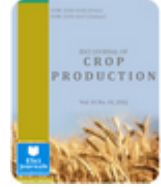




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## EFFECT OF TRANSPLANTING DATES OF SOME ONION CULTIVARS ON VEGETATIVE GROWTH, BULB YIELD AND ITS QUALITY

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### ABSTRACT

In order to study effect of transplanting dates on vegetative growth, bulb yield and its components of some local onion cultivars. Two field experiments were conducted at Gemmeiza Agriculture Research Station Farm, Gharbeia Governorate, Agriculture Research Center, Egypt during 2010/2011 and 2011/2012 seasons Results showed that transplanting onion seedlings on 15<sup>th</sup> December recorded highest averages of foliage fresh weight/plant at 90 and 120 days from transplanting, total yield, marketable yield and averages bulb weight, total soluble solids, dry matter and total weight loss percentages of onion bulbs every month after harvesting till end of storability. Highest bulbing ratios at 90 and 120 days from transplanting in the second season, total yield and marketable yield, total culls and bulb weight as well as total weight loss percentage of onion bulbs every month after harvesting till end of storability in both seasons were produced from Texas Early Yellow Grano X Giza 20 cultivar. A significant interaction was produced between transplanting dates of some onion cultivars in foliage fresh weight/plant at 90 days from transplanting, marketable yield, total culls. According to the obtained results from this study, it can be concluded that, transplanting seedlings of Texas Early Yellow Grano X Giza 20 cultivar on 15<sup>th</sup> December or 1<sup>st</sup> January to maximize productivity and bulb quality under the environmental conditions of Middle Delta, Gharbeia Governorate.

**Keywords:** Marketable yield, T.S.S., transplanting dates, cultivars.

### INTRODUCTION

In Egypt onion (*Allium cepa* L.) is one of the most important crops on account of its value for local consumption and exportation commodity. Since great attention should be paid towards improving yield, keeping quality and maturation time. So, an early crop could be harvested to compete with other countries in supplying world and local market. One of the important lines of research towards this improvement is to study the effect of transplanting dates on the growth, yield and quality of some onion cultivars. Transplanting dates of onion seedlings means the effect of edaphic factors and environmental conditions in large scale on growth, bulb yield and bulb quality, which differ widely from region to another. Thus, determined optimum transplanting dates have a vital role in maximizing growth, bulb yield and its quality of onion. Ansari (2007) showed that onion set

can be produced at late winter in Khuzestan province. Sowing date had affected on set size. The best date of set production for bulbs was late February. Bhatt *et al.* (2007) investigated the effect of sowing dates i.e. 18 (D1) and 28 (D2) August, 7 (D3) and 17 September (D4) on onion yields. They observed that higher plant height was obtained with D1 and D2 at 45 days after sowing and at 60 DAS over later dates of sowing. D1 remaining at par with D2 recorded significantly higher number of leaves at 45, 60 days after sowing date and at harvest compared to later sowing dates. Sharma *et al.* (2007) revealed that sowing of onion seed on 15<sup>th</sup> December significantly recorded higher yield of total sets (742.08 q/ha) and optimum size sets (593.63 q/ha) over later dates of sowing and it was found at par with 31<sup>st</sup> December sowing. George *et al.* (2009) reported that highest total bulb yield was obtained when onions seedlings were transplanted on 24<sup>th</sup> Nov. This treatment did not differ from onions transplanted on 22<sup>nd</sup> Dec. in 2003 season or 20<sup>th</sup> Jan. in 2004 season. Patil *et al.*

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(2012) showed that early transplanting (15<sup>th</sup> November) of onion significantly gave high yield. The highest onion yield of 37.5 t/ha was recorded in second season when transplanted on 15<sup>th</sup> November, while lowest yield of 14.3 t/ha in first season when transplanted on 15<sup>th</sup> January. The transplanting date had significant effect on yield and other studied parameters. The transplanting on 15<sup>th</sup> November having comparatively less TSS content.

Several investigators reported that wide variations in bulb yield and its quality were observed among onion cultivars. In this respect, Schiavi *et al.* (2001) found that Yellow Vaquero cv. had highest yield of 43 t/ha, and most consistent quality. Highest yields for red onions were obtained by cv. Nigra and cv. Ramata di Milano (both 45 t/ha). Akhtar, Ehsan (2002) reported that Phulkara cultivar gave maximum bulb yield of onion (61.11 t/ha). Ayodele (2005) showed that the bulb yield was higher in Red Creole variety, which was 31.15 t/ha. Gemma *et al.* (2007) found that Viz Renate, Ailsa Iraig and S.S.I. cultivars were gave highest yield of bulbs, which were 30.00, 31.06 and 29.31 t/ha, respectively. Kandil *et al.* (2010) indicated that Giza 20 and Composite 9 had the heaviest bulb weight, followed by Giza Red. Highest percentages of TSS and dry matter % were obtained from Giza White, followed by Giza 20. Giza 20 cultivar was associated with maximum total bulbs yield and marketable yield, followed by Composite 9. Shah *et al.* (2012) found that Parachinar Local cv. had highest number of leaves (15.4), leaf length (47.7 cm), neck height (6.5 cm), plant height (77.9 cm) and total yield (33.1 t/ha). Soleymani and Shahrajabian (2012) stated that foliage fresh weight, bulbing ratio, plant height, weight of bulb, total yield, favorite yield, total percentage of dry matter and nitrate content in bulb was significantly influenced by cultivars and maximum values of these traits were resulted from Cisakht cultivar.

Therefore, this study was conducted to investigate the effect of different transplanting dates of different onion cultivars as on growth, bulb yield and its components, bulb quality as well as storage ability of some onion cultivars under the environmental conditions of Middle Delta Region.

#### **MATERIAL AND METHODS**

Two field experiments were conducted at Gemmeiza Agriculture Research Station Farm, Gharbeia Governorate, Agriculture Research Center, during two

seasons of 2010/2011 and 2011/2012. The objectives of this investigation were aimed to study the effect of transplanting dates on vegetative growth, bulb yield and its components of some onion cultivars.

Field experiments were carried out in strip-plot design with four replications. The vertical plots were occupied with four transplanting dates (15<sup>th</sup> November, 1<sup>st</sup> December, 15<sup>th</sup> December and 1<sup>st</sup> January). The horizontal plots were assigned with three onion cultivars (Giza 20, Giza Red and Texas Early Yellow Grano X Giza 20). Onion seed cultivars were obtained from Onion Research Section, ARC, Egypt.

The soil of the experimental sites was clayey, pH was 7.87 and 8.00, available nitrogen was 40.12 and 51.33 ppm, available phosphate was 3.36 and 4.44 ppm and exchangeable potassium was 299.1 and 315.2 ppm in both seasons, respectively. Each plot area was 10.5 m<sup>2</sup>, which consisted of 5 ridges, each of 3.5 m in length and 60 cm in width. The preceding crop was maize (*Zea mays* L.) in both seasons.

In 2010/2011 season, onion seeds were sown in the nursery bed on 7<sup>th</sup> September, 22<sup>th</sup> September, 7<sup>th</sup> October and 20<sup>th</sup> October 2010, respectively. Whereas, in the second season, onion seeds were sown in the nursery bed on 6<sup>th</sup> September, 20<sup>th</sup> September, 5<sup>th</sup> October and 21<sup>th</sup> October 2011, respectively. Seedlings of sixty days old when they usually were 25 cm in height were pulled tied and moved to the permanent land for transplanting on 12<sup>th</sup> and 13<sup>th</sup> December in the first and second seasons, respectively. Other cultural practices were carried out in the same manner prevailing in the region.

After 90 and 120 days from transplanting, ten plants were selected at random from every sub-plot to record plant height, number of leaves/plant, foliage fresh weight per plant and bulbing ratio. At harvest time ten guarded plants were chosen at random from the outer ridges of each plot to determine the following characters: bulb weight (g), total soluble solids (TSS) in bulbs (%) and bulb dry matter (%). Total bulbs yield (t/ha), marketable bulbs yield (t/ha) and culls bulbs yield (t/ha) were determined by harvesting two middles rows per plot in kg and then converted to t/ha.

Marketable yield of each plot were placed in common burlap bags and kept under normal storage conditions. Storability was measured as percentage of total loss in weight of bulbs during storage period (five months). Total soluble solids (TSS) and bulb dry matter

percentages in bulbs were determined during storage period. Total loss percentage was determined by examining bulb yield every month, then rotting and sprouting bulbs were discarded and the remaining yield was weighted.

All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the strip plot design as published by Gomez and Gomez (1984) by using "MSTAT-C" computer software package. Least Significant of Difference (LSD) method was used to test the differences between treatment means at 5 % level of probability as described by Snedecor and Cochran (1980).

## RESULTS AND DISCUSSION

**Effect of transplanting dates:** Transplanting dates of onion seedlings caused significant effects on all studied characters *i.e.* plant height, number of leaves/plant, foliage fresh weight and bulbing ratio at 90 and 120 days from transplanting, total yield, marketable yield, total culls, average bulb weight, total soluble solids, dry matter and total weight loss percentages of onion bulbs every month after harvesting till end of storability in both seasons. The highest values on plant height at 90 and 120 days from transplanting and total culls were resulted from transplanting seedlings on 15<sup>th</sup> November (early transplanting date) in both seasons. Delay transplanting date up to 1<sup>st</sup> January recorded the highest number of leaves/plant and bulbing ratio at 90 and 120 days from transplanting in both seasons. The highest averages of foliage fresh weight/plant at 90 and 120 days from transplanting, total yield, marketable yield and averages bulb weight as well as total soluble solids, dry matter and total weight loss percentages of onion bulbs every month after harvesting till end of storability were resulted from transplanting onion seedlings on 15<sup>th</sup> December in both seasons. The stimulatory effect of transplanting on 15<sup>th</sup> December may be attributed to the suitable weather condition during vegetative growth, which contributed to good foliage growth and formation ample canopy able to make best photosynthesis, hence increasing dry matter accumulation, bulb weight as well as total bulbs yield/ha. Ansari (2007) and Patil *et al.* (2012). Confirming these findings, reported by Bhatt *et al.* (2007), Sharma *et al.* (2007) and George *et al.* (2009).

**Cultivars performance:** Results in tables 1,2,3,4 and 5 showed significant differences were detected in all studied traits *i.e.* plant height, number of leaves/plant, foliage fresh weight and bulbing ratio at 90 and 120 days

from transplanting, total yield, marketable yield, total culls, average bulb weight, total soluble solids, dry matter and total weight loss percentages of onion bulbs every month after harvesting till end of storability due to the tested onion cultivars involving Giza 20, Giza Red and Texas Early Yellow Grano X Giza 20 in both growing seasons. From obtained results it could be observed that Giza 20 cultivar produced the highest bulbing ratios at 90 and 120 days from transplanting in the first season. The highest averages of plant height, number of leaves/plant and foliage fresh weight per plant at 90 and 120 days from transplanting as well as TSS and dry matter percentage in bulbs at harvesting and every month after harvesting till end of storability were produced from Giza Red cultivar in both seasons. Whereas, the highest bulbing ratios at 90 and 120 days from transplanting in the second season, total yield and marketable yield, total culls and bulb weight as well as total weight loss percentage of onion bulbs every month after harvesting till end of storability in both seasons were produced from Texas Early Yellow Grano X Giza 20 cultivar. The difference between studied cultivars might be related to genetic factors make up by the used cultivars Kandil *et al.* (2010). Similar results were obtained by Akhtar, Ehsan (2002), Gemma *et al.* (2007) and Soleymani and Shahrajabian (2012).

**Effect of interaction:** The interaction between onion cultivars and transplanting dates significantly affected foliage fresh weight/plant at 90 days from transplanting, marketable yield, total culls in both seasons and bulb weight in the second season as well as total weight loss percentage of onion bulbs after 1, 3 and 4 months from harvesting in both seasons. Foliage fresh weight/plant was significantly affected by the interaction between cultivars and transplanting dates at 90 days from transplanting in both seasons. Highest foliage fresh weight/plant (165.0 and 127.5 g) were obtained from transplanting seedlings of Giza Red cultivar on 15<sup>th</sup> December in the first and second seasons, respectively as shown from data listed in Fig. 1. On the other hand, lowest foliage fresh weight/plant (104.0 and 89.4 g) were resulted from transplanting seedlings of Giza 20 cultivar on 1<sup>st</sup> January in the first and second seasons, respectively.

The interaction between onion cultivars and transplanting dates exhibited significant effect on marketable bulbs yield/ha in the two growing seasons of this study.

Table 1. Averages of plant height, number of leaves/plant, foliage fresh weight per plant and bulbing ratio at 90 and 120 days from transplanting (DFT) as affected by transplanting dates of some onion cultivars and their interaction during 2010/2011 and 2011/2012 seasons.

Treatments/Characters	Plant height (cm)				Number of leaves/plant				Foliage fresh wt. (g/plant)				Bulbing ratio						
	Seasons		2010/2011		2011/2012		2010/2011		2011/2012		2010/2011		2011/2012		2010/2011		2011/2012		
Seasons	2010/2011	120	90	120	90	120	90	120	90	120	90	120	90	120	90	120	90	120	
<b>A-Transplanting dates:</b>																			
15 <sup>th</sup> November	83.78	90.18	92.16	91.63	7.80	9.26	7.32	7.40	113.3	193.6	109.8	134.7	1.60	1.90	1.36	1.43			
1 <sup>st</sup> December	78.35	83.41	77.00	84.86	7.73	8.88	6.45	7.03	141.5	220.3	111.9	148.6	1.64	2.73	1.43	2.13			
15 <sup>th</sup> December	78.15	67.55	69.72	67.18	7.83	8.61	6.52	6.98	144.3	233.3	119.5	169.4	1.70	3.21	1.62	3.24			
1 <sup>st</sup> January	77.53	50.28	65.55	45.15	8.84	10.45	7.45	7.53	110.0	163.0	94.9	115.9	2.32	3.87	2.07	3.74			
F. test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
LSD at 5%	4.16	3.63	3.75	4.85	0.59	0.56	0.47	0.46	9.5	10.3	7.6	8.5	0.07	0.15	0.16	0.14			
<b>B: Cultivars:</b>																			
Giza 20	79.01	72.83	75.66	70.98	7.69	8.78	6.70	6.97	119.8	175.0	107.0	135.0	1.95	3.08	1.61	2.66			
Giza Red	83.91	76.81	78.88	77.08	8.40	9.95	7.20	7.67	135.4	223.2	111.1	150.2	1.67	2.63	1.57	2.48			
Yellow Grano X Giza 20	75.43	68.92	73.78	68.55	8.05	9.17	6.91	7.06	126.5	209.5	109.0	141.2	1.82	3.08	1.68	2.76			
F. test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
LSD at 5%	3.46	4.04	2.85	3.63	0.53	0.53	0.40	0.52	7.3	8.7	3.7	4.6	0.11	0.14	0.08	0.13			
<b>C: Interaction:</b>																			
A×B	NS	NS	NS	NS	NS	NS	NS	NS	NS	*	NS	*	NS	NS	NS	NS	NS	NS	

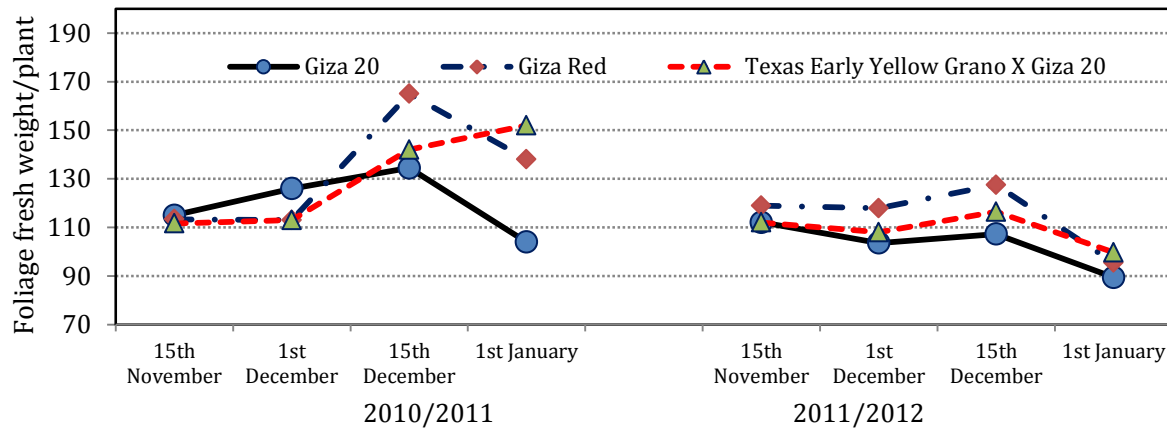


Figure 1. Averages of foliage fresh weight (g/plant) at 90 days from transplanting as affected by the interaction between onion cultivars and transplanting dates during 2010/2011 and 2011/2012 seasons.

Table 2. Averages of total yield, marketable yield, total culls and bulb weight at harvesting as affected by transplanting dates of some onion cultivars and their interaction during 2010/2011 and 2011/2012 seasons.

Treatments/ Characters	Total yield (t/ha)		Marketable yield (t/ha)		Total culls (t/ha)		Bulb weight (g)	
	2010/2011	2011/2012	2010/2011	2011/2012	2010/2011	2011/2012	2010/2011	2011/2012
<b>A-Transplanting dates:</b>								
15 <sup>th</sup> November	35.60	32.32	19.04	16.30	18.92	16.02	108.4	101.9
1 <sup>st</sup> December	33.37	29.44	25.70	21.16	7.64	8.28	109.2	102.7
15 <sup>th</sup> December	37.96	34.30	32.46	29.87	5.38	4.71	118.9	122.1
1 <sup>st</sup> January	37.87	33.06	31.51	28.30	4.09	4.43	116.5	111.4
F. test	*	*	*	*	*	*	*	*
LSD at 5%	2.55	2.07	1.59	1.79	0.55	0.29	6.0	7.8
<b>B: Cultivars:</b>								
Giza 20	35.84	31.92	27.13	24.13	8.69	7.76	112.2	108.1
Giza Red	34.01	30.75	25.25	22.68	8.73	8.04	110.7	107.6
Texas Early Yellow Grano X Giza 20	38.75	34.15	29.13	24.89	9.59	9.26	116.9	112.9
F. test	*	*	*	*	*	*	*	*
LSD at 5%	2.12	1.59	1.90	1.48	0.36	0.31	5.4	4.4
<b>C: Interaction:</b>								
A×B	NS	NS	*	*	*	*	NS	NS

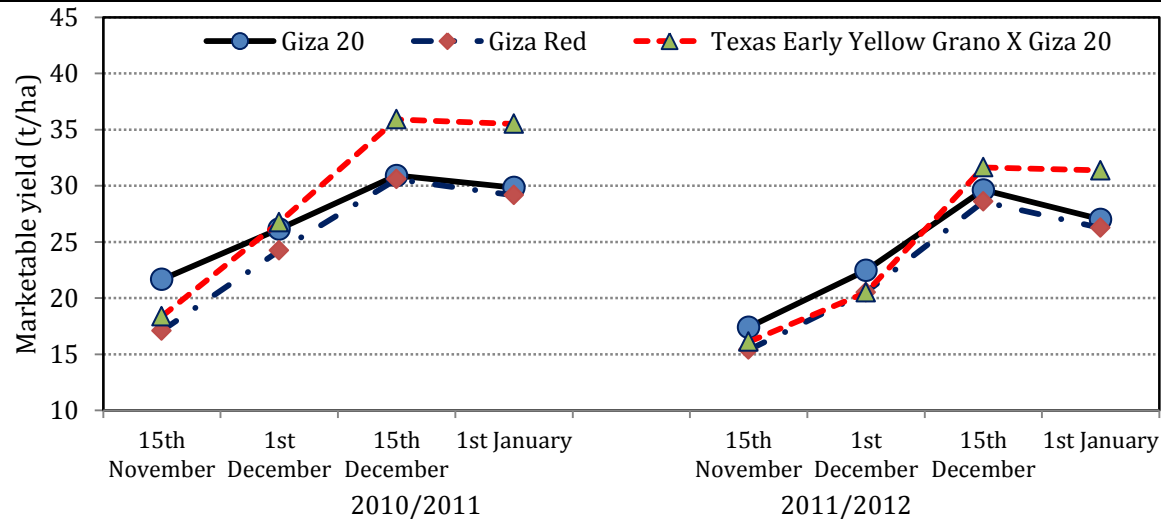


Figure 2. Averages of marketable yield (t/ha) at harvesting as affected by the interaction between onion cultivars and transplanting dates during 2010/2011 and 2011/2012 seasons.

Table 3. Averages of total soluble solids (TSS) in bulbs at harvesting and every month after harvesting till end of storability as affected by transplanting dates of some onion cultivars and their interaction during 2010/2011 and 2011/2012 seasons.

Treatments/ Characters	Total soluble solids (TSS %)												
	At harvesting		After 1 month		After 2 months		After 3 months		After 4 months		After 5 months		
	Seasons	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012
<b>A-Transplanting dates:</b>													
15 <sup>th</sup> November	12.22	12.51	12.74	12.15	13.08	12.23	13.47	12.50	13.63	12.98	13.81	13.30	13.30
1 <sup>st</sup> December	12.10	11.72	12.41	12.10	12.76	12.13	12.86	12.40	12.93	12.80	13.15	13.30	13.30
15 <sup>th</sup> December	11.20	11.50	11.47	11.80	11.87	11.54	12.44	12.35	12.70	12.35	12.93	13.23	13.23
1 <sup>st</sup> January	11.12	11.48	11.31	11.40	11.87	11.40	12.15	11.85	12.16	11.80	12.50	12.76	12.76
F. test	*	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5%	0.56	0.68	0.64	0.73	0.64	0.49	0.51	0.43	0.52	0.62	0.67	0.41	0.41
<b>B: Cultivars:</b>													
Giza 20	11.68	11.92	11.98	12.05	12.48	12.10	12.51	12.41	12.67	12.53	12.86	13.15	13.15
Giza Red	12.52	12.70	12.77	12.93	13.08	12.48	13.83	13.35	13.95	13.51	14.20	14.07	14.07
Texas Early Yellow Grano X	10.79	10.78	11.20	10.63	11.63	10.90	11.84	11.06	11.95	11.41	12.24	12.22	12.22
Giza 20													
F. test	*	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5%	0.41	0.45	0.57	0.63	0.40	0.54	0.68	0.53	0.41	0.59	0.55	0.61	0.61
<b>C: Interaction:</b>													
A×B	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

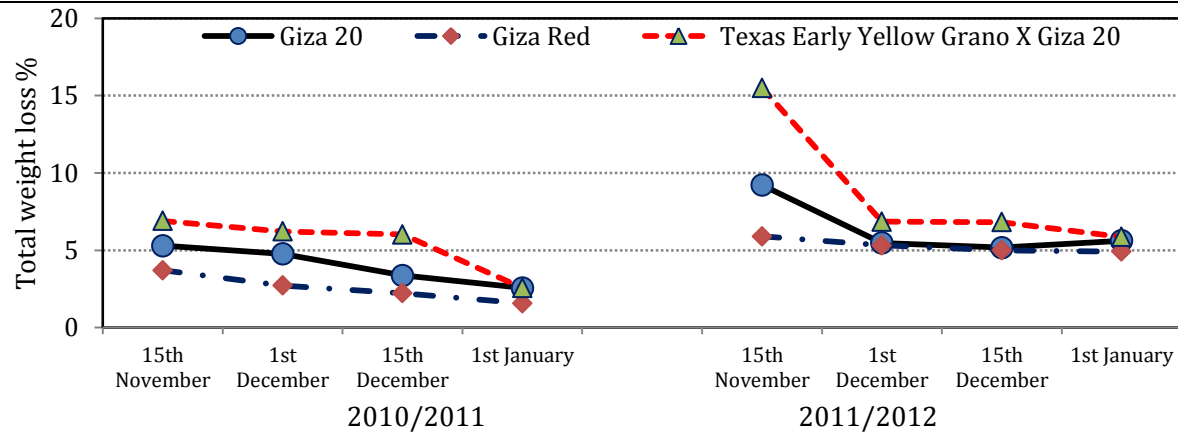


Figure 4. Averages of total weight loss percentage of onion bulbs every month after 1 month from harvesting as affected by the interaction between onion cultivars and transplanting dates during 2010/2011 and 2011/2012 seasons.

Table 4. Averages of dry matter percentage in bulbs at harvesting and every month after harvesting till end of storability as affected by transplanting dates of some onion cultivars and their interaction during 2010/2011 and 2011/2012 seasons.

Treatments/ Characters	Dry matter (%)												
	At harvesting		After 1 month		After 2 months		After 3 months		After 4 months		After 5 months		
	Seasons	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012
<b>A-Transplanting dates:</b>													
15 <sup>th</sup> November	17.00	16.75	17.37	17.08	17.91	17.66	18.62	18.70	20.25	19.70	20.66	20.33	
1 <sup>st</sup> December	16.75	16.69	17.08	17.04	17.33	17.41	17.62	18.29	18.66	18.91	19.08	19.58	
15 <sup>th</sup> December	15.83	16.70	16.91	16.87	17.00	17.16	17.66	17.75	18.12	18.87	19.29	20.25	
1 <sup>st</sup> January	14.79	16.45	16.25	16.79	16.75	17.04	17.12	17.75	18.08	18.79	19.00	19.58	
F. test	*	*	*	*	*	*	*	*	*	*	*	*	
LSD at 5%	0.49	0.32	0.71	0.63	0.40	0.29	0.43	0.38	0.94	0.61	0.97	0.64	
<b>B: Cultivars:</b>													
Giza 20	16.34	16.62	16.87	16.81	17.25	17.40	18.06	18.34	18.93	19.00	19.68	19.93	
Giza Red	17.06	17.81	17.87	18.12	18.31	18.40	18.65	19.28	19.53	20.40	20.46	21.31	
Texas Early Yellow Grano X Giza 20	14.87	15.51	15.96	15.90	16.18	16.15	16.56	16.75	17.87	17.81	18.37	18.56	
F. test	*	*	*	*	*	*	*	*	*	*	*	*	
LSD at 5%	0.34	0.38	0.54	0.57	0.42	0.54	0.61	0.77	0.75	0.67	0.89	0.91	
<b>C: Interaction:</b>													
A×B	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	

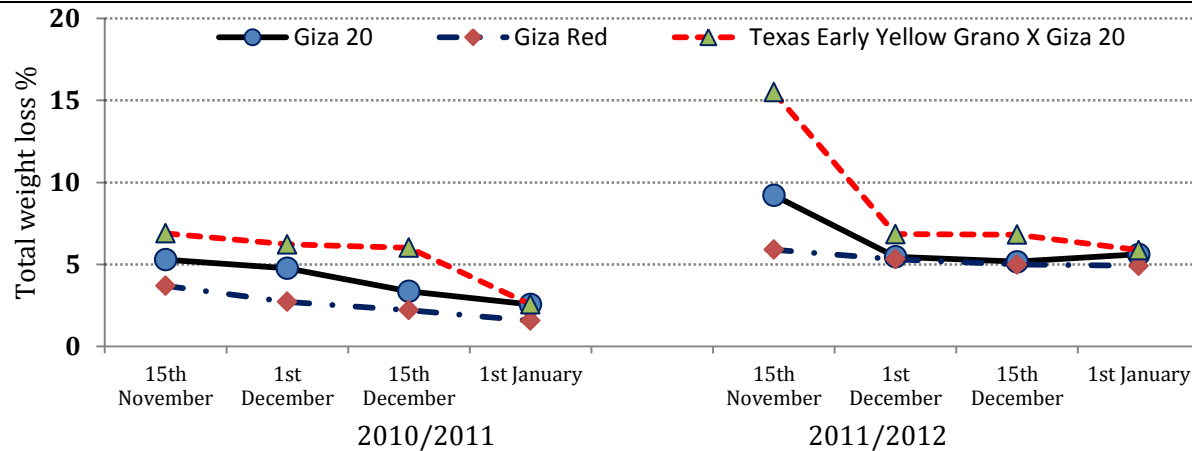


Figure 5. Averages of total weight loss percentage of onion bulbs every month after 3 months from harvesting as affected by the interaction between onion cultivars and transplanting dates during 2010/2011 and 2011/2012 seasons.

Table 5. Averages of total weight loss percentage of onion bulbs every month after harvesting till end of storability as affected by transplanting dates of some onion cultivars and their interaction during 2010/2011 and 2011/2012 seasons.

Treatments/ Characters	Total weight loss (%)									
	After 1 month		After 2 months		After 3 months		After 4 months		After 5 months	
	Seasons	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011	2011/ 2012	2010/ 2011
<b>A-Transplanting dates:</b>										
15 <sup>th</sup> November	4.97	10.20	9.34	22.34	18.44	26.97	28.25	36.13	34.33	39.69
1 <sup>st</sup> December	4.90	5.79	9.25	15.82	16.20	21.39	26.12	30.17	32.83	34.16
15 <sup>th</sup> December	3.87	5.67	7.92	11.85	17.51	17.94	27.54	21.85	31.46	25.90
1 <sup>st</sup> January	2.24	5.55	5.36	11.53	10.09	13.14	20.65	18.03	28.86	22.60
F. test	*	*	*	*	*	*	*	*	*	*
LSD at 5%	1.36	1.55	1.12	2.64	1.40	2.28	0.99	2.07	2.01	3.44
<b>B: Cultivars:</b>										
Giza 20	4.00	6.37	7.63	15.23	15.08	19.00	25.90	25.53	31.97	28.66
Giza Red	2.55	5.28	6.38	12.25	13.73	15.31	22.43	21.05	28.25	26.30
Texas Early Yellow Grano X Giza 20	5.43	8.76	9.90	18.68	17.86	25.27	28.60	33.06	35.40	36.80
F. test	*	*	*	*	*	*	*	*	*	*
LSD at 5%	0.94	1.18	0.74	1.14	0.92	1.84	1.10	1.75	2.71	3.14
<b>C: Interaction:</b>										
A×B	*	*	NS	NS	*	*	*	*	NS	NS

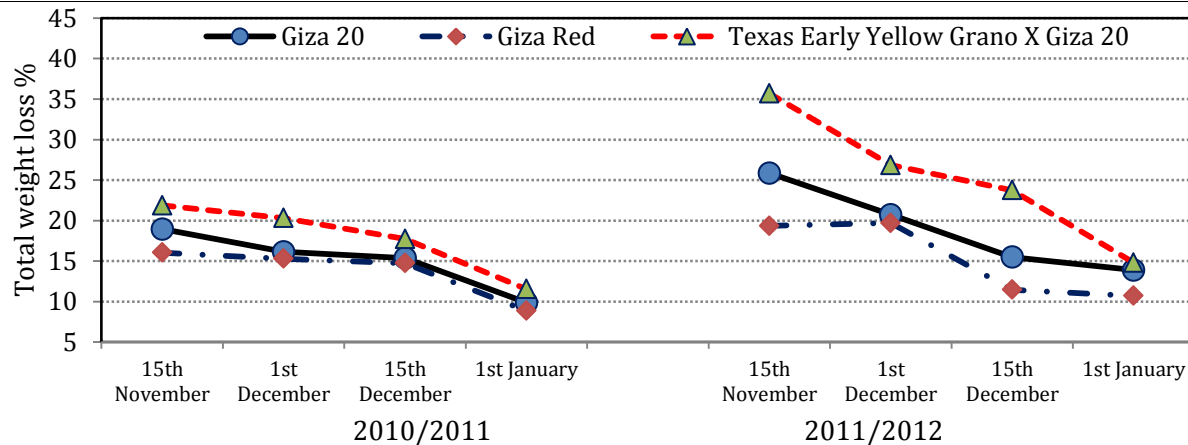


Figure 5. Averages of total weight loss percentage of onion bulbs every month after 3 months from harvesting as affected by the interaction between onion cultivars and transplanting dates during 2010/2011 and 2011/2012 seasons.



As seems to appear from data in Fig. 2, transplanting seedlings of Texas Early Yellow Grano X Giza 20 cultivar on 15<sup>th</sup> December produced the highest values of marketable bulbs yield (35.91 and 31.63 t/ha) in the first and second seasons, respectively. It was followed by transplanting seedlings of the same cultivar on 1<sup>st</sup> January in either growing seasons. On the other hand, the lowest values of marketable bulbs yield (17.09 and 15.40 t/ha) were resulted from transplanting seedlings of Giza Red cultivar on 15<sup>th</sup> November in the first and second seasons, respectively. Total culls/ha was significantly affected by the interaction between onion cultivars and transplanting dates in the first and second season. From data listed in Fig. 3 indicate that, the highest values of total culls (21.73 and 18.52 t/ha) were obtained when transplanting seedlings of Texas Early Yellow Grano X Giza 20 cultivar on 15<sup>th</sup> November in the first and second seasons, respectively. Followed by transplanting seedlings of Giza Red cultivar on the same

time in both seasons. On the other hand, lowest means of total culls (3.36 and 4.05 t/ha) were resulted from transplanting seedlings of Giza Red cultivar on 1<sup>st</sup> January in the first and second seasons, respectively. Effect of the interaction between onion cultivars and transplanting dates on total weight loss percentage in bulbs after 1, 3 and 4 months from harvesting was significant in both seasons. As seen from results in Fig. 4,5 and 6 highest total weight loss percentage in bulbs (6.90, 15.50, 21.87, 35.70, 30.05 and 49.80 %) were obtained due to transplanting seedlings of onion cultivar Texas Early Yellow Grano X Giza 20 on 15<sup>th</sup> November after 1, 3 and 4 months from harvesting in the first and second seasons, respectively. Whereas, lowest total weight loss percentage in bulbs (1.57, 4.92, 8.85, 10.72, 17.42 and 14.70 %) were resulted from transplanting seedlings of onion cultivar Giza Red on 1<sup>st</sup> January after 1, 3 and 4 months from harvesting in the first and second seasons, respectively.

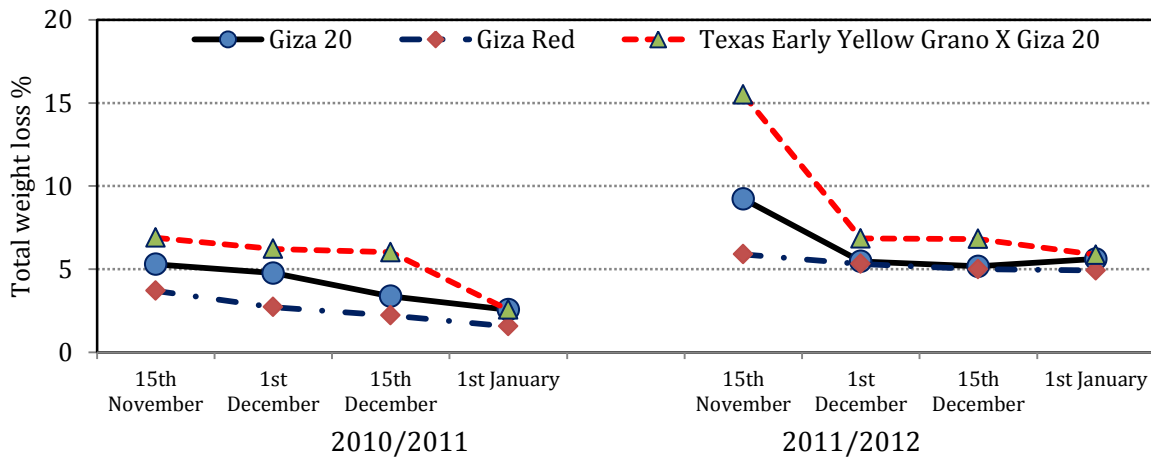


Figure 6. Averages of total weight loss percentage of onion bulbs every month after 4 months from harvesting as affected by the interaction between onion cultivars and transplanting dates during 2010/2011 and 2011/2012 seasons.

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