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EFFECT OF PLANTING DATE AND BULB CIRCUMFERENCE WIDTH ON BULBLET YIELD OF NARCISSUS (*Narcissus tazetta* L.) FLOWER

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A B S T R A C T

In this study, the effects of planting date and bulb circumference on bulb yield were investigated in *Narcissus tazetta* flower. *Narcissus* spring bulbs, which were picked from nature in August, were divided into three groups (12.1-14, 10.1-12 and 8.1-10 cm) according to their circumference and planted in open field at different dates (September, October and November). In the research, bulb sprout rate, bulb circumference increase, and bublet formation rate were determined. As a result of the study, the best planting date (September) in terms of bulb circumference increase values (15.25 cm) and bulblet formation number (1.39 per plant) was revealed as a result of the study. The highest bulb circumference increase rate (34%) was obtained from bulbs with a circumference of 8-10 cm, while the lowest value (25%) was obtained from bulbs with a circumference of 12-14 cm. In terms of bulblet formation rates, there was no difference between circumference length. In the light of these data, it has been determined that bulbs with a circumference of 8-10 and 10-12 cm should be used to increase the bulb circumference. Bulbs with a circumference of 12-14 cm and larger should be used to obtain bulblet.

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1. Introduction

In recent years, the demand for Türkiye's ornamental plants has been increasing and production is developing in line with these demands. Türkiye has suitable climate and ecological conditions for ornamental plant production and is close to foreign markets. In order to transform these advantages into added value, it is necessary to prevent foreign dependency in purchasing materials. However, hybrid ornamental plant seeds used in ornamental plant production in Türkiye are mostly imported. In addition to seeds, bulbs used in the production of bulbous plants are also imported. This situation increases foreign dependency and production costs in ornamental plants, causing the country's resources to be exported (Çelikel, 2015).

The ornamental plants sector is known as the sector that provides the highest added value per unit area when compared to other areas of the agricultural sector (SÜSBİR, 2016). Although Türkiye's ornamental plant production and export has increased in recent years, it has not yet reached the desired target. Ornamental plants imports amounted to 37517 dollars and exports amounted to 114391 dollars. Türkiye's ornamental plants production areas have reached approximately 56865 da. Natural flower bulb production areas in this area are very low, approximately 506 da (TUIK, 2023). In order to develop the sector, it is very important to introduce local species to the sector and increase domestic production. Utilizing our existing wealth, protecting our endangered species and increasing R&D studies for this purpose will contribute to our country's production and therefore its economy.

Natural flower bulbs, known as geophytes, are economically important in the ornamental plants sector (Aksu et al., 2002). *Narcissus* (*N. tazetta*), which is one of our important geophytes and the subject of this study, is a species from the *Narcissus* family (Amaryllidaceae). *N. tazetta* species have naturally spread from the Mediterranean coast to China and Japan (Grey-Wilson and Mathew, 1981; Mathew, 2002; Zeybekoğlu, 2010). In Türkiye, it has a natural distribution in Adana, Siirt, Antalya, Diyarbakır, Mersin, İzmir, Muğla, Samsun, Ordu (Ünye) and Van (Sari and Çelikel, 2018a; TÜBİVES, 2023). Obtaining production material is an important issue in the production of bulbous plants. As a matter of fact, obtaining bulbs from bulbous plants is quite laborious and takes a long time. The most important criterion in determining bulblet formation and other vegetative characteristics in bulbous plants is the width of the bulb circumference. This issue has been touched upon in previous studies on daffodils.

In the study of Özel and Erden (2008) on *N. tazetta*, bulbs are classified into three different sizes: 8-10 cm, 10-12 cm, and 12-14 cm. In the research, it varied between the circumference of the mother bulb is 13.40-14.90 cm, the weight of the mother bulb is 47.32-67.25 g, the number of bulblet is 1.68-2.21 per plant, the circumference of the bulblet is 8.50-9.83 cm, the weight of the bulblet is 15.67-17.17 g, the bulblet yield is kg m^{-2}. In addition, Özel and Erden (2018) determined increase rate of bulb circumference in *N. tazetta* subsp. *tazetta* by comparing the initial and final circumference of bulbs. The researchers initially divided bulbs into 8-10, 10-12, and 12-14 cm circumferences and found that the highest increase rate was 42.22-43.7% in the first group, while the lowest was 2.05-6.92% in the third group. Additionally, they indicated that the number of bulblet formations per plant was 0.48 in the 8-10 cm group, 2.12 in the 10-12 cm group and 4.88 in the 12-14 cm group.

Ünye district of Ordu, the *Narcissus* (*N. tazetta* L.), with many fragrant and multi-layered flowers on a long stem, which spreads mostly at the bottom of the hazelnut trees, blooms from the end of autumn to the beginning of spring (Sari and Çelikel, 2019a; Sari and Çelikel, 2019b). In this period when cut flowers are scarce, they are sold in bunches, creating an additional source of income for the district farmer. Determining the appropriate production methods to ensure the production of bulbs required for the production of daffodil flowers will be instructive for the producer. For this reason, the main purpose of this research study is to determine the most suitable bulb circumference width and planting date in terms of bulblet yield of the layered narcissus flower, which spreads naturally in Ünye.

2. Material and methods

2.1. Plant materials

In the study, bulbs from the natural populations of *Narcissus tazetta* located in Saca village locality of Ordu/Ünye district were used as plant material (Figure 1).

2.2. Bulb circumference

Measurements were made to determine the most suitable bulb circumference for cultivating bulbs collected from their natural environment. Bulb circumference was measured with a tape measure from the widest part of the bulb with the longest diameter perpendicular to the axis of the bulb and grouped as 0-8, 8.1-10, 10.1-12, 12.1-14 and above 14.1cm. The ones to be used in planting were divided into the first circumference (12.1-14 cm), the second circumference (10.1-12 cm), and the third circumference (8.1-10 cm), and planting was carried out. Bulbs of three circumferences were used at the first and second planting dates. At the third planting date, only the first and second circumference bulbs were used due to insufficient bulbs with a circumference of 8.1-10 cm.

2.3. Planting dates and climate conditions

After the bulbs were divided into three circumferences, they were sprayed with fungusit (Captan 50 wp). Afterwards, the bulbs, which were taken to the dry, were dried and placed in plastic crates according to their circumference and dried in a cool place. Bulbs were kept until September 23 and the first plantings were made on this date. Those planted on September 23 were kept in a shaded environment at an average of 20 °C, those planted on October 23 at 19.2 °C and those planted on November 12 were kept in a shaded environment at an average of 18 °C.

Table 1. Climatic values of the trial period

Months	Average temperature (°C)	Max. temperature (°C)	Min. temperature (°C)	Rains (mm)	Relative humidity (%)	Number of days with snow
January	6.3	18.0	-2.4	96.2	66.3	2
February	6.7	15.4				
March	8.1	18.6	0.5	151.0	77.0	1
April	9.6	26.1	4.8	79.2	81.2	
May	14.7	23.4	6.5	57.2	82.2	
June	20.8	28.5	14.6	64.3	74.0	
July	24.8	31.3	16.2	28.8	73.2	
August	23.9	32.0	19.0	109.2	71.3	
September	21.2	28.3	13.7	80.7	68.7	
October	20.2	28.3	7.9	70.2	70.2	
November	8.1	16.4	1.6	223.2	73.4	
December	9.5	21.9	3.2	97.0	65.8	

Ankara records of the General Directorate of Meteorology Affairs (Anonymous, 2012)

The experimental site is located in the Eastern Black Sea region. It has a warm and rainy summer and a mild climate in winters. When the dismantling was carried out, the average temperature in August was determined to be 23.9 °C. When the planting was done, the average temperatures in September, October and November were 21.2 °C, 20.2 °C and 8.1 °C, respectively. Table 1 shows that the lowest precipitation amount in the growing season is in October (70.2 mm), and the highest precipitation is in November (223.2 mm). It was observed that the lowest relative humidity was in December (65.8%), and the highest relative humidity was in November (73.4%). Average precipitation was 80.7 mm, 70.2 mm and 223.2 mm in September, October and November, when bulbs were planted, and average relative humidity was 68.7%, 70.2%, and 73.4% (Table 1).

Before planting, the land was arranged to have a plot length of 200 cm, a plot width of 100 cm and a plot height of 15 cm. Plantings were made at 15 x 15 distances between rows and over rows.

Weed control, hoeing and irrigation were done only on the hot days of the first planting date in the trial area from planting to dismantling. During the plant development process, spraying and plant feeding were not carried out.

Figure 1. Natural distribution area of *Narcissus tazetta* flower

With the beginning of development, morphological and phenological measurements started to be carried out on plants, and bulb yield values were examined during the examinations made during the development and resting periods.

2.4. Measurement

The research measured bulb sprout rate, bulb circumference increase, and bublet formation rate. The bulbs were removed, and measurements were made on the 15th of August when the upper part of *Narcissus tazetta* was completely dry.

2.5. Bulb sprout rate (%)

The first sprout and the completion dates were determined by observations with 1-2 days intervals. The growth rate of bulbs in the plots at each planting date was determined.

2.6. Bulb circumference increase (cm)

Bulbs were removed from the field one year after planting and subjected to drying, and their circumference was measured and recorded with a tape measure. The increase rates were found by comparing the obtained data with the data at planting date.

2.7. Bulblet formation rate (%)

Bulbs with different circumferences, planted according to planting dates, were removed from the field at the end of the trial period and the bulblet formation rates were determined.

2.8. Experimental design and statistical analysis

The research was carried out in three replications according to the split-plot design. At each planting date, 32 bulbs (32 x 3=96 total) were used for each replication plot. However, third circumference length bulbs (8-10 cm) could not be used in the experiment due to the lack of bulbs at the third planting date. Bulbs were planted in rows of 4 on each plot.

The data obtained were subjected to statistical analysis in the SPSS package program were determined. All analyses were statistically calculated within 5% error limits, and the differences between the applications were compared with the Duncan test.

3. Results and discussion

3.1. Bulb sprout rate (%)

Regarding bulb lengths and planting dates, the first sprout dates for the first and second planting dates were 11 and 26 October, respectively, and for the plantings made at the third planting date, it was November 21. The sprout rate of bulbs in the plots of each planting date was determined (Table 2).

Table 2. According to the planting dates and bulb circumference in *Narcissus tazetta* cultivation, the number of bulbs planted, the number of bulbs that have sprouted, the date of sprouting, and the number of bulbs that have sprouted %

Planting date	Bulb circumference (cm)	Number of bulbs planted	Number of bulbs sprout	Sprout date (days)	Sprout percentage (%)
September	12-14	96	92	20	95.8
	10-12	96	96	19	100
	8-10	96	96	19	100
October	12-14	96	96	14	100
	10-12	96	95	14	96.8
	8-10	96	96	20	100
November	12-14	96	96	9	100
	10-12	96	96	9	100

For the September planting, the percentage of sprouts was 95.8% for the bulbs with the largest circumference and 100% for the other two bulbs. In plantings in October, the yield was 100% for 12-14 cm and 8-10 cm bulb circumferences and 96.8% for 10-12 cm bulb circumferences. The bulb sprout was 100% in both bulb circumference lengths (12-14 cm, 10-12 cm) used in November planting. In terms of sprouting dates, the shortest sprouting date was determined in the November planting of the bulbs, and the longest sprouting date was determined in the September planting.

3.2. Bulb circumference increase (cm)

Planting date and bulb circumference had a statistically significant effect on the increase in bulb circumference in *N. tazetta* cultivation. Regarding planting date, the highest (15.25 cm) value was obtained from September planting, and the lowest (13.84 cm) was obtained from October planting. In terms of bulb circumference, the highest value (16.3 cm) was obtained from bulbs with the largest circumference (12-14 cm), and the lowest (12.1 cm) was obtained from bulbs with the third bulb circumference (8-10 cm). However, when compared to the circumference of the bulb before planting, the increase rate in bulbs with a circumference of 8-10 cm was 34%, while the circumference of bulbs with a circumference of 10-12 cm followed it with 30%. The lowest value (25%) was determined in bulbs with a circumference of 12-14 cm (Table 3). An increase in the circumference of the bulb occurred in all groups. Pala (2006) found in his study that the average bulb circumference before planting was 13.69 cm, and the average bulb circumference at harvest was 13.62 cm, and a decrease in the average bulb circumference increase rate (-0.20%). Özel and Erden (2008) found the bulb circumference to be 13.40-14.90 cm in their study on *N. tazetta* L. Again, Özel and Erden (2018) in their study on *N. tazetta* subsp. *tazetta* L. determined the bulb circumference as 12.93 cm in the 8-10 cm group, 13.53 cm in the 10-12 cm group and 13.90 cm in the 12-14 cm group. While the researchers found the highest increase rate between 42.22-43.70% at 8-10 cm circumference, they found the lowest increase rate between 2.05-6.92%. These similar results, also reported by Özel and Erden (2018), are thought to be due to the low rate of increase in bulbs with the largest circumference length since the bulb circumference has approached the final stage and the bulbs are now at the division stage.

Table 3. The bulb circumference (cm) increases according to planting date and bulb circumference in *N. tazetta* cultivation

Planting date	Bulb circumference			Mean
	8-10 cm	10-12 cm	12-14 cm	
September 23	12.6	15.4	17.7	15.25 a
October 23	11.6	14.2	15.7	13.84 b
November 12	-	13.5	15.5	14.47 ab
Mean	12.1 c	14.3 b	16.3 a	

Different letters indicate differences among planting dates according to Duncan's multiple range test at P≤0.05

3.3. Bulblet formation rate (%)

The effect of planting date was statistically significant on the bulblet formation rate in *N. tazetta* cultivation. In terms of average planting date, October and November plantings were statistically in the same group, while planting in September was higher (1.39 per plant).

Regarding bulb circumference, the bulblets' formation rate was found to be statistically insignificant. However, more bulblets (0.84 per plant) were obtained with 10-12 cm bulb circumference lengths compared to other circumference lengths (Table 4). Pala (2006) found the average number of bulblets of *N. tazetta* species to be 2.20 per plant. Özel and Erden (2008) found that bulblets varied between 1.68 and 2.12 per plant in their study of *N. tazetta*. Again, Özel and Erden (2018) *N. tazetta* subsp *tazetta* L. Their study determined bulblets' formation as 0.48 per plant in the 8-10 cm group, 2.12 per plant in the 10-12 cm group and 4.88 per plant in the 12-14 cm group. The values obtained were lower than those found by the researchers in all groups. It is thought that this situation may be caused by factors such as planting date, soil structure and cultivation. It has been reported by different researchers that genotype, location, ecological factors and growth techniques affect bulb quality and yield (Kebeli and Çelikel, 2013; Khan et al., 2013).

Table 4. Bulblet formation rate (%) according to planting date and bulb circumference in *N. tazetta* cultivation

Planting date	Bulb circumference			Mean
	8-10 cm	10-12 cm	12-14 cm	
September 23	0.98	1.61	1.60	1.39 a
October 23	0.42	0.55	0.52	0.49 b
November 12	-	0.37	0.25	0.31 b
Mean	0.70	0.84	0.79	

Different letters indicate differences among planting dates according to Duncan's multiple range test at P≤0.05

4. Conclusion

When the effects of planting date on bulb characteristics were examined in 12-14 cm bulbs, In terms of bulb emergence dates, the shortest date from planting (9 days) was taken from the November planting, followed by the October planting (14 days) and the longest 20 days. It has emerged from the study that the best planting date for bulb circumference increase values and bulblet formation in September. The highest increase in bulb circumference was obtained from bulbs with a circumference of 8-10 cm, while the lowest value was obtained from bulbs with a circumference of 12-14 cm. In terms of bulblet formation rates, there was no difference between circumference and length. However, other researchers obtained more bulblets from 12-14 cm circumferences than those with other circumferences. In light of these data, it has been determined that bulbs with a circumference of 8-10 and 10-12 cm should be used to increase the circumference of bulbs, and bulbs with a circumference of 12-14 cm and larger should be used to obtain bulblets.

Compliance with Ethical Standards

Conflict of Interest

The author of article declare that there are no conflicts of interest with respect to the research, authorship, and/or publication of this article.

Authors' Contributions

Ömer SARI: Methodology, original draft investigation, conceptualization, validation, writing. **Fisun Gürsel ÇELİKEL**: Methodology, investigation, conceptualization, validation, review and editing.

Ethical approval

Not applicable.

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Data availability

Not applicable.

Consent for publication

We humbly give consent for this article to be published.

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References

Aksu, E., Erken, K., & Kaya, E. (2002). İhracatı yapılan doğal çiçek soğanları. Atatürk Bahçe Kültürleri Merkez Araştırma Enstitüsü., Yalova, Cilt:84, s39.

Anonymous, (2012). Meteoroloji İşleri Genel Müdürlüğü Ordu - Ünye Bölgesi Kayıtları

Çelikel, F.G. (2015). Bahçe bitkileri tohumluğu üretimi ve kullanımında değişimler ve yeni arayışlar. *Türkiye Ziraat Mühendisliği VIII. Teknik Kongresi Bildiriler Kitabı*, 2, 1004-1006, 12-16 Ocak 2015, Ankara.

Grey-Wilson, C., & Mathew, B. (1981). *Bulbs, the bulbous plants of Europe and their Allies, Collins, London*

Kebeli, F., & Çelikel, F.G. (2013). Doğal ve Kültür Çeşidi Nergis Soğanında Dikim Zamanının Çiçek Kalitesi ve Çiçeklenme Süresi Üzerine Etkileri. *V. Süs Bitkileri Kongresi*, 06-09 Mayıs 2013, Yalova, Cilt: 2, 823-829.

Khan, I.M., Khan, F.U., Salmani, M., Khan, M. H., Mir, M.A., & Amir, H. (2013). Effect of bulb density, nitrogen application time and deheading on growth, yield and relative economics of daffodil cv. Tunis (*Narcissus* sp.). *African Journal of Agricultural Research, 8*(31): 4189-4193. https://doi.org/10.5897/AJAR2013.7142

Mathew, B. (2002). Classification of the genus *Narcissus*. *Narcissus* and daffodil: the genus *Narcissus*. Taylor and Francis, New York, 30-52.

Özel, A., & Erden, K. (2008). Bazı doğal nergis (*Narcissus tazetta* L.) ekotiplerinin soğan verimi ve bazı tarımsal özelliklerinin belirlenmesi. *Harran Üniversitesi Ziraat Fakültesi Dergisi, 12*. 11-17.

Özel., & Erden, K. (2018). The effect of bulb sizes on the yield and some plant characteristics of bunch-flowered daffodil *(Narcissus tazetta* subsp. tazetta L.). *Harran Tarım ve Gıda Bilimleri Dergisi, 22*(3), 355-362. https://doi.org/10.29050/harranziraat.366339

Pala, F. (2006). Ekonomik öneme sahip bazı soğanlı bitkilerin Diyarbakır ekolojik koşullarında kültür olanakları. Yüksek Lisans Tezi. Çukurova Üniversitesi Fen Bilimleri Enstitüsü, Adana, 5713.

Sari, Ö., & Çelikel, F. G. (2018a). Planting time and bulb size affect the quantitative properties of *Narcissus tazetta*. *Acta Horticulturae,* 1263, 183-190. https://doi.org/10.17660/ActaHortic.2019.1263.23

Sari, Ö., & Çelikel, F. G. (2018b). A study on growing techniques of native *Narcissus tazetta*. *Acta Horticulturae,* 1263, 159-166. https://doi.org/10.17660/ActaHortic.2019.1263.20

SÜSBİR, (2016). Süs Bitkileri Sektör Raporu, http://www.susbir.org.tr/index.php/raporlar Accessed to web: October, 2023

TÜBİVES, (2023). http://194.27.225.161/yasin/tubives/index.php?sayfa=1&tax_id=9318 . Accessed to web: December, 2023

TÜİK, (2023). https://data.tuik.gov.tr/Kategori/GetKategori?p=tarim-111&dil=1. Accessed to web: December, 2023

Zeybekoğlu, E. (2010). Türkiye'de kültürü yapılan ve doğal yayılış gösteren nergislerin (*Narcissus*) araştırılması, kültüre alınması, bazı morfolojik ve biyolojik özelliklerinin incelenmesi, Doktora tezi, Ege Üniversitesi Fen Bilimleri Enstitüsü, İzmir, 285107.