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Determination of Adaptation Capabilities of Some Dahlia Varieties in Tokat /Turkey Ecology

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Abstract: Dahlia 'also known as dalya' blooms from summer to autumn season, its stem is in the shape of a bush, and its roots are tuber-shaped. It was naturally grown between the Mexican borders and the neighboring countries of Central America. Dahlia is among the most planted and best-known plants of the gardens all over the world. This study was carried out to determine the morphological and phenological features of some *Dahlia* spp. varieties include yield, flower diameter, pedicle length, stem diameter, stem number, bud diameters, and plant length. The research used 6 different dahlias (Philadelphia, Rebecca's World's, American Dawn, Marble Ball, Mr. Optimist, and Hulin's Carnival) types. In the study conducted in the ecological conditions of Tokat, Hulin's carnival was the most suitable variety in terms of pedicle length, stem diameters, and flower bud diameter. At the same time, American Dawn was the most suitable variety in terms of plant height and flower diameter.

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1. Introduction

Extremely interesting flowers of bulbous-tuberous plants in terms of form and color, early flowering, especially at the end of winter, as soon as the snow is removed from the soil or blooms with snow, is also symbolic significance as the herald of spring, due to their easy cultivation and production, they constitute the most used traditional plant material of gardens and parks in various countries of the world (Mathew, 1987; Mathew and Swindells 1994; Leeds, 2000; Yazici and Gulgun, 2016; Akca et al., 2018; Yazici and Yıldız, 2016; Yazici and Gulgun, 2017). Ohno et al (2013) reported that garden dahlia is one of the most popular plants in the world.

Aster flower is one of the plants that stands out with its use of outdoor ornamental plants among tuberous plants. The native land of the Aster flower, whose scientific name is Dahlia, is Mexico. It was named Dahlia because it was found by the Swedish botanist Anders Dahl in the 18th century. Dahlia was first found by the Spaniards in the mountains of Mexico and is considered the national flower of the country (Gatt et al, 1998). Dahlia is very rich in flower color compared to other floricultural. According to Takeda et al., (1986), Nordström and Swain (1953), and Ohno et al., (2011), Dahlia's flower colors, which are pink, red, ivory white, purple, and black cultivars, were important in terms of accumulation of anthocyanin, flavone, and/or lutein derivatives.

The Aster flower in the Asteraceae family has 30 major species and approximately 20,000 varieties. Aster flowers have around 30 prominent species and around 20.000 breeds. It blooms in summer and autumn season; its stem is a shrub and its roots are tubers. There are 27 species in nature, and some of these species reach a height of 8-9 m in some species have a length stunted (Brickell 1992; Hessayon 1993; Mc Claren 2004). In addition to earlier flowering in temperate regions, it has different plant sizes and different flower shapes and sizes. Flower forms; change to simple, lilies, anemones, puffs, top, semi cactus, cactus, decorative orchids, and peonies. As for the color palette, it offers a wide variety of warm colors other than the shades of blue.

McClaren (2009) stated that Dahlia is referred to by special names such as *D.pinnata*, *D. variabilis*, and *D. hybrida*; They are planted in the spring after being stored in winter. They are generally produced in the open area in summer. When desired, they can also be produced in the greenhouse in the winter months (Yazici and Gunes, 2018). It is possible to grow cultivars easily. The ecological demands; optimum germination temperature is 18-26 ° C. However, the temperature should then be lowered. 12 °C is sufficient for the next period. It requires sunny-airy environments for abundant and early flowering. Dahlia likes humus and lightly loamy soils, but also does not like too acidic soils; soil pH should be around 6-7. Tubers need to be protected from frost in winter, and attention should be paid to keeping the environment dry and airy.

Considering another study on dahlias (*Dahlia* spp.); Lumpkin (2005), in their shading applications dahlias; plant excessive sunlight, high temperatures, and low humidity and protect the plant from the wilt problem caused by sun exposure, increasing the length of the flower stem, they have indicated the need to adjust the amount of boost the flower color quality sunlight intensity. In another shading study, Dahlia 'ChootHashani', 'Orpheo', and 'Lavender Perfection' varieties have investigated the effects of shading of plants on the cultivation of roots. Although the natural light intensity decreased by about 50% in the rooting percentage of 'Orpheo' steels, it did not affect the rooting of 'Lavender Perfection' steels. (Biran and Halevy, 1973). When the literature is examined, it is seen that the studies on the varieties of dahlia flowers are limited. This study aims to evaluate the adaptation capabilities of the ornamental plant known as dalya and to determine the most suitable for the 6 different dahlia varieties under the ecological conditions of the Kazova plains of the city of Tokat. A secondary objective is to determine the suitability of dalya (*Dahlia* spp.) for plant design. Hopefully, this study will be able to determine optimal practices for the plant and act as a precursor for the growers who want to grow ornamental plants in the city of Tokat. We believe a new plant can thus be introduced to the ornamental plant design patterns in places like Tokat ecological conditions, together with this study The Middle Black Sea region of Turkey with the cultivation of different varieties of dahlia in the region and was made to provide new information and resources to the literature.

2. Material and Method

2.1. Material

In the study; *Dahlia* spp. (The cultured dahlias obtained were usually caused by hybridization of *D.pinnata* and *D.coccinea*) varieties were used. The plant materials for the study were obtained from Konya AsyaLale Production Company. The study was conducted in the fields of The Center of Agricultural Research and Applications in the city of Tokat (Turkey), under the ecological conditions of the Kazova plains on April 28, 2017 Climate data of the experimental area were given in Figure 1.

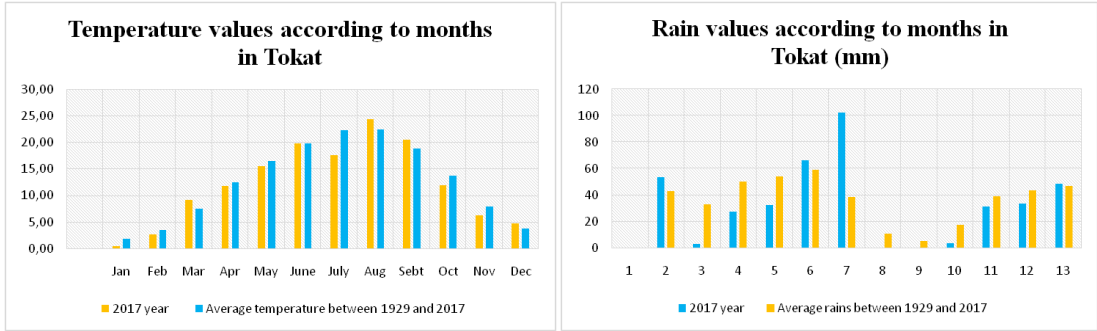


Figure 1: Monthly temperature and rain graphs in Tokat Ecology

The tubers were planted in the field and the observations were followed and data obtained. Dahlia varieties Philadelphia(a), Rebecca’s World (b), American Dawn (c), Marbleball(d), Mr. Optimist (e), and Hulin’s Carnival (f) are used in the study in Figure 2; Figure 3.



Figure 2: The photograph from the experimental field (Original)



Figure 3: Some varieties of *Dahlia* spp. photographs from the experimental field a: Philadelphia, b: Rebecca'sWorld's, c: American Dawn, d: Marble Ball, e: Mr. Optimist, f: Hulin's Carnival (Original)

2.2. Method

The study was carried out in the experimental field of the Agriculture Faculty at Tokat Gazismanpasa University. Some properties of experimental area soil are given in Table 1. *Dahlia* spp. Tubers were planted in GUTAM (Gaziosmanpaşa University Agricultural Application and Research Center) in 2017. Before planting, it was kept in plastic buckets for 30 minutes in a 50% Carbendazim solution against fungal diseases. Considering that the flowers are relatively large, the plants were seeded in a 50 x 50 cm grid, to a depth of 15 cm due to the large blooms.

Table 1: Some physical and chemical properties of experimental soil

Soil depth(cm)	Total salt (%)	Lime (%)	Organic matter(%)	Phosphorus P ₂ O ₅ (kg/da)	Potassium K ₂ O (kg/da)	Structure	pH	EC
0-30	0.02	9.99	0.79	6.12	80.31	Siltli	7.87	0.50

The study was applied in three replications (each repeat had 6 tubers) and was grouped as 'a' randomized complete block design". A total of 108 *Dahlia* spp. tubers were thusly used. After the variance analysis, the averages were compared using the Duncan test (Düzgüneş et al., 1987).

Observations, after variance analysis, means by Duncan test compared. Observations were given below (Aslanboğa, 1992; Yalçırık et al., 1997).

2.2.1 Morphological observations

Yield; It is the total number of flowers obtained from plants during the season. **Flower diameter (mm);** It was measured with calipers and tape measure. **Pedicle length (cm);** It was determined by measuring the distance from the first two leaves at the bottom to the flower. **Stem diameter (mm);** The plant was measured with a caliper 5 cm above the soil surface. **Stem number (pcs);** Stems in plants were counted and averaged by varieties. **Bud diameters (mm);** After the flower buds have been colored to the extent of the flower color, they have been measured from the thickest point with a caliper. **Plant length (cm)** was determined by measuring the distance between the soil surface of the plant and the flower receptacle (Table 2).

2.2.2 Statistical analysis

In this study; the tests were repeated three times with the “parcels divided by randomized blocks” method, and each repeat had 6 tubers. After the variance analysis, the averages were compared using the Duncan test (Düzgüneş et al., 1987).

3. Results and Discussion

3.1. Yield

When the yield data of dahlia cultivars grown in Tokat ecology are analyzed; In terms of the total number of flowers obtained from plants throughout the season, Rebecca (41,04 pieces) has the highest yield among 6 varieties. This was followed by American Dawn (39,35 pieces) and Philadelphia (38 pieces). American Dawn (ab) and Philadelphia (ab) Marble purple (b) varieties are important in terms of yielding Mr. Optimistic and Hulin’s carnival (Figure 4; Table 2). Yazici and Gunes (2018) stated that the Seattle and Babylon Purple flowers yielded more flowers (with 15.66 and 17.66 units) from Le Castel and Gloriosa. Also, similar results were obtained in the study of Kumar et al. (2015).

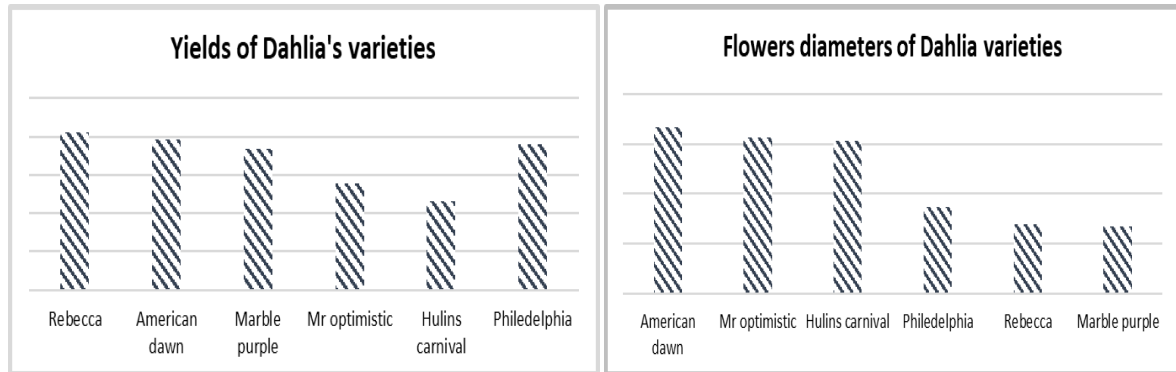


Figure 4: The yield and flower diameter in *Dahlia* spp. some varieties

3.2. Flower diameter (mm)

Another observation is the flower diameter value. According to the data obtained; the largest flower diameter was obtained from the American dawn (16.66 mm) variety. This was followed by Mr. Optimistic (15.63 mm) and Hulin’s carnival (15.30 mm) variants, respectively (Figure 4.). American Dawn (a), Mr. Optimistic (b), Hulin’s carnival (b), and Philadelphia (c) varieties were found to be significant compared to Marblepurple (d) Rebecca(d) in terms of flower diameter (Table 2). It has been reported that the flower diameter characteristics were highly influenced by genotype and climatic factors and were considered as a measure of adaptation to ecological conditions Dhane and

Nimbalker (2002). According to Grupta et al. (2015), the Maximum diameter of a fully opened flower (24.5 cm) was found in hybrid Kenya blue.

3.3. Pedicle length (cm)

The longest flower stem was obtained from Hulin's carnival (26.41 cm), followed by Philadelphia (16.61 cm) and Mr. Optimistic (15.41 cm), respectively (Figure 5; Table 2). Hulin's carnival (a) and Rebecca (b) varieties were found to be important from Philadelphia (c) American Dawn (d) Mr. Optimistic (d) Marblepurple (e) in terms of pedicle length. Gupta et al (2015), Dhane and Nimbalker (2002), and Yazici and Gunes (2018) reported that the plant height and plant diameter characteristics may vary depending on the cultivation of the same species and/or variety in a greenhouse or open area or depending on the differences in the cultural processes applied.

3.4. Stem diameter (mm)

In the experiment using 6 different varieties, the average of the data obtained from the stem diameter is presented in Figure 6. In the light of the given data obtained from the measurements; Hulin's carnival variety (18.28 mm) has the largest stem diameter, followed by Rebecca (12.97 mm) and Philadelphia (12.48 mm), respectively (Figure 5.). It is seen that there is a significant difference in American Dawn (d), Philadelphia (c) Marble Purple (f) Mr. Optimistic (e) stem diameter, Rebecca (b), and Hulin's carnival (a). The study of Baburao et al. (2008) stated that all parameters of courage were found most promising in terms of the number of days required for first flower bud emergence from transplanting (39.06 days), Diameter of the flower (25.05 cm), Weight of flower (106.47cm), Shelf life of flower (15.66 days).

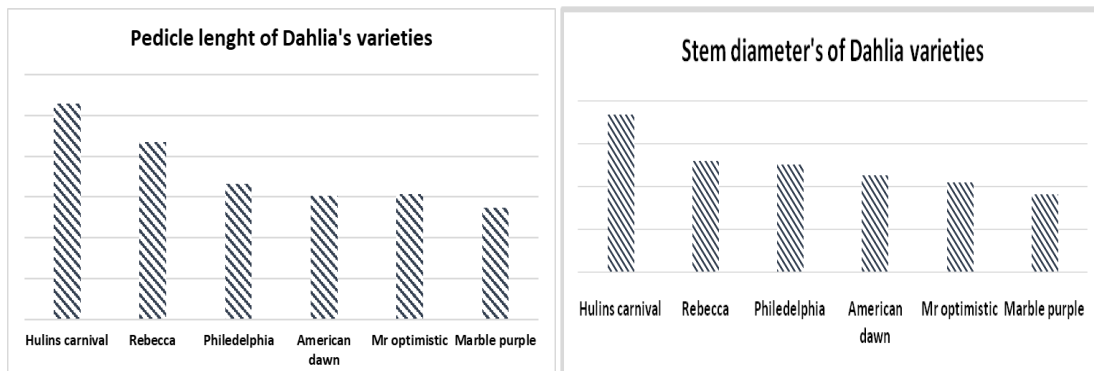


Figure 5: The pedicle length and stem diameter in *Dahlia* spp. some varieties

3.5. Stem number

When the data on the number of stems are examined in the study; the Marble purple variety (4.33 pieces) has the highest number of stems. This is followed by the Mr. Optimistic variety (4.11 pieces), Hulin's carnival (3.44 pieces), Philadelphia (3.11 pieces), and Rebecca (2.77 pieces) (Figure 6). Marble Purple (a), Mr. Optimistic (a), American Dawn (b), and Hulin's Carnival (b) are important compared to Philadelphia (c) and Rebecca (c). Gupta et al (2015) reported that similar results were obtained in the study of Kumar et al. (2009).

3.6. Bud diameters (mm)

According to the data obtained from the measurements made during the flowering period of the plant; The highest value of flower bud diameter was obtained from Hulin's carnival variety with 30.72 mm, followed by the American dawn variety with 28.39 mm (Figure 6). Hulin's Carnival (a), and American Dawn (b) are important in terms of flower bud diameters compared to Mr. Optimistic (c), Philadelphia (c), Rebecca (d), and Marble Purple (e). Grupta (2015); Suman et al. (1991); and Yazici and Gunes (2018) reported that the bud appearance characteristics may vary depending on the

cultivation of the same species and/or variety in a greenhouse or open area.

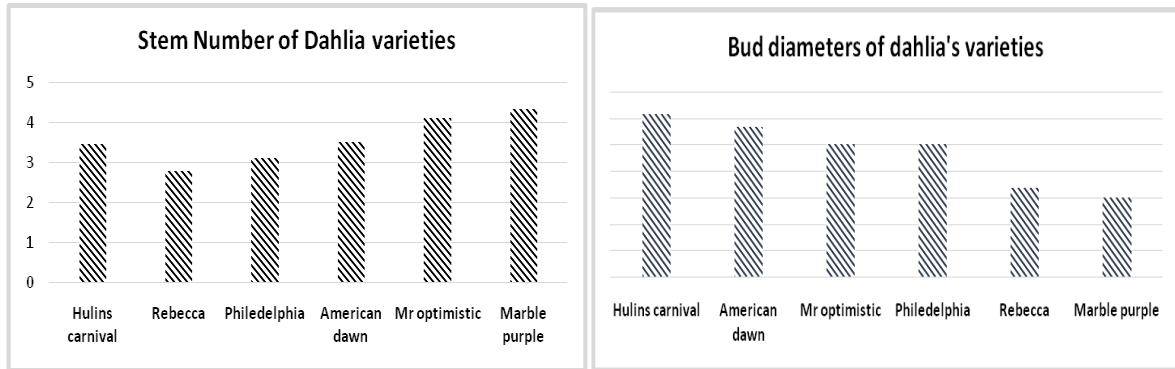


Figure 6: The stem number and bud diameters in *Dahlia* spp. some varieties

3.7. Plant height (cm)

According to the data obtained in terms of plant length, the longest plant length was obtained from the American dawn (111,6 cm) type, followed by the Rebecca (111,5 cm) type (Figure 7). In terms of plant length, Rebecca (a) and American Dawn (a) are statistically significant relative to Hulin’s Carnival (b), Philadelphia (c) Marble Purple (e), and Optimistic (d).

Gupta et al. (2015) stated that. The maximum plant height (59.27 cm) was observed in Nandini followed by Santasyrna (57.27 cm) and S.P. Kamala (55.20 cm), while the minimum plant height (40.08 cm) was observed in S.P. Glory of India. The maximum number of leaves per plant (29.46) was observed in Kenya Blue followed by Kenya white (27.33) and Eternity Sports (27.2), while a minimum number of leaves per plant (22.13) was observed in S.P. Glory of India. Our study obtained a maximum height of 111,6 cm (American Dawn). Suman et al. (1991) Plant height and number of leaves also showed a slight positive effect on the number of flowers.

According to the study of Bati (2018), as a result of the measurements and observations made within the scope of morphological definition, a wide variation between genotypes was observed and the genetic diversity of dahlias grew in the Konya region. Yazici and Gunes (2018) stated that Tokat ecology was suitable for Dahlia growth.

Table 2: Statistical data of Morphological observations of *Dahlia* spp. some variability

	Philadelphia	Rebecca’s World’s	American dawn	Marble ball	Mr.optimist	Hulin’s carnival
Yield	38,027A	41,038A	39,354A	36,650A	27,77B	23,261B
Flower diameter (mm)	8,725C	7,016D	16,664A	6,759D	15,637B	15,308B
Stem diameter (mm)	12,486C	12,975B	11,197D	9,0727F	10,350E	18,281A
Stem number	3,1CB	2,72C	3,5B	4,333A	4,166A	3,44B
Pedicle length (cm)	16,615C	17,63B	15,412D	15,38D	13,73E	26,416A
Bud diameters (mm)	25,158C	16,725D	28,39B	15,029E	25,181C	30,72A
Plant height (cm)	104,067C	111,567A	111,665A	83,055E	84,710D	108,29B

4. Conclusion

Recent developments in ornamental plants have brought up the evaluation of all kinds of ornamental plants. Dahlia, which is a bulbous plant, is used as an outdoor ornamental plant and it is a

plant that remains flowering during the summer months, the flowering period of which is longer than many bulbous plants. When recent studies are examined, it is noteworthy that there are few studies on dahlia. In this study, the phenological properties of some cut flower dahlia varieties under Tokat conditions were evaluated. These results can give information about the usage conditions of the varieties that come out with different features in the landscape. The results are important for us since it is taken into consideration that average values will be obtained in places close to or similar to the ecology of Tokat.

As a result of the measurements; Hulin's carnival variety was determined as having the highest values with the longest flower pedicle length (26.41 cm), maximum stem diameter (18.28 cm), and maximum flower bud diameter (30.72 mm). In the cut flower sector, features such as flower diameter, flower stem thickness, and flower stem length are taken into consideration. According to plant length in the varieties of dahlia used American dawn variety had the most length 112 cm in the study.

In addition, American dawn varieties with a flower diameter of 16.66 mm have the highest value. As a result; when the characteristics of 6 different cut flower dahlia cultivars grown in Tokat ecological conditions and phenological observations were evaluated, it was determined that Hulin's carnival and American dawn varieties were the most suitable. This study is an example for future studies and producers that can be made in dahlia flowers.

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