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PRODUCTION POTENTIAL OF ONION (*ALLIUM CEPA* L.) AS INFLUENCED BY DIFFERENT TRANSPLANT AGES

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ABSTRACT

In order to evaluate the production potential of onion as influenced by different transplant ages in Hashtbandi region, Minab, Hormozgan province of Iran, was performed an experiment as split plot in randomized complete block design with three replication. The main and sub plots were consisting transplant age (45, 60 and 75 days-old) and onion cultivar (Baluchi, Primavera and Mineroa) respectively. The evaluated characteristics were including the length and diameter of bulb; bulb index shape; average bulb weight, weight percentage of multi-bulbing and bolting; total and economic (marketable) yield. The obtained results from data analysis showed that the effect on transplant age (except bulb diameter) and onion cultivar as well as interaction between two factors was significant ($p < 0.01$) on the all evaluated traits. Mean comparison indicated that the highest bulb length and bulb shape index was observed in 60 and 75 days-old transplant and the greatest bulb weight average, total yield and economic yield in 60 days-old transplant and the lowest bolting and multi-bulb percent in 75 days-old transplants. Likewise, the highest bulb length, bulb shape index, average bulb weight, total and marketable yield and the lowest number and weight percent of bolting was observed in Primavera cultivar. Interaction between transplant age and cultivar demonstrated that the highest bulb length (74.2 cm), bulb index shape (1.247), average bulb weight (114.2 g), total yield (48 ton/ha) and economic yield (46.4 ton/ha) obtained in 60 days transplants of Primavera cultivar. The highest weight percent of bolting and multi-bulbing and the lowest length, diameter and index shape of bulb and total and marketable yield was observed in 45 days transplants of Baluchi onion. In the most evaluated traits, Primavera cultivar and 60 days transplant were better than other transplant age and cultivars, hence is recommended in Hashtbandi region climate and other similar conditions.

Keywords: *Onion, Transplant Age, Cultivar, Total and Marketable Yield*

INTRODUCTION

Onion (*Allium cepa* L.) has been listed among 15 vegetables by FAO. With respect to its importance, it has been provided second rank following tomato and with respect to production, in the fourth rank in the world. Inclusion of onion in daily diet increases its area of cultivation and consequently its economic importance. Providing attention to the best transplanting age to keep its quality is always important. For planting onion in the short-day regions, the seed is cultured as direct, transplanting material. The cheapest method is sowing of seed and it is used in the most regions of the world where the duration of growth season adequately is long and/or early-ripening crop is not necessary. In the regions where growth season is short and/or the aim is production of further and early-ripening crop, transplant or small onion are commonly used (Izadkhah-Shishvan *et al.*, 2010). In some studies, the effect of transplant age was significant on final yield and in the most experiments the best transplant age of 6-10 weeks has been reported (Galmarini and Della-Gaspera, 1995; Leskovar and Vavrina, 1999). Ghavami and Ghavami (2013) evaluated improving production of onion c.v Rey's Red in order to stable culture and effect of transplant age (45, 55 and 65 days-old). The results indicated that the best transplant ages were 45 and 55 days-old. Vachhani and Patel (1990 and 1998) in India showed that the biggest onion (81.33 g) and the highest yield obtained from 7 weeks-old transplant and the lowest yield from 4 weeks-old transplant. Lujan-Favela (1992) also in Mexico obtained the greatest yield of onion c.v White Grano from 7 weeks-old transplant. More than 10,000 ha onion is planted as production progressive design in the southern provinces of Iran with aim of crop presentation in winter and early spring. In these regions is mainly used

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transplanting method by using the expensive imported seeds as well as some suitable native mass such as Baluchi. To obtain suitable transplant ages for planting in the early autumn by using new foreign cultivars can be effective in enhancing production, transplant survival and reducing undesirable phenomenon of bolting. Usually, duration of onion nursery in Minab is 70 days, which by reducing this period the transplant will have more opportunity to establish in the main field.

MATERIALS AND METHODS

This study was conducted in Hashtbandi region of Minab placed in 165 km east Bandar-abbas, with latitude 27° 10' and longitude 57° 26' and 85 m altitude by using a loamy soil as split plot in randomized complete block design with three replication in the year of 2014-2015. The main and sub plots were consisting transplant age (45, 60 and 75 days-old) and onion cultivar (Baluchi, Primavera and Mineroa) respectively. Planting system was furrow with super drip irrigation. Seed planting in the nursery was done in the end of September and according to transplant age the 45, 60 and 75 days-old transplants were transferred to the main field and were planted in both side of furrows with 10 cm distance. During experiment period, irrigation was done equally for all plots with distinct time-distances. The evaluated characteristics were including the length and diameter of bulb; bulb index shape; average bulb weight, weight percentage of multi-bulbing and bolting; total and economic (marketable) yield. The obtained data was analyzed by SAS 9.1 software and the means were compared by using Tukey's test ($p < 0.05$).

RESULTS AND DISCUSSION

In the all evaluated characteristics, there was high significant interaction between transplant age and onion cultivar (Table 1). According the obtained results of Tukey's test, the highest bulb length was relative to 60 days-old transplant of Primavera cultivar (74.3 mm) and the lowest bulb length was observed in 45 and 60 days-old transplant of Baluchi cultivar (49.2 and 52.7 mm, respectively) (Table 2). The results of our study are according to the findings of Mirzaei and Khodadadi (2008). They also reported the highest bulb length from Primavera cultivar in Jiroft region. Suitable size and age is one of the main cases in transplanting method. Planting transplant with suitable age can be additional to desirable establish of plant in the field, increase production ability and on the other hand by early-ripening create more commercial profits for onion growers. The highest bulb diameter was relative to 45 days-old transplant of Primavera cultivar (67.2 mm) and the lowest bulb diameter was observed in 45 days-old transplant of Baluchi cultivar (56.5 mm) (Table 2). Mirzaei and Khodadadi (2008) reported the greatest bulb diameter from Primavera cultivar in Jiroft region with 52.3 mm.

Table 1: Analysis of variance in relation to the evaluated characteristics

S.V	D. F	Mean Square (MS)							
		Bulb length	Bulb diameter	Bulb shape index	Bulb weight	Bolting %	Multi-bulbing %	Total yield	Marketable yield
Replication (R)	2	4.80 ^{ns}	3.21 ^{ns}	0.0005 ^{ns}	31.3 ^{ns}	0.80 ^{ns}	0.433 ^{ns}	1.40 ^{ns}	0.30 ^{ns}
Transplant age (A)	2	78.85 ^{**}	4.05 ^{ns}	0.0328 [*]	714.6 ^{**}	50.91 ^{**}	35.062 [*]	352.42 [*]	264.66 ^{**}
Error a	4	2.64	3.09	0.0004	34.8	0.60	0.159	2.61	1.96
Cultivar (B)	2	300.97 [*]	27.60 ^{**}	0.0494 [*]	3673.5 [*]	882.88 [*]	83.174 [*]	428.58 [*]	805.32 ^{**}
Interaction AB	4	118.09 [*]	40.24 ^{**}	0.0330 [*]	259.2 ^{**}	27.76 ^{**}	20.116 [*]	51.41 ^{**}	59.21 ^{**}
Error b	12	4.33	3.58	0.0003	26.9	0.49	0.206	0.097	1.18
C.V %		3.4	3.1	1.8	7.2	9.5	18.5	3.4	1.4

^{ns} and ^{**} not-significant and significant $p < 0.01$, respectively

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Table 2: Mean comparison of the evaluated characteristics as influence by interaction between transplant age and cultivar

Traits		Bulb length (mm)	Bulb diameter (mm)	Bulb shape index	Bulb weight (g)	Bolting %	Multi-bulbing %	Total yield (ton/ha)	Marketable yield (ton/ha)
Transplant age × Cultivar									
45 days	Baluchi	49.3 ^c	56.5 ^d	0.870 ^e	50.0 ^e	21.7 ^a	9.2 ^a	16.2 ^g	11.0 ^f
	Minera	61.8 ^b	61.3 ^{bc}	1.007 ^c	68.4 ^{cd}	4.5 ^c	0.0 ^e	25.1 ^e	24.3 ^d
	Primavera	63.7 ^b	67.2 ^a	0.950 ^d	77.6 ^{bc}	0.1 ^e	1.4 ^d	29.4 ^c	28.5 ^c
60 days	Baluchi	52.7 ^c	59.7 ^{cd}	0.883 ^e	54.2 ^e	22.3 ^a	8.0 ^b	27.5 ^d	19.2 ^e
	Minera	63.7 ^b	61.8 ^{bc}	1.030 ^{bc}	77.2 ^{bc}	3.6 ^c	0.0 ^e	31.6 ^b	30.5 ^b
	Primavera	74.2 ^a	59.5 ^{cd}	1.247 ^a	114.2 ^a	0.3 ^e	2.9 ^c	48.0 ^a	46.4 ^a
75 days	Baluchi	63.8 ^b	60.6 ^{bc}	1.05 ^b	52.6 ^e	12.0 ^b	0.3 ^e	22.9 ^f	18.7 ^e
	Minera	64.5 ^b	63.3 ^b	1.017 ^c	65.1 ^d	1.9 ^d	0.0 ^e	27.4 ^d	28.1 ^c
	Primavera	61.5 ^b	58.5 ^{cd}	1.050 ^b	86.0 ^b	0.0 ^e	0.2 ^e	30.5 ^{bc}	30.4 ^b

[†]Means within each column followed by the same letter are not significantly different according to Tukey's test at $p < 0.05$.

The highest bulb shape index was relative to 60 days-old transplant of Primavera cultivar (1.247) and the lowest was relative to 45 and 60 days-old transplant of Baluchi cultivar (0.870 and 0.883, respectively) (Table 2). Shape index of bulb is one of the important selective indicators to onion breeding. The best age of transplant in view point of bulb length and shape index in the present study was 60 days-old. High bulb shape index in 60 days-old transplant is due to high bulb length. The highest bulb weight was relative to 60 days-old transplant of Primavera cultivar (114.2 g) and the lowest bulb weight was observed in 45 and 60 days-old transplant of Baluchi cultivar (50.0 and 54.2 g, respectively) (Table 2). By increasing transplant age until 60 days, bulb weight also increased. It seems transplant recovery to re-growth in the main field is important. In 75 days-old transplant this recovery because of high age of transplant is slow and balance between shoot and root is lower and its vegetative growth delay and allocate more nutrition, hence a part of assimilates in growth season utilize by leaves and low dry matter transfer to bulbs and consequently will have lower weight. These results are according to the finding of Ibrahim (2010), Leskovar and Vavrina (1999), Vachhani and Patel (1990 and 1998) and Mettanada and Fordham (1999). Based on the results of our study, the highest weight percent of bolting was relative to 45 days-old transplant of Baluchi cultivar and the lowest was relative to all transplant ages of Primavera cultivar (Table 2). By increasing transplant age, bolting significantly decreased. Superiority of Primavera cultivar compared to others in view point of bolting and multi-bulbing tolerance as well as marketability in the production progressive design regions such as Jiroft and Hormozgan has been demonstrated in the previous researches (Moghaddam *et al.*, 2001; Mirzaei, 1999). By increasing transplant age, weight percent of multi-bulbing significantly decreased. The highest multi-bulbing was observed in 45 days-old transplant of Baluchi cultivar. The lowest multi-bulbing was observed in 75 days-old transplant of all cultivars and 45, 60 days-old transplant of Mineroa cultivar. The highest total and economic yield was relative to 60 days-old transplant of Primavera cultivar (48.0 and 46.4 ton/ha, respectively) and the lowest was observed in 45 days-old transplant of Baluchi cultivar (16.0 and 11.0 ton/ha, respectively) (Table 2). Onion yield has high dependence to leaf area development before bulb formation. In desirable condition, to achieve high yield, 70-90% of leaf dry weight transfer to bulb. Fathi (2009) reported the best onion transplant age is 60 days and the 60 days-old transplant had the higher yield than other transplant ages. Vachhani and Patel (1998) obtained the highest and lowest yield from 7 and 4 weeks-old, respectively. Lujan-Favela (1992) in Mexico in study on the effect of transplant age on yield of White Grano onion reported that the highest yield obtained from 7 weeks-old transplant. Wojtaszek *et al.*, (1993) in Netherland used 30, 40 and 50 days-old transplant for transplanting in spring planting and reported significant different between them in view point of marketable yield. Liu and Woong (1996) evaluated

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35, 45 and 55 days-old transplant of hybrid onion c.v Granex and recommended 45 and 55 days-old transplant in relation to total and marketable yield.

Conclusion

Based on the total results of the present study, the most suitable transplant age and cultivar in view point of yield and yield components were 60 days-old and Primavera cultivar, respectively.

REFERENCES

- Fathi SMR (2009).** The most suitable age for planting onion. *Fars News Service* (In Persian)
- Galmarini CR and Della-Gaspera PG (1995).** Effects of transplanting dates and plant density on yield responses on onion (Valenciana type). *Horticultural Argentina* **14**(37) 23-29.
- Ibrahim ND (2010).** Growth and yield of Onion (*Allium cepa* L.) in Sokoto, Nigeria. *Biology of Agriculture* **1**(4) 556-564.
- Izadkhah-Shishvan M, Tajbakhsh M and Amirnia R (2010).** Study the effect of age and different size of transplant on economical and biological yields, harvest index and some qualitative characteristics of long-day and middle-day onions. *Journal of Horticultural Sciences (Agricultural Sciences and Industries)* **24**(2) 203-215. (In Persian)
- Leskovar DI and Vavrina CS (1999).** Onion growth and yield are influenced by transplant tray cell size and age. *Scientia Horticulture* **80** 133-143.
- Liu F and Woong C (1996).** Effect of plug size and seedling age on growth and development of onion (*Allium cepa* L.). *Bulletin of National Pingtung Polytechnic Institute* **5**(2) 1-6.
- Lujan-Favela M (1992).** Growth and productivity of onions sown and transplanted at different dates, ages and sizes. *Revista-Fitotecia-Mexicana* **15**(1) 51-60.
- Mettanada KA and Fordham R (1999).** The effects of plant size and leaf number on the bulbing of tropical short day onion cultivars (*Allium cepa* L.) under controlled environments in the United Kingdom and tropical field conditions in Serilanka. *Journal of Biotechnology Science* **74**(5) 623-633.
- Mirzaei Y (1999).** The most suitable nursery time in cool region and transfer onion transplant to ward region of Jiroft. Research Report of Plant and Seed Improving Department of Agricultural Research Center of Jiroft (In Persian).
- Mirzaei Y and Khodadadi M (2008).** Evaluation the effects of different production methods on some traits of three onion cultivars as production progressive design in Jiroft region. *Journal of Pajouhesh-o-Sazandegi in Agronomy and Horticulture* **80** 8 (In Persian)
- Moghaddam N, Kheiri K, Mirzaei Y, Mivechi-Langroodi H and Shahriari A (2001).** The most suitable nursery time and onion transplanting in southern regions of Iran. Final Report of Research Design, Research Institute of Plant and Seed Improving, Karaj, Iran (In Persian)
- Vachhani MU and Patel ZG (1990).** Effect of age of transplants on the growth and yield of onion in lowland conditions. *Gujarat Agricultural University Research Journal* **15**(2) 49-50.
- Vachhani MU and Patel ZG (1998).** Studies on growth and yield of onion as affected by seedling age at transplanting. *Progressive Horticultural* **20**(3-4) 297-298.
- Wojtaszek T, Kunicki E, Bednarz F and Poniedzialek M (1993).** Multi-seeded onions: Effect of block spacing and transplant age on yield of onions. *Folia- Horticulture* **5**(1) 11-18.