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On the Investigation of Transplant Age Effects on Some Morphophysiological Traits of Onion Varieties in Jiroft Region

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Abstract: *This farm research was conducted in Jiroft, region in south east of Iran, in 2010 for surveying onion transplant ages effects on yield and some morphophysiological traits of three onion varieties ,as sub factor, including Primavera, Texas Early Grano 502 and Juguar. Transplant ages as main factor had four levels of 45, 55, 65 and 75 days. The varieties of seed planting in nursery to reach these transplant ages began of 23th July in 10 days intervals,respectively. This experimental research was based upon split plot with reference to RCBD with three replications. Transplanting date for all transplant ages was 7th October. Furthermore, cultivation operations such as irrigation, nutrition and insecticide spraying were done for all treatments regularly. Traits as yield, bulb characteristics (Mean bulb weight, bulb neck diameter, bulb DM %, bulb diameter, percentage of multicenter bulbs), plant bolting percentage and leaf area were recorded. The results of this study indicated that almost in all traits, 65- day transplants with especially in Primavera variety were better than that of other ages and varieties. The highest yield obtained from "65 day transplant*Primavera" treatment (71.1T/ha).*

Keywords: *onion, transplant, age, yield, variety*

I. Introduction

Onion (*Allium cepa*L.) is produced in Iran in all seasons. The winter production of onion was done in southern provinces of Iran and Jiroft is one of the most important regions of onion winter production. Jiroft 's onion cultivation area is about 3000 ha. Onion planting in southern regions as Jiroft is done with transplanting in early October.

By planting unsuitable transplants (young or old transplant), some physiological problems such as plant bolting and bulb neck thickness can be depicted in crop (Brewester*et al*., 1987; Bhonde and Chougule, 1998; Metanda and Fordham, 1999).

However, by using transplant in suitable age, we can witness high and early yields in the field. Therefore, one of the most appealing research topics as long as southern regions' onion winter production is concerned was reported as examining of the best transplant age and high yield varieties. According to the researches done in this area, the effect of transplant age on onion yield was significant. Moreover, these studies have suggested 6-10 weeks transplants for planting in the farm (Liu and Chang, 1996; Rice *et al*., 1996; Vachhani and Patel, 1989). For instance, Vachhani and Patel (1989) reported that 7 -week transplants produced large bulb and high yield. Also, Mohanti*et al.*,(1990) in onion Nasik red variety reported that in 8-week transplants bolting was less and yield and their components significantly were high. In the same token, Liu and Chang (1996) in onion F1 Granex reported that transplants with 45 and 55 days ages yield and bulb traits were higher than those of less age.

Planting of young transplants and extra nitrogen application can be led to the production of thick neck bulbs. The reason of this disorder is growth during elongation that crop can not be suitable for harvest (Mohanty*et al*., 1990). Plant bolting is other physiological disorder that can be occurred in onion production. Planting of old transplants and exposure of plants in 8-12°C temperatures leads to onion plant bolting; this disorder can be decreased by using of resistant varieties (Brewster, 1994; Warid and Mlocilize, 1993).

The introduction of suitable short day onion varieties like Primavera and Savana Sweet in Iranian southern regions had increased cultivation area in these regions. Inspired by the afore-mentioned literature, this study aimed to find the best transplant age in three onion varieties in Jiroftregion of Iran

II. Materials and Methods

This experiment was conducted in Jiroftregion; it was located in east south of Iran, in 2010. Its height of this region is about 627m. The climate of Jiroft is warm and many kinds of vegetables as onion are cultivated at second half of the year. Transplant production conducted in some mountainous areas of Giroft region in early of July.

The soil analysis of research farm showed that soil texture was sand-loam with EC and pH were 1.56 dS/m and 8.2, respectively. Two factors have been investigated and further the experiment was done in a split plot design at RCBD in 3 replications. The first factor was transplant age in four levels (45, 55, 65 and 75 days) that was considered as the main factor and onion varieties in three levels (Primavera, Texas early Grano 502

and Juguar) as sub factor. Each plot had six rows with 3m lengths. The distance between rows and plants was 25 and 10 cm, respectively. Transplant nursery was located in Sardoye region that has cool climate. The varieties of seed sowing were done from 23th July in 10 days intervals. Transplanting date was 7th October. Cultivation operation as irrigation, pest and disease control and nutrition was done regularly for all plots. In addition to yield, yield components as mean bulb weight, bulb neck diameter, bulb diameter, percentage of multicenter bulbs, bulb DM percentage, plant bolting percentage and leaf area were recorded during growth period and after harvesting, that was on the 30th February. Leaf area was recorded by Gamiely*et al*., (1991)'s method. However, recording of yield was done by measuring of crop in non-margin four rows, and for recording other traits, 30 bulbs selected of each plot crop and each trait recorded by its common method. The researcher used SAS and Excel softwares for the statistical analysis in this study.

III. Results and Discussion

As can be seen from table 1, different transplant ages are significantly different in all traits except for bulb dry matter percentage; varieties are significantly different in all traits. The reciprocal effects of factors are significantin bulb DM%, bulb multicenter percentage, plant bolting percentage, and leaf area.

Table 1: Traits analysis variance results (MS)

SOV	df	Yield	Mean Bulb weight	Bulb neck diameter	Bulb diameter	B.DM %	Multicenter	Plant Bolting	Leaf area
Block	2	229.42^{ns}	1441.861^{ns}	0.09^{ns}	0.724^{ns}	0.241^{ns}	0.130	12.250^{ns}	620.193^{ns}
Transplant Age	3	1090.749^{**}	10484.630^{ns}	1.163^{**}	25.486^{**}	0.206^{ns}	3.967^{**}	361.80^{**}	108.942^{**}
Ea	6	50.065	4320.713	0.059	1.073	0.130	0.030	11.250	131.680
Variety	2	954.710^{**}	17852.111^{**}	1.935^{**}	27.022^{**}	7.074^{**}	15.084^{**}	969.25^{**}	24399.415^{**}
T. A.*Variety	6	5.262	143.519^{ns}	0.044^{ns}	0.107^{ns}	1.288^{**}	1.928^{**}	35.58^{**}	731.104^{**}
Eb	16	80.342	986.208	0.115	1.141	0.264	0.109	14.833	194.681

*, **, ns: Significant in %5 level, significant in %1 level and not significant

Mean comparisons of factors and reciprocal effects of them have been depicted shown in table 2, table 3 and table 4.

Table 2: Mean comparisons of transplant age

Transplant Ages (day)	Yield (T/ha)	M.Bulb. weight (g)	Bulb neck diameter (mm)	B. diameter (mm)	B.DM (%)	B. multicenter (%)	Plant bolting (%)	Leaf area (cm^2)
45	36.51^{c}	115.4^{a}	1.1^{c}	5.5^{b}	6.4^{a}	0.7^{d}	6.9^{b}	100.3^{d}
55	45.51^{bc}	132.6^{a}	1.4^{bc}	7.4^{b}	6.5^{a}	1^{c}	11.7^{b}	137.2^{c}
65	62.10^{a}	193.6^{a}	1.7^{ab}	8.7^{ab}	6.7^{a}	1.4^{b}	18.2^{a}	160.6^{b}
75	53.99^{ab}	160.0^{a}	1.9^{a}	9.4^{a}	6.8^{a}	2.2^{a}	20.9^{ac}	165.1^{a}

Table 3: Mean comparisons of onion varieties

Variety	Yield (T/ha)	M.Bulb. weight (g)	Bulb neck diameter (mm)	B. diameter (mm)	B.DM (%)	B. multicenter (%)	Plant bolting (%)	Leaf area (cm^2)
Primavera	59.16^{a}	192^{a}	1.2^{b}	6.7^{b}	5.9^{b}	0.2^{c}	7.2^{b}	99.1^{c}
T.E.G. 502	41.55^{b}	115.8^{b}	1.9^{a}	9.5^{a}	6.5^{b}	2.5^{a}	24.5^{a}	188.9^{a}
Juguar	47.88^{b}	143.3^{b}	1.3^{b}	7.1^{b}	7.5^{a}	1.3^{b}	11.5^{b}	156.2^{b}

As table 2 illustrates, the highest yield was obtained from 65 day and 75 day transplants with 62.10 T/ha and 53.99 T/ha, respectively. In these ages bulb neck, bulb diameter, and plant bolting are higher than that of other ages. Leaf area is the highest in 65- days' transplant. So, it can be concluded that by planting of 65- day transplants can reach to high yield with due traits. In their study in onion growing seasons in Ghana during the 1996–97 and 1997–1998, Kanton *et al*., (2003) reported that plants developed from 20 to 40 day old transplants produced the highest yields. The results of their study indicated that using 20 to 40 day old transplants will give optimal bulb yields. In the same vein, Boyhan*et al*., (2009) reported that Medium transplant size in the range of 130 to 150 g per 20 plants produced satisfactory yield, while maintaining low plant bolting and doubled bulbs, which are undesirable characteristics. Also, smaller transplant size (40–60 g per 20 plants) have reduced yields and would lower plant bolting and double bulbs.

Table 4: Mean comparisons of onion varieties

Treatment	B. DM (%)	B. multicenter(%)	Plant bolting (%)	Leaf area (cm^2)
45*Primavera	3.6^{de}	0.0^{e}	3.3^{f}	43
45*T.EG502	6.4^{abcde}	1^{cd}	12.3^{cde}	129.7^{e}
45*Juguar	7.5^{a}	1^{cd}	5^{ef}	128.1^{e}
55* Primavera	6.8^{abcd}	0.0^{e}	5.7^{ef}	93.4^{f}
55* T.EG502	5.7^{cde}	1.1^{c}	20.7^{b}	173.1^{bc}
55* Juguar	7.1^{abc}	1.3^{c}	8.7^{def}	145^{de}
65* Primavera	6.1^{bcde}	0.3^{de}	9.7^{def}	122.4^{e}

65* T.EG502	6.5^{abcde}	2.7^{b}	30^{a}	196.5^{b}
65* Juguar	7.6^{a}	1.3^{c}	15^{bcd}	162.9^{cd}
75* Primavera	5.3^{e}	0.3^{de}	10.3^{cdef}	140.2^{de}
75* T.EG502	7.3^{ab}	4.7^{a}	35^{a}	256.2^{a}
75*Juguar	7.7^{a}	1.7^{c}	17.3^{bc}	188.9^{b}

As it is shown in table 3, the most suitable variety of among other varieties is Primavera variety with yield 59.16 T/ha and low bulb neck diameter, bulb multicenter and plant bolting.

Although leaf area is high in T.E.G 502 variety, this variety is not recommendable in other traits as plant bolting, bulb multicenter, and bulb neck. In the last variety (Juguar) bulb dry matter is high; however, like T.E.G 502, quality traits in this variety are low and so they are not suitable for planting in Jiroft region (Table 3). According to table 4, the mean comparison of treatments showed that the transplant ages in Juguar variety have higher DM% but the least DM is related to "75 days transplant*Primavera" with 5.3 %. Therefore, it can be concluded that Primavera is a suitable fresh variety and Juguar is a storing variety. Bulb multicenter is the highest in "75 days transplant*T.EG 502" treatment but this trait is very low in "45 days transplant * Primavera" and "55 days transplant*primavera" treatments (Table 4). Plant bolting is high in TEG 502 variety with different transplant ages but in "45 days transplant*primavera" treatment is the least (3.3%) (Table 4). In a research on transplant age effects on Abhar region onions, Khodadadi and Fathi (2009) reported that 60-day transplants had higher yield than that of other ages and among surveying cultivars, the Tarom had higher yield than others. In this research, 60- day transplants in Tarom cultivar with 81.81 T/ha yields were the best treatment and can be recommended in research region.

Although leaf area is low in primavera variety in all transplant ages and also is high especially in "75 days transplant*TEG502" treatment, this trait is not considered very important trait in this research. Due to the short growth of duration of Jiroft region, Primavera variety is an early variety and is suitable for region. However, TEG 502 variety that is a late variety cannot produce suitable bulbs in this region. Due to the high vegetative growth, this variety is susceptible to plant bolting that usually occurs in late November in Jiroft region.

To sum, it can be concluded that the use of 65- day transplant in primavera variety which is the most suitable treatment for high production results in obtaining the best bulb quality and getting less plant bolting in Jiroft region. Thus, the results of the current study are recommended for near future.

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