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Floristic Properties of Different Commercial Tulip Varieties under the Ecological Conditions of Bayindir[A]

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Abstract: The research was carried out over a vegetation period at Ege University, Bayindir Vocational Training School's trial fields between 2011 and 2012 to determine the adaptation performance of different commercial tulip cultivars under regional conditions. The research was carried out with three replications of randomized block design. Twenty different commercial tulip varieties of 10-12 sizes (Rai, Aladdin, Carnaval De Nice, Monte Carlo, Rem's Favorite, White Triumphator, Pink Impression, Monesella, Oxford Elite, Cassini, Dow Jones, Van Eijk, Yokohama, Golden Apeldoorn, Ali Baba, Los Angeles, Rococco, Salmon Impression, Jan Van Nes, Wildhof) were evaluated in terms of sprouting time, flowering time, end of flowering time, flowering longevity, plant height and general bulb yield criteria.

According to the data obtained, it was determined that there was a difference between varieties in terms of the characteristics examined. According to this; varieties of the first sprout time were observed at the earliest in January and at the latest in early March, the beginning of flowering was sighted earliest in March and latest in early April, while the end of flowering occurred between late March and late April. The duration of the flowering of the varieties ranged between 10 and 29 days and plant height differences were determined between 22.4 cm and 61.3 cm. In terms of bulb yield, cultivars except for Wildhof cultivar provided medium, good or very good bulb yield.

Key Words: Adaptation, Mediterranean climate, *Tulipa gesneriana.*

A This study does not require ethics committee permission.

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Farklı Ticari Lale Çeşitlerinin Bayındır Ekolojik Koşullarındaki Floristik Özellikleri

Öz: Araştırma, Ege Üniversitesi Bayındır Meslek Yüksekokulu deneme tarlalarında 2011 – 2012 yılları arasında farklı lale çeşitlerinin, bölge koşullarındaki adaptasyon performanslarının belirlenmesi amacıyla bir vejetasyon döneminde incelenmiştir. Araştırma tesadüf blokları deneme desenine göre 3 tekerrürlü yürütülmüştür. Çalışmanın bitkisel materyalini çevre uzunluğu 10-12 cm olan *Tulipa gesneriana* türüne ait yirmi farklı ticari lale çeşidi (Rai, Alaaddin, Carnaval De Nice, Monte Carlo, Rem's Favorite, White Triumphator, Pink Impression, Monesella, Oxford Elite, Cassini, Dow Jones, Van Eijk, Yokohama, Golden Apeldoorn, Ali Baba, Los Angeles,Rococco, Salmon Impression, Jan Van Nes, Wildhof) oluşturmuştur. Sürgün çıkış tarihi, çiçeklenme başlangıç tarihi, çiçeklenme bitiş tarihi, çiçekte kalma süresi, bitki boyu ve genel soğan verimi özellikleri ele alınarak çeşitler karşılaştırılmıştır.

Elde edilen verilere göre incelenen birçok karakter açısından çeşitler arasında farklılık olduğu belirlenmiştir. Buna göre; çeşitlerde ilk sürgün çıkışları Ocak ve Mart ayı başlangıcında, çiçeklenme başlangıcı Mart ve Nisan ayı başlangıcında, çiçeklenme bitimi Mart sonu ile Nisan ayı sonlarında gerçekleşmiştir. Çeşitlerin çiçekte kalma süreleri 10 ile 29 gün aralığında değişiklik göstermiş, bitki boy farklılıkları 22,4 cm ile 61,3 cm aralığında belirlenmiştir. Soğan kalitesi açısından Wildhof çeşidi hariç diğerleri orta, iyi veya çok iyi şeklinde ifade edilen soğan verimi sağlamışlardır.

Anahtar Kelimeler: Akdeniz İklimi, adaptasyon, *Tulipa gesneriana.*

Introduction

Ornamental plants began to gain commercial importance in the early 20th century and became an important commercial activity in many developed and developing countries after World War II. Today, this is considered as an effective sector which contributes to the economy of many countries. Plants which exist in all living spaces including our homes, working areas and social lives are not limited to ornamental consideration and have become instead an integral part of our lives. Ornamental plants are a general concept that consists of; cut flowers, indoor (pot) ornamental plants, outdoor ornamental plants and natural flower bulbs (geophytes) which are examined in four sub-groups (Menguc and Zencirkiran, 1991; Sayin and Sayin, 2004). Geophytes are the name given to herbaceous plants that store foodstuffs in specialized subsoil organs such as bulbs, tubers and rhizomes. Flower bulbs contain everything that a plant needs to grow. Examples include tulips, hyacinths, irises, lilies and daffodils. It is known that flower bulbs, which have a wide distribution area, are especially concentrated in the Balkan, Caucasus and Anatolia regions (Zencirkiran, 2002).

Flower bulbs are produced in a production area of approximately 43,000 hectares around the world. Regarding the distribution of flower bulb production areas, the highest production rates were found in the Netherlands (53.5%), United Kingdom (10.9%), USA (8.4%) and China (4.7%). The most important countries

producing flower bulbs for commercial purposes are the Netherlands, Chile, Brazil, New Zealand (Anonymous, 2008).

Although Turkey is very rich in terms of natural resources, it is noted that this issue is not given great importance, even though it is the homeland of many geophyte types. Natural flower bulbs have been removed and exported from the country's natural environment for over a hundred years. However, after 1960 export regulations were updated and exports gradually increased until the 1990s. With the development of environmental awareness, the idea that nature was being destroyed as a result of bulb exports began to gain weight. As of 2004 - 2005, the bulb production area in Turkey was 226 hectares of native flowers and ornamental plants which constituted 6% of the total production (Anonymous, 2008).

Generally, tulips are associated with The Netherlands. However, the primary gene centre of the genus Tulipa L. is located in the Pamir Alai and Tien Shan mountain ranges in Central Asia (Hoog, 1973). The tulip is a monocotyledonous plant in the *Liliaceae* family. The number of species ranges from about 45 (Stork, 1984) to more than 100 (Hall, 1940, Botschantzeva, 1962). According to the taxonomic classification by Van Raamsdonk and De Vries (1992, 1995), the genus is divided into two subgenera: Tulipa and Eriostemones. Mostly hybrid varieties and some species are used in cut flowers, potted plants and landscape design. The most widely used varieties are derived from *Tulipa gesneriana*. Tulips can be propagated from seeds and the actual propagation is made from bulbs. The tulip, which has almost no odour but attracts people with its beauty and the attractiveness of its colours, was cultivated by the Turks in the early 1000s. They are between 10 cm and 70 cm in plant height depending on their varieties and growing environments. A total of 19 taxa are grown naturally in Turkey as 17 species, 1 subspecies and 1 botanical variety in Tulipa genus (Eker et al., 2014).

The aim of the research is to examine the adaptation performances of different commercial tulip varieties in the region and to provide new plant production by sharing the positive results with the growers of the region.

Material and Method

The research was carried out over a vegetation period at Ege University, Bayindir Training School's ($38^{o}20.12$'N - $27^{o}67.14$'E, at an altitude of 105 meters) trial fields between 2011 and 2012 to determine the performance of different commercial tulip cultivars under regional conditions. Twenty different commercial tulip varieties (Rai, Aladdin, Carnaval De Nice, Monte Carlo, Rem's Favorite, White Triumphator, Pink Impression, Monesella, Oxford Elite, Cassini, Dow Jones, Van Eijk, Yokohama, Golden Apeldoorn, Ali Baba, Los Angeles, Rococco, Salmon Impression, Jan Van Nes, Wildhof) were used as plant material. The research was carried out with three replications of randomized block design.

The site was examined in terms of the physical and chemical components of soil structure through a soil analysis laboratory (Table 1). The site was typical of a Mediterranean climate. The relative humidity (%), average temperature (^{o}C) and total precipitation (mm) were obtained from the planting site for 2011 and 2012 when the research was conducted, and between 1956 and 2016 for longer-term averages (Table 2).

Table 1. Some physical and chemical components of the research site soil

Sand (%)	79.1	Soluble Total Salt (%)	0.03
Clay (%)	1.8	Organic Material (%)	2.27
Silt (%)	19.1	Total N (%)	0.090
Texture	loamy sand	Available P (ppm)	2.54
pH	6.07	Available K (ppm)	40
$CaCO_3$ (%)	0.80	Available Ca (ppm)	1305

In November, before planting, the research plots were cleared of debris and weeds manually. No chemicals were used for clearing or fertilization purposes. Accordingly, bulbs from all 20 cultivars were planted in prepared plots on 15 December 2011 in a randomized block design with three replications. Each of the 60 plots contained 50 bulbs of a single cultivar. Bulbs were planted at a spacing of 10 x 10 cm and 10 cm deep. 10-12 size tulip bulbs were planted in the study.

Table 2. Climate data of the study period and long term averages

	2011 - 2012			1956 - 2016		
Months	Relative Humidity (%)	Average Temperature (^oC)	Total Precipitation (mm)	Relative Humidity (%)	Average Temperature (^oC)	Total Precipitation (mm)
December	77.2	8.0	156.9	82.3	9.1	93.3
January	78.1	5.0	153.4	83.1	6.9	108.7
February	74.8	6.0	82.6	79.8	8.3	66.2
March	65.7	10.2	63.6	73.6	11.1	40.5
April	67.4	15.9	38.4	71.0	15.3	39.3
May	67.4	19.3	50.2	60.0	20.2	30.7

Planting was completed by hand in one day and the bulbs were irrigated. There was no further irrigation until April. During the growing period, 3 different fertilizers were applied. When the shoots were 5 cm, 50 kg/da Entec-26 (%26 N), 20 kg/da $CaNO_3$ were applied before flowering and 20 kg/da KNO_3 after the flower break.

The following nine criteria were recorded:

a. Sprouting time (when 20 % of the bulbs had sprouted in days)
b. Flowering time (when 20 % of the flowers were present in days)
c. End of flowering time (when 20 % of the flowers had wilted)
d. Flowering longevity: (from tepal colouring to wilting in days)
e. Plant height: (from ground level to the apex of flower in cm)
f. General bulb yield: Bulb yields were evaluated visually in the range of 1-5 points. (1- very bad, 2- bad, 3- medium, 4- good, 5- very good)

Statistical analysis was conducted by using the TOTEMSTAT Statistical program (Acikgoz et al., 2004). Probabilities equal to or less than 0.05 were considered significant. If, TOTEMSTAT indicated differences between treatments means an LSD test was performed to separate them.

Results and Discussion

Sprouting Time: The data of the sprouting time and day intervals of the experiment are given in Table 3. It can be seen from the table that there are differences in the dates of sprouting times among varieties used in the research. According to the data obtained from the sprouting times, the first sprouts were observed in Monte Carlo cultivar 22 days after planting (06.01.2012), followed by Dow Jones (29 days), Rococco (30 days) and Salmon Impression (30 days) varieties. The shoots appeared on the soil surface at least 80 days after planting in Carnaval De Nice. The sprout times of the other cultivars used in the research were realized 33 to 59 days after planting. The sprout speed of bulbs affects the variety of bulbs, climatic structure of the region, soil properties and sowing depth.

Flowering Time: The data on the flowering times and day intervals of the experiment are given in Table 3. As it can be seen from an examination of the table, there are differences between the flowering times of the varieties. When the data on the beginning of the flowering is examined, it is seen that Monte Carlo (08.03.2012), Pink Impression (13.03.2012) and Cassini (14.03.2012) varieties reached this stage first. On the other hand, it was determined that Carnaval De Nice (04.04.2012), White Triumphator (30.03.2012), Rem's Favorite (25.03.2012) and Jan Van Nes (24.03.2012) varieties came to the flowering stage at the latest. Our findings regarding the beginning of the flowering period show that it generally occurred between the first week of March and the first weeks of April.

The tulip bulbs planted in autumn pass into the flowering phase when the weather starts to warm up in spring. The data we obtained on this subject was consistent with the findings of Hessayon (2003), Sonyol (2012), Salman et al. (2016) and Pala (2006).

End of Flowering Time: The data regarding the end of flowering time of the research is given in Table 3. As it can be seen from an examination of the table, there are differences at the end of flowering time between the varieties. This period was determined on 31.03.2012 and 24.02.2012. Salmon Impression (31.03.2012), Wildhof (02.04.2012) and Monte Carlo (02.04.2012) were the first varieties that lost their flowers in late March and early April. Carnaval De Nice (24.04.2012) cultivar reached the end of the flowering stage at the latest among the research varieties. The data obtained from the end of flowering in the study was found to be consistent with the statements of Salman et al. (2016).

Plant Height: The data of plant height obtained from 20 different commercial tulip varieties used in the study is given in Table 3. According to the results of the statistical analysis, it was determined that there was a significant difference between the varieties. The highest data for the examined plant height character were determined in Salmon Impression (61,3 cm), Jan Van Nes (58,0 cm), Rem's Favorite (51,0 cm) and Dow Jones (50,6 cm) varieties. The lowest plant height data were measured in Ali Baba (22,4 cm), Wildhof (33,0 cm) and Carnaval De Nice (33,0) varieties. Plant height in tulips varies between 10 and 70 cm depending on variety and growing environment conditions (Salman et al. 2016). It is important to know the plant height at the point of evaluating the plant as outdoor, potted or cut flower. Since the plant height is over 40 cm in many tulip varieties

used in our research, we can say that these varieties are suitable in the production of cut flowers. It will be more appropriate to evaluate the varieties that are below 40 cm in length as outdoor and ornamental pot plants. The findings we obtained in the study were consistent with the findings of Salman et al. (2016) and Bhat et al. (2017).

General Bulb Yield: The data obtained from the bulb yield in the range of 1-5 points are given in Table 3. It was observed that there were differences between bulb yields of different tulip cultivars grown under the ecological conditions of the region. As can be seen from Table 3, the best bulb development was determined with 5 points in Monesella, Dow Jones, Van Eijk and Salmon Impression varieties. Rem's Favorite, Pink Impression, Oxford Elite, Cassini, Yokohama, Golden Apeldoorn and Ali Baba were the varieties considered as having good bulb development and received 4 points. Among the 20 different tulip varieties examined, Wildhof was the weakest for bulb development. Early harvesting, storage and forcing application of tulip bulbs is an important step in commercial cut flower tulip production. Therefore, this study, carried out in a region where the Mediterranean climate is dominant, shows that cultivation of tall varieties with 4 and 5 points bulb yield value is important in terms of cut flower production. The cultivar, leaf area, growing period, environmental conditions, sowing time, sowing frequency, soil type, fertilization, climatic conditions, disease and pest status and harvest time are the factors that affect bulb yields (Le Nard and De Hertogh, 2002).

Conclusion

In this study of 20 different commercial tulip varieties in the Bayindir region, where the Mediterranean climate dominates, differences between the varieties in terms of their characters were examined.

Knowing the characteristics of the varieties which are used in landscape planning will help in the realization of design and yield healthy results.

Considering the fact that most of the world's production of tulip bulbs is made of cut flower production, an early harvest advantage provided in the studies performed in the region may lead to the formation of a new sector. The Netherlands, which is the leader in this field, produces in countries like Spain, France and Italy where the Mediterranean climate allows for early bulb production.

Considering the bulb enlargement study, the preferred 4 and 5 point values – Rem's Favorite, Pink Impression, Oxford Elite, Cassini, Dow Jones, Van Eijk, Yokohama, Golden Apeldoorn, Ali Baba, Salmon Impression, Jan Van Nes - will allow successful results to be achieved.

Table 3: The data of the characters examined in the research

Cultivars	Sowing Date	First Sprouting Date	Day Range	First Flowering Date	Day Range	End of Flowering Date	Day Range	Flowering Longevity	Plant Height	Bulb Yield
Rai	15.12.2011	04.02.2012	51	18.3.2012	94	07.04.2012	114	20	40.8 h	3
Alaaddin	15.12.2011	26.01.2012	42	20.3.2012	96	11.04.2012	118	22	48.7 d	3
Carnavel De Nice	15.12.2011	04.03.2012	80	04.04.2012	111	24.04.2012	131	20	33.0 l	3
Monte Carlo	15.12.2011	06.01.2012	22	08.03.2012	84	02.04.2012	109	25	37.2 j	3
Rem's Favorite	15.12.2011	09.02.2012	56	25.03.2012	101	10.04.2012	117	16	51.0 c	4
White Triumphator	15.12.2011	25.01.2012	41	30.03.2012	106	09.04.2012	116	10	43.7 g	3
Pink Impression	15.12.2011	17.01.2012	33	13.03.2012	89	04.04.2012	111	22	47.0 f	4
Monesella	15.12.2011	26.01.2012	42	17.03.2012	93	08.04.2012	115	22	39.0 ı	5
Oxford Elite	15.12.2011	09.02.2012	56	23.03.2012	99	05.04.2012	112	13	43.7 g	4
Cassini	15.12.2011	20.01.2012	36	14.03.2012	90	12.04.2012	119	29	48.0 de	4
Dow Jones	15.12.2011	13.01.2012	29	16.03.2012	92	04.04.2012	111	19	50.6 c	5
Van Eijk	15.12.2011	26.01.2012	42	16.03.2012	92	07.04.2012	114	22	47.8 e	5
Yokohama	15.12.2011	17.01.2012	33	21.03.2012	97	10.04.2012	117	20	37.0 j	4
Golden Apeldoorn	15.12.2011	12.02.2012	59	23.03.2012	99	08.04.2012	115	16	43.3 g	4
Ali Baba	15.12.2011	25.01.2012	41	23.03.2012	99	10.04.2012	117	18	22.4 h	4
Los Angeles	15.12.2011	01.02.2012	48	21.03.2012	97	11.04.2012	118	21	48.5 de	3
Rococco	15.12.2011	14.01.2012	30	21.03.2012	97	05.04.2012	112	15	35.4 k	3
Salmon Impression	15.12.2011	14.01.2012	30	17.03.2012	93	31.03.2012	107	14	61.3 a	5
Jan Van Nes	15.12.2011	26.01.2012	42	24.03.2012	100	10.04.2012	117	17	58.0 b	5
Wildhof	15.12.2011	25.01.2012	41	18.03.2012	94	02.04.2012	109	15	33.0 l	2
CV									1.04	
LSD (%5)									0.75	

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