia julibrissim</i>	✓	✓	✓	✓	
<i>Aucuba japonica</i> "Crotonifolia"	✓				
<i>Aucuba japonica</i> "Variegata"	✓		✓		
<i>Azalea sp.</i>	✓				
<i>Bambusa sp.</i>	✓				
<i>Berberis thunbergii</i> "Atropurpurea"	✓	✓	✓	✓	✓
<i>Betula pendula</i>	✓	✓	✓		
<i>Bignonia grandiflora</i>	✓		✓		
<i>Buddleia davidii</i>	✓				
<i>Buxus sempervirens</i>	✓	✓	✓	✓	✓
<i>Caesalpinia gilliesi</i>		✓			
<i>Callistemon sp.</i>	✓				
<i>Calycanthus floridus</i>			✓		

<i>Carpinus betulus</i>		✓	✓		
<i>Castanea sativa</i>	✓	✓	✓		✓
<i>Catalpa bignonioides</i>		✓		✓	
<i>Cedrus atlantica</i> “Glaucua”	✓	✓			✓
<i>Cedrus deodora</i>	✓	✓	✓	✓	✓
<i>Cedrus deodora</i> “Aurea”	✓	✓	✓	✓	✓
<i>Cedrus libani</i>	✓	✓	✓	✓	✓
<i>Celtis australis</i>		✓	✓		
<i>Cercis siliquastrum</i>	✓	✓	✓	✓	✓
<i>Chaenomeles japonica</i>	✓	✓			
<i>Chamaecyparis lawsoniana</i>	✓	✓	✓		
<i>Chrysanthemum</i> sp.	✓				
<i>Cornus alba</i> “Sibirica”	✓	✓			✓
<i>Cotinus coggygria</i>		✓			
<i>Cotoneaster dammeri</i>	✓	✓	✓	✓	
<i>Crataegus monogyna</i>	✓				
<i>Cryptomeria japonica</i> var. <i>elegans</i>					✓
<i>Cupressus arizonica</i>	✓	✓	✓	✓	✓
<i>Cupressus arizonica</i> “Fastigiata Aurea”	✓	✓	✓	✓	✓
<i>Cupressus macrocarpa</i>	✓	✓	✓		✓
<i>Cupressus macrocarpa</i> “Goldcrest”	✓	✓			✓
<i>Cupressus sempervirens</i>	✓	✓	✓	✓	✓
<i>Deutzia gracilis</i>	✓				
<i>Elaeagnus angustifolia</i>	✓	✓		✓	
<i>Elaeagnus pungens</i>	✓				
<i>Eriobotrya japonica</i>		✓			
<i>Euonymus japonica</i> “Aureovariegata”	✓	✓	✓	✓	✓
<i>Fagus orientalis</i>	✓				✓
<i>Feijoa sellowiana</i>					✓
<i>Ficus benjamina</i> “Aurea”	✓				
<i>Ficus carica</i>			✓		
<i>Forsythia x intermedia</i>	✓	✓	✓	✓	✓
<i>Fraxinus americana</i>	✓	✓	✓	✓	✓
<i>Fraxinus angustifolia</i>	✓	✓			✓
<i>Fraxinus excelsior</i>	✓	✓	✓	✓	
<i>Gaura lindheimeri</i>	✓		✓		
<i>Ginkgo biloba</i>	✓		✓		
<i>Gleditsia triacanthos</i>	✓	✓		✓	
<i>Hebe buxifolia</i>					✓
<i>Hedera helix</i>	✓	✓	✓	✓	✓
<i>Hibiscus mutabilis</i>					✓
<i>Hibiscus syriacus</i>	✓	✓	✓	✓	✓
<i>Hydrangea macrophylla</i>	✓		✓	✓	
<i>Ilex aquifolium</i>	✓				
<i>Jasminum officinale</i>	✓	✓			
<i>Juglans regia</i>		✓	✓	✓	✓
<i>Juniperus communis</i> “Hibernica”		✓		✓	✓
<i>Juniperus excelsa</i>		✓			✓
<i>Juniperus horizontalis</i>		✓			✓
<i>Juniperus sabina</i>	✓	✓	✓	✓	✓

<i>Juniperus x media</i> "Pfitzeriana Aurea"					✓
<i>Kerria japonica</i> "Pleniflora"					✓
<i>Kniphofia uvaria</i>	✓				
<i>Koelreuteria paniculata</i>		✓		✓	
<i>Laburnum anagyroides</i>				✓	
<i>Lagerstroemia indica</i>	✓	✓	✓	✓	✓
<i>Laurus nobilis</i>	✓	✓	✓	✓	✓
<i>Lavandula angustifolia</i>	✓		✓		
<i>Ligustrum vulgare</i>	✓	✓	✓	✓	✓
<i>Liquidambar styraciflua</i>	✓	✓	✓		
<i>Liriodendron tulipifera</i>	✓				
<i>Lonicera nitida</i>	✓	✓		✓	✓
<i>Maclura pomifera</i>	✓				
<i>Magnolia grandiflora</i>	✓	✓			✓
<i>Mahonia aquifolium</i>		✓			
<i>Malus floribunda</i>	✓	✓			
<i>Malus sylvestris</i>	✓				✓
<i>Melia azedarach</i>		✓			✓
<i>Morus alba</i>		✓	✓		✓
<i>Myrtus communis</i>			✓		
<i>Nandina domestica</i>	✓				
<i>Nephrolepis</i> sp.		✓			
<i>Nerium oleander</i>	✓	✓	✓	✓	
<i>Ophiopogon japonicus</i>	✓				
<i>Parthenocissus quinquefolia</i>	✓	✓	✓		
<i>Philadelphus coronarius</i>	✓			✓	✓
<i>Phoenix canariensis</i>				✓	
<i>Phoenix theophrastii</i> spp. gölköy					✓
<i>Phormium tenax</i>	✓				
<i>Photinia serrulata</i>	✓	✓		✓	
<i>Picea abies</i>	✓				✓
<i>Picea glauca</i> "Conica"	✓	✓			✓
<i>Picea orientalis</i>	✓	✓	✓		✓
<i>Picea pungens</i>	✓	✓	✓	✓	✓
<i>Pinus brutia</i>			✓	✓	✓
<i>Pinus maritima</i>	✓	✓			✓
<i>Pinus mugo</i> var. <i>mugo</i>	✓				
<i>Pinus nigra</i>	✓	✓	✓	✓	✓
<i>Pinus nigra</i> var. <i>pyramidata</i>	✓	✓			
<i>Pinus pinea</i>	✓	✓	✓	✓	✓
<i>Pinus sylvestris</i>	✓				✓
<i>Pistacia terebinthus</i>		✓			
<i>Pittosporum tobira</i>	✓	✓			✓
<i>Platanus orientalis</i>	✓	✓	✓	✓	✓
<i>Platanus x acerifolia</i>	✓	✓	✓	✓	✓
<i>Platycladus orientalis</i> "Pyramidalis Aurea"	✓	✓	✓	✓	✓
<i>Platycladus orientalis</i> "Compacta"	✓	✓	✓	✓	
<i>Platycladus orientalis</i> "Pyramidalis"	✓		✓	✓	
<i>Platycladus orientalis</i> "Aurea Nana"	✓	✓	✓	✓	✓

<i>Populus x euroamericana</i>			✓		
<i>Prunus amygdalus</i>				✓	✓
<i>Prunus armeniaca</i>	✓				
<i>Prunus cerasifera</i> “Pissardii Nigra”	✓	✓	✓	✓	✓
<i>Prunus laurocerarus</i>	✓		✓		
<i>Prunus mahaleb</i>	✓				
<i>Prunus serrulata</i> “Rosea”	✓				
<i>Pseudotsuga menziesii</i>		✓			
<i>Punica granatum</i>	✓				✓
<i>Pyracantha coccinea</i>	✓	✓	✓	✓	
<i>Pyrus elaeagrifolia</i>		✓			
<i>Quercus virginiana</i>	✓	✓	✓	✓	✓
<i>Ribes rubrum</i>		✓			
<i>Robinia pseudoacacia</i>	✓	✓	✓	✓	✓
<i>Rosa canina</i>		✓			✓
<i>Rosa multiflora</i>	✓	✓	✓		✓
<i>Rosmarinus officinalis</i>	✓	✓	✓	✓	
<i>Salix babylonica</i>	✓	✓	✓		✓
<i>Salvia sp.</i>	✓				
<i>Santolina chamaecyparissus</i>	✓		✓		
<i>Sedum sp.</i>					✓
<i>Sophora japonica</i>	✓	✓	✓		
<i>Spartium junceum</i>			✓		
<i>Spiraea x vanhouttei</i>		✓	✓	✓	
<i>Syringa vulgaris</i>	✓	✓			
<i>Taxodium distichum</i>	✓		✓		✓
<i>Taxus baccata</i>	✓	✓			✓
<i>Thuja occidentalis</i> “Danica”	✓				✓
<i>Thuja occidentalis</i> “Rehingold”	✓	✓			✓
<i>Thuja occidentalis</i> “Smaragd”	✓				✓
<i>Thuja occidentalis</i> “Sunkist”	✓	✓	✓		✓
<i>Tilia cordata</i>	✓	✓	✓	✓	
<i>Tilia tomentosa</i>	✓	✓		✓	✓
<i>Trachycarpus fortunei</i>	✓		✓		
<i>Ulmus campestris</i>	✓	✓	✓		✓
<i>Viburnum lucidum</i>	✓				
<i>Viburnum opulus</i>	✓				
<i>Viburnum tinus</i>	✓		✓		✓
<i>Washingtonia filifera</i>	✓		✓	✓	✓
<i>Weigela floribunda</i>					✓
<i>Wisteria sinensis</i>	✓		✓		
<i>xCupressocyparis leylandii</i>	✓	✓	✓	✓	✓
<i>Yucca filamentosa</i>			✓		
<i>Zizyphus jujuba</i>	✓			✓	✓

(URL 2, 2018).

However, when the plant taxa in the forests of the Marmara Region were evaluated in terms of taxonomic group, 68,85% was found to be Angiospermae and 31,15% was Gymnospermae. When the distribution of taxonomic groups by provinces is examined, the highest rate for Angiospermae is Istanbul with 72,09%. With 71,60% and 71,43%, Bursa and Çanakkale provinces are ranked second. The highest rate of Gymnospermae was Sakarya with 40,23%, while the lowest rate was 27,91% in Istanbul (Table 2).

Table 2. Taxonomic groups of plants in the forest nurseries of Marmara Region

	İstanbul (%)	Balıkesir (%)	Bursa (%)	Çanakkale (%)	Sakarya (%)
Angiospermae	72,09	68,69	71,60	71,43	59,77
Gymnospermae	27,91	31,31	28,40	28,57	40,23

When the plant taxa in Marmara Region nurseries are evaluated in terms of life forms, The plant form with the highest rate is 65,36% trees. The plants form with the lowest proportion are the ground covers and climbers with 3,27%. According to the results of statistical analysis on plant distribution according to their life span based on provinces, significant differences have been observed at $p \leq 0,05$ level (Figure 3). According to Table 3, Sakarya province ranks first with 71,26% in tree and shrub taxa produced in forest nursery enterprises of Marmara Region, while Istanbul ranks first with 36,43% in bush taxa. It is observed that Bursa is the leader with 4,94% in ground covers/climbers taxa.

Table 3. Distribution of plant taxa grown in forest nurseries in Marmara Region according to their life forms

	İstanbul	Balıkesir	Bursa	Çanakkale	Sakarya
Trees	59,69 e	68,69 b	62,96 d	66,67 c	71,26 a **
Shrubs	36,43 a**	28,28 c	32,10 b	31,75 b	26,44 d
Groundcovers/climbers	3,88 ab	3,03 bc	4,94 a**	1,59 c	2,30 bc

**The letters show different groups at the level of $p \leq 0,05$

On the other hand, 53,81% of the forest nursery in the Marmara region was determined to produce the most exotic plant taxa, whereas the rate of natural plant taxa was determined to be 46,19%. According to the results of statistical analysis on plant distribution regarding the state of being natural / exotic based on provinces, significant differences were observed at $p \leq 0,05$ level (Figure 4). According to Table 4, while the most natural taxa is in Çanakkale with 50,79%, it ranks last in terms of exotic taxa with 49,12%. In terms of natural taxa, Istanbul province ranks last with 41,86%, while it ranks first with 58,14% exotic taxa rate.

Table 4. Natural / exotic distribution of plant taxa grown in forest nurseries in Marmara Region

	İstanbul	Balıkesir	Bursa	Çanakkale	Sakarya
Native	41,86 c	46,46 b	48,15 b	50,79 a**	47,13 b
Exotic	58,14 a**	53,54 b	51,85 b	49,12 c	52,87 b

**The letters show different groups at the level of $p \leq 0,05$

3.1. Qualitative Assessments of Seedlings

As a result of the evaluations made in terms of the root characteristics of the plants in the forests of the Marmara Region, it was determined that 25,73% of the plants were mostly ground cover seedlings, rootballs and pots. In the least amount, enso-pot and basket-shaped seedling production was determined with 4,37%. (Figure 5) When the distribution of the body perimeter length of seedlings is examined, it is found that the highest rate is 18,37% with the seedlings smaller than 6 cm and the lowest rate is the seedlings larger than 7,14% and 20 cm. It is seen that 14-16 cm and medium size seedlings are produced with a rate of 12,24% (Table 5).

Table 5. Distribution of seedlings according to body perimeter lengths

Body Perimeter Lengths	Frequencies (%)
<6 cm	18,37
6-8cm	10,71
8-10cm	10,20
10-12cm	14,80
12-14cm	9,18
14-16cm	12,24
16-18cm	9,69
18-20cm	7,65
20cm >	7,14

As a result of the innovations of time and cultural and sociological changes, cities around the world now spread to large areas. The importance of green areas and public recreation areas in urban areas is more evident. Demand for ornamental plants has also increased throughout the world in this direction. Together with the increase in demand, intensive production of ornamental plants in nurseries and greenhouses has started (Söğüt, 2012). Plants used in landscaping works to be carried out in urban green areas in our country are obtained from state and private nurseries. Largest seedling nursery organizations in Turkey are Nursery Directorates and Seedling Chiefs under Forestry Directorates affiliated to Ministry of Agriculture and Forestry which has realized a new restructuring in recent years (Yer and Ayan, 2013).

In the study, forest nurseries and plants grown in these nurseries affiliated to Regional Forest Directorate in Marmara Region where the most amount of construction works is seen has been evaluated. As a result of the study including Forest Nurseries in the Marmara Region, 13 nursery in 5 provinces were evaluated, according to this, the plants grown in forest nurseries in İstanbul province found to have a rich variety both in terms of number of plant taxa (28,10%) and taxonomic group (Angiospermae taxa = 72,01%). After İstanbul, in terms of the number of plant taxa, Balıkesir province ranks first with its forest nurseries. In terms of taxonomic group, again Bursa and Çanakkale ranks first with Angiospermae taxa. In terms of the life forms of the produced plants, there are differences according to the provinces and it has been determined that seedling production is common in almost every category. In that, the most species of trees and treetops were produced in Sakarya (71,26%), while the most bush species were produced in İstanbul (36,43%) and the ground-covers / climbers were most produced in Bursa (4,94%) provinces. However, the vast majority of plant taxa produced in forest nurseries were found to be as exotic plants (53,81). The highest amount of exotic taxa was found in forest nurseries in İstanbul province, and natural plant taxa were mostly produced in Çanakkale forest nurseries.

Thus, Cengiz et al. (2017), in their study in 3 different private nurseries located in İstanbul, stated that, among these 162 plants taxa produced in these nurseries, only 45 taxa (28%) are natural plants, remaining 117 plant taxa (72%) were exotic plants. In their study, Gagliardi and Brand (2007) emphasized the need to focus on the production and use of natural plants. Similarly, Cengiz et al. (2013) determined the use of natural plant material in nurseries in Bartın; while the rate of exotic plants was 67,54%, the rate of natural plants was 32,46%. Yer and Ayan (2013), in their study among all forest nurseries in Turkey found that Balıkesir is the province with the highest diversity of production followed by 94 (44%) different taxa in İzmir and 93 (44%) different taxa in Sakarya.

On the other hand, in the study carried out by Yılmaz and Zengin (2003) in the city of Erzurum, 66% of the plants produced in Erzurum Forest District Nursery Directorate were trees and 34% of them were bushes. In the same study, they found that 63% of the saplings produced at the Green Field Directorates of Atatürk University were trees and 37% were bushes. Similarly, Erduran Nemutlu (2013) conducted a survey of the outdoor ornamental plant in Çanakkale. As a result of the research, it was found that 58 of the plants produced were trees (51%), 49 of them were bushes (43%), and 7 of them were groundcovers and climbers (6%). In the same study, it was revealed that there is no continuity in terms of diversity of species and production was performed according to demands and plants were imported when necessary.

When the seedlings produced in the forest nurseries of Marmara Region have been evaluated qualitatively, it has been observed that the seedlings generally have been not suitable for the standards and production has been performed according to the needs. Seedlings produced were mostly (25,73%) rootball and potted. It has been noted that the body of the seeders is mostly less than 6 cm in length. While the number of large seeders was low, the number of seeders with a medium circumference length was moderate.

In fact, Gilman and Kempf (2009) stated that trees with sufficient body size could stand on their own, and that the diameter of the branches for branch unity should be half the main body. In the study of Yeler et al. (2006) comparing ornamental plant seedling nurseries in Europe with the ones in Turkey, especially in outdoor ornamental plants, the superiority of enterprises in the field of tall seedlings and trees were mentioned. It is also stated that enterprises in Europe are not producing trees under certain sizes.

4. Conclusions

As a result, the plant taxa produced in forest nurseries of Marmara region vary according to the climatic characteristics of the regions they are in, the requirements and needs of the users and they show a rich variety. While the production of tree, shrubs and bush species is intensely applied, there is a minimal production of ground covers-climbers species. However, in the qualitative evaluation, produced seedlings are generally not in

compliance with the standards, there are smaller-bodied seedlings and they are sensitive to bending and fracturing and require support. With the implementation of regular maintenance procedures with innovative approaches, it will be possible to obtain the seedlings in accordance with the standards.

On the other hand, the basis of landscape design and applications is emulation from nature. In recent years, use of natural plants in the design is important in terms of recent concepts spoken such as global warming, urbanization and water scarcity. In terms of the sustainability of urban landscape, it is also necessary to place natural types in landscaping arrangements. However, in the Marmara Region forest nurseries, which are the subjects of our study, it is observed that the production of native plants is less than the exotic plant species. This shows us that the natural vegetation is not sufficiently exploited. A great contribution to both urban sustainability and economy can be provided with the production, reproduction, adaptation and sales of natural species which are less costly rather than high cost exotic species. Native plants should be easy to obtain without the need for importation and they should be made available to designers with the help of promotional catalogs. In this context, it is necessary to increase the production of our native plants, to provide incentive state policies for production and to raise awareness of users for using these taxa in landscape designs.

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