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A RESEARCH ON EFFECTS OF VARIOUS GROWING TECHNIQUES ON YIELD AND QUALITY OF BULB PRODUCTIONS OF SOME ONION CULTIVARS

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Abstract: This research was carried out in experimental fields of the Faculty of Agriculture, Akdeniz University, Antalya in 1992-93. In this research, H-9 F_1, Yellow Granex F_1, H-8 F_1, Ori, Yodalef, Early Red, Granex 2000 F_1, H-202 F_1, Galil F_1, Grano 4 F_1, Siberia F_1 and Meteor F_1 were investigated. Direct seed sowing was performed on 18th December. For seedling growing, onion seeds were also in seed trays on 18th December. Cvs. Galil and Granex 2000 gave the best results for both bulb yield or bulb characters, and followed by Granex 4.

In terms of growing techniques, the seedling transplanting method affected yield, bulb weight and percentage of optimum bulb weight positively compared to direct seed sowing. Production onion bulbs via seedling transplanting increased yield by 28 % and percentage of optimum bulb formation by 17 % compared to the direct seed sowing method. The Seedling transplanting was found to be a technically sound method of improving onion yield compare to the direct seed sowing.

Bazı Soğan Çeşitlerinin Farklı Yetiştirme Tekniğiyle Baş Soğan Üretiminde Verim ve Kaliteye Etkileri Üzerine Bir Araştırma

Özet: Bu çalışma 1992-93 yıllarında Antalya'da Akdeniz Üniversitesi, Ziraat Fakültesi Araştırma ve Uygulama Alanında Yapılmıştır. Çalışmada H-9 F_1, Yellow Granex F_1, H-8 F_1, Ori, Yodalef, Early Red, Granex 2000 F_1, H-202 F_1, Galil F_1, Grano 4 F_1, Siberia F_1 and Meteor F_1 soğan çeşitleri kullanılmıştır. Gerek doğrudan tohum ekiminde gerekse fideden yetiştirme tekniğinde, tohumlar 18 Aralık'ta ekilmiştir. Çeşitlerden Galil ve Granex 2000, baş verimi ve özellikleri itibariyle en iyi sonucu verirken bunları Granex 4 soğan çeşidi takip etmiştir. Yetiştirme teknikleri açısından incelendiğinde, fideden yetiştiricilik doğrudan tohum ekimine göre verimde % 28, soğanda baş iriliğinde ise % 17'lik bir artış sağlamıştır.

Introduction

Onion has an significant economic value in Turkey since its productions is approaximately 1.5 millions tonnes per year and its consumption is year-round through the use of storage facilities (1). Onion is a cool-climate vegetable.

The onion plant develops roots and leaves in low temperatures and short-day conditions, but high temperatures and long-day conditions induce onion bulb formation. Strong development of roots and leaves influences bulb yield positively if the conditions are optimal (2). Sowing date vary according to different regions. It was reported that late sowing dates delayed bulb initiation and reduced bulb yield (3). Akıllı (4), reported that for onion bulb production the period between September and January was the most suitable for direct sowing in Mediterranean region. Low temperatures affect bulb formation negatively. If temperatures are too low, leaves drig out starting from the tips and consequently plant development is stopped. Seed-grown plants show this kind of damage more than bulbil-grown plants. In onions bulb formation and yield vary according to plant density and growing method (5). In onion production via seedlings, it is possible to control plant density and to plant a defined size of seedlings. However, it is quite difficult to direct seed sowing. Therefore, adequate soil preparation for seed sowing is a very important factor for homogeneous and rapid emergence, and increased bulb size and bulb yield (6).

Onion seed requires excellent soil preparation prior to sowing due to its very small size, so that sowing depth should be considered an important factor. Khristov et al.(7), reported that Sowing onion seeds 3-4 cm deep produced stronger plants and consequently bulb yield was increased. Kathan (8), emphasized that greater sowing depth reduced germination rate. However, he also suggested that the top 1-2 cm layers of soil lose humidity more qickly than lower layers, thus seeds should be sown at least 2 cm deep in order to prevent seeds from drying out.

Soluble solids content of onion bulb varies according to variety and bulb size (9). However, number of outer scales of onion bulbs was found closely related to whether a cultivar was a winter or summer variety (10).

In this study, the aim was to obtain higher yields and quality of onion bulbs, and to compare direct drilling in the field with the use of seedlings raised in a glasshouse.

Materials and Methods

This research was carried out in experimental fields of the Faculty of Agriculture, Akdeniz University, Antalya in 1992-93. Onion cultivars, H-9, Yellow Granex, H-8, Ori, Yodalef, Early Red, Granex 2000, H-202, Galil, Grano 4, Siberia and Meteor were included in the trials. Both direct drilling in the field and sowing in seed trays were carried out on 18 December 1992. The experiment was set up in randomized-block design with three replication. After performing variance analysis, differences between groups were determined by Duncan's test at the level of 5 %. Plot size

was 3.6 m² and plant spacing was 0.27x0.08 m. Each plot had four rows. Seedlings were transferred from trays to field on 14th April.

In this research, for each variety and growing technique, onion bulb yield (kg/ha), percentage of optimum bulb size (%), bulb diameter(mm), average bulb weight (g/bulb), number of outer scales (no./bulb), amount of soluble solids (%), earliness (day) were investigated.

Results

Effects of different growing techniques on bulb yield and bulb size were found statistically different (Table 1). The lowest yield per hectare was obtained from cv.H-8 with 5440 kg. Percentage of optimum bulb size was found highest in Galil variety with 87.71 %. Cvs. Meteor, Early Red, Ori, Yodalef and H-8 formed a group with the lowest bulb sizes.

Table 1. Effects of Cultivars on Bulb Yield and Bulb Size.

Cultivars	Yield (kg/ha)	Percentage bulbs in 2 size class (%) 20-40 mm	40-60 mm
1. Galil [H]**	14444 a*	8.32	87.71 a
2. Granex 2000 [H]	13170 ab	11.47	87.09 ab
3. Granex 4 [H]	12830 ab	13.96	83.79 abc
4. Siberia [H]	11830 ab	22.14	73.29 bcd
5. H-202 [H]	11080 bc	21.02	76.72 cd
6. H-9 [H]	10640 bcd	22.56	74.43 de
7. Yellow Granex [H]	8330 cde	21.81	75.03 e
8. Meteor [H]	7890 def	37.70	54.63 e
9. Early Red	7060 ef	33.24	59.77 e
10. Ori	6500 ef	39.07	54.30 e
11. Yodalef	5800 ef	40.85	50.34 e
12. H-8 [H]	5440 f	28.58	62.86 e

*p= 0.05 **[H]=Hybrid

Effects of different growing techniques on bulb yield were also found significant (Figure 1). Seedling-grown plants gave an average yield of 11080 kg per hectare, but the direct seed sowing method gave 7970 kg hectare, and the 2 groups were statistically.

The seedling transplanting method increased the yield by 28 % over direct seed sowing method. Seedling planting method produced 40-60 mm diameter bulbs more (81.72 %) than direct seed sowing method (64.80 %). In terms of bulb size, seedling transplanting revealed 17 % increase over direct seedling.

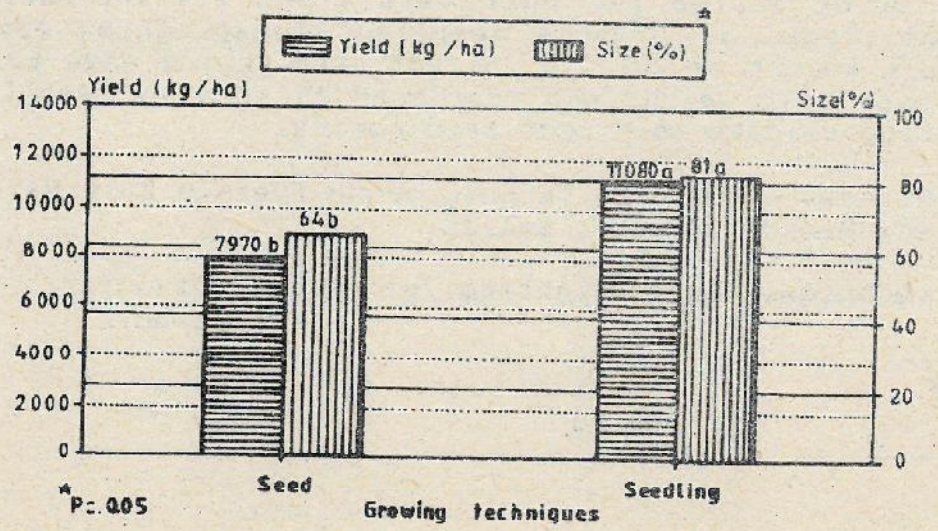

Figure 1. Effects of different growing techniques on onion bulb yield.

Effect of cultivars on average bulb weight and diameter are shown in Table 2. Cvs. Galil Grano 4 and Granex 2000 produced 93.0 g, 89.0 g and 85.5 g average bulb weight respectively and they were in the same statistical group. In terms of bulb diameter, Grano 4 with 53.70 mm diameter was found statistically different from others.

Table 2. Effect of Varieties on Average Bulb Weight and Bulb Width.

Cultivars	Bulb weight(g/bulb)	Bulb diameter(mm)
1. Galil [H]	93.0 a*	51.93 ab
2. Grano 4 [H]	89.0 a	53.70 a
3. Granex 2000 [H]	85.5 a	52.56 ab
4. Yellow Granex [H]	66.5 b	51.60 ab
5. H-202 [H]	66.5 b	48.30 bcd
6. Siberia [H]	65.8 b	50.07 abc
7. H-9 [H]	60.5 bc	44.40 cd
8. H-8 [H]	59.2 bc	44.13 d
9. Early Red	55.3 bc	45.36 cd
10. Meteor [H]	54.8 bc	45.73 cd
11. Ori	51.9 bc	45.00 cd
12. Yodalef	46.8 c	43.98 d

*p=0.05 **[H]=Hybrid

Effects of growing techniques on average bulb weight and number of outer scales per bulb were found statistically significant (Table 3). While seedling transplanting gave average bulb weight of 70.30 g, direct seed sowing gave 63.33 g, so average bulb weight was increased 11.40 % by seedling transplanting compare to direct seed sowing.

Table 3. Effects of Growing Techniques on Average Bulb Weight and Number of Outer Scales.

Growing techniques	Bulb weight(no./g)	Number of outer scales/bulb
Seedling	70.35 a*	2.14 a*
Seed	62.33 b	1.85 b

*p=0.05

Average number of outer scales per bulb was 2.14 from seedling transplanting and 1.85 from direct seed sowing, and they were different statistically.

Variance analysis of effects of growing techniques on earliness, bulb diameter and soluble solids contents revealed that differences were not statistically significant.

When cultivars were considered in onion bulb production, differences in terms of earliness, soluble solids content and number of outer scales were significant (Table 4).

Table 4. Some Results of Analysis Related to Varieties.

Cultivars	Growing period (day)	Soluble solids content (%)	No.of outer scales/bulb
1.Siberia [H]**	230 a*	7.31 bc	2.48 a
2.Meteor [H]	230 a	8.15 a	2.31 ab
3.Grano 4 [H]	220 b	7.41 b	2.30 ab
4.Galil [H]	219 b	6.53 cd	2.08 bc
5.H-8 [H]	218 b	8.80 a	1.83 cde
6.Granex 2000 [H]	217 bc	6.53 cd	2.03 bc
7.Early Red	217 bc	6.93 bc	1.56 e
8.H-202 [H]	217 bc	7.01 bc	2.06 bc
9.Yodalef	216 bc	7.13 bc	1.95 cd
10.Yellow Granex [H]	215 bc	6.56 cd	1.93 cd
11.H-9 [H]	213 c	6.73 bcd	1.63 de
12.Ori	204 d	6.10 d	1.83 cde

*p=0.05 **[H]=Hybrid

Cv.Ori appeared to be the earliest variety with growing period of 204 days, the shortest growing period.

In terms of soluble solids content H-8 and Meteor F1 varieties gave the highest percentage of soluble solid with 8.80 % and 8.15 % respectively. On the otherhand, Cv.Ori produced the lowest soluble solids content. When number of outer dry scales per bulb was considered, Siberia gave the highest number of outer scales with 2.48, and Early Red variety gave the lowest number with 1.50 other varieties were grouped in between.

Discussion

This study demonstrated that Cvs.Galil and Granex 2000 gave the best results for both bulb yield or bulb characters, followed by Granex.

In terms of growing techniques, seedling transplanting affected yield, bulb weight and percentage of optimum weight bulb positively compare to direct seed sowing method. Producing onion bulbs via seedling transplanting increased yield by 28 % and percentage of optimum bulb formation by 17 % compared to direct seed sowing. In our regipn where Mediterranean climate prevails for the small farming areas, growing from the seedling for the early maturing cultivars is a rather profitable way. Labour costs are not important when compare to the monetary return due to increase in yield. Some growers in the region use this method since it is profitable. Today, evaluation of agricultural lands and crops productivity are important aspects of horticultural research. Thus seedling planting method was found to be an alternative method to direct seed sowing method.

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