Minufiya J. Agric. Res. Vol. 34 No.2: 697 - 718 (2009) "http://www.mujar.net"

YIELDING AND STORABILITY OF SOME ONION CULTIVARS GROWN UNDER TWO IRRIGATION SYSTEMS

H. A. Obiadalla-Ali[1] and Nevein A. El-Sawah[2]

(1) Dept. Horticulture, Faculty of Agriculture, Sohag University, Sohag, Egypt.
(2) Dept. Horticulture, Faculty of Agriculture, Fayoum University, Fayoum, Egypt.

(Received: Feb. 26, 2009)

ABSTRACT: *Yielding and storability of some onion cultivars; Giza 6 Mohassan, Giza 20, Shandaweel 1, Ganoub El-Wady I and Ganoub El-Wady II grown under two irrigation systems (surface and drip) at the Experimental Farm, Faculty of Agriculture, Sohag University during the two seasons of 2006/2007 and 2007/2008 have been studied. The most important results can be summarized as follow:*

- *All cultivars showed a wide range of variation in the most studied traits of yield and storability under both irrigation systems.*
- *Regarding yielding and quality of the studied onion cultivars:*

1. Ganoub El-Wady II gave the highest values in exportable bulbs yield under surface irrigation system, while Giza 20 cv. recorded the highest values under drip irrigation system. Ganoub El-Wady I cv. gave the greatest values in total bulbs yield under surface irrigation system and Giza 20 cv. gave the highest one under drip irrigation system.

2. The cultivar of Shandaweel 1 gave the lowest values in bolter bulbs yield and total double yield under surface irrigation system while, under drip irrigation system, Giza 20 cv. and Ganoub El-Wady II cv. gave the lowest values in bolter bulbs yield and total double bulbs yield, respectively.

3. Shandaweel 1 cv. gave the lowest values in yield of large and small bulbs under surface irrigation system while, the lowest ones under drip irrigation system were recorded by cvs. of Ganoub El-Wady I and Giza 6 Mohassan, respectively.

4. The cultivar of Shandaweel 1 gave the least values in commercial defect and local marketable bulbs yield under surface irrigation system while, the lowest ones under drip irrigation system were recorded by Ganoub El-Wady II. In addition, the cultivar of Ganoub El-Wady II gave the lowest values in culls yield and the highest ones in total soluble solids% (TSS%) under both irrigation system.

5. However, the highest exportable and total bulbs yield in all cultivars was obtained from the drip irrigation system as compared with the surface irrigation system.

6. The bolter bulbs yield, total double bulbs yield, small bulbs yield, commercial defect bulbs yield and local marketable bulbs yield were the lowest under surface irrigation system comparison drip irrigation one.

7. TSS% was the highest under surface irrigation system over than the drip irrigation one.

8. With respect to the storability of the tested onion cultivars; the lowest values in weight loss%, decay% as well as sprouting% were recorded by the cultivars of Ganoub El-Wady II, Shandaweel 1 and Giza 20, respectively under both of surface and drip irrigation systems.

Key Words: *Onion, irrigation, cultivar, yielding, storability.*

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most important crops in Egypt for consumption, processing and exportation. Great advance in the techniques and methods of onion production during the last decade were developed (El-Sayed and Atia, 1999). Cultivars and irrigation systems are major factors affecting yield quality and storability of onion bulbs.

Evaluation of some onion cultivars has been assessed by many investigators (Warid and El-Shafie, 1976; Bolanos, 1989; Muniy *et al.*, 1989; Lancaster *et al.*, 1995; Mohammed and Gamie, 1999; Costa *et al.*, 2000; Cheema *et al.*, 2003 and El-Damarany and Obiadalla, 2005).

Many investigators indicated that the irrigation intervals play a significant role in affecting the yield and quality of onion bulbs (Chaudhry and Erinne, 1984; El-Kalla and El-Kassaby, 1985; Chung, 1989; Dhian *et al.* 1991; Galbiatti *et al.*, 1992; Ells *et al.*, 1993; Martin *et al.*, 1994; Glala, 1997; Steiner and Akintohi, 1998; Koriem *et al.*, 1999; Mohamed and Gamie, 2000; Vijay *et al.*, 2002; Khan *et al.*, 2005; Glala *et al.*, 2006 and Iiala *et al.*, 2007). Several workers have been studied the effect of different irrigation systems on yield of onion (Caraballo *et al.*, 1989 and Al-Jamal *et al.*, 2001). As well as Storability of onion bulbs has been investigated by Warid and Ahmed (1960); Hurst *et al.* (1985); Patil and kale(1985); Shekib *et al.* (1986); Patil *et al.* (1987); Smittel (1988); Mondal and Pramanik (1992); Gamal (1994); Kopsell and Randlew (1997); Gamie *et al.* (2000); Shinde *et al.* (2001); Metwally (2002); Kotb (2004); Adamicki (2006) and Rafika *et al.* (2006).

The aim objective of this study was to evaluate yielding and storability of two new synthetic cultivars of onion (Ganoub El-Wady I and II) and three commercial cultivars of onion in Egypt (Giza 6 Mohassan, Giza 20 and Shandaweel 1) grown under surface and drip irrigation systems.

MATERIALS AND METHODS

A field experiments were carried out at the Experimental Farm of the Faculty of Agriculture, Sohag University during 2006/2007 and 2007/2008 seasons under surface and drip irrigation systems. The most important properties of the experimental site (newly reclaimed soil) are presented in Table (1). Nursery of five onion cultivars; Ganoub El-Wady I (round) and II (flat) synthetic cultivars, Giza 6 Mohassan, Giza 20 and Shandaweel 1 cultivars were sown in 25th September and transplanted in 27th November in both seasons.

Table (1): Soil properties of the experiment site (mean of the two seasons).

Properties	Sampling depth (0-25)
Sand (%)	47.18
Silt (%)	23.12
Clay (%)	29.70
$CaCO_3$ (%)	11.27
O.M (%)	2.51
pH (1:2.5)	7.35
EC (dsm^{-1}, 1:5)	0.21

The experiment was laid out in split-plot design with four replications. The different irrigation systems were arranged in the main plot and the different cultivars were assigned to sub-plots. Under surface irrigation system, seedlings were transplanted on both sides of 60 cm wide ridges in 3×3.5 m^2 plots. Distances between plants were 7.5 cm. While, under drip irrigation system, seedlings were transplanted on both sides of ridges and the distance between each ridge and plants on the ridge were 60 and 7.5 cm, respectively. All agricultural practices for commercial production of onion were followed as recommended by Ministry of Agriculture, Egypt. Plants were grown to maturity and the crop was considered mature when the foliage lodged on 50% of the plants. At this stage of maturity, a representative sample of ten plants were randomly taken of each cultivar in each replicate was harvested and scored for the yield characters.

Storage and quality experiment on the harvested bulbs was carried out at Department of Horticulture lab, Faculty of Agriculture, Sohag University during 2006/2007, 2007/2008 seasons for determining the storability and quality characters in five onion cultivars which were produced under surface and drip irrigation systems. After curing (in the field for two weeks), samples of marketable yield from each plot were selected for uniformity in size and shape. One hundred bulbs samples for each one were cleaned and placed in big Kraft paper bags. All samples were kept under normal storage conditions at room temperature for seven months in four replications.

Data recorded.

1- Yield and its quality.

After harvesting and curing the following characters were recorded:

1.Exportable bulbs yield (ton $fed.^{-1}$). 2.Total bulbs yield (ton $fed.^{-1}$).
3. Bolters bulbs yield (ton $fed.^{-1}$). 4. Total double bulbs Yield (ton $fed.^{-1}$).
5. Yield of large size bulbs {bulbs > 6cm (ton $fed.^{-1}$)}.
6. Yield of small size bulbs {bulbs < 3cm (ton $fed.^{-1}$)}.
7. Commercial defect bulbs yield (ton $fed.^{-1}$). This includes (bolters bulbs yield, total double bulbs yield).
8. Local marketable bulbs yield (ton $fed.^{-1}$). This includes (yield of commercial defect bulbs, Yield of bulbs > 6cm and yield of bulbs < 3cm).
9. Culls bulbs yield (ton $fed.^{-1}$).

10.Total soluble solids% (TSS %): estimated by handle Refractometer.

Data obtained were statistically analyzed and treatments means were compared using the Least Significant Difference (LSD) test at 5% according to Gomez and Gomez (1984).

2- Storability Characters.

The following characters were recorded at 30 days intervals on the stored bulbs

A- Weight loss % calculated as:

$$\text{Weight loss \%} = \frac{\text{Weight loss of bulbs}}{\text{Total bulb weight at beginning of storage}} \times 100$$

B- Decay bulbs% calculated as:

$$\text{Decay \%} = \frac{\text{No. of decay bulbs}}{\text{Total No. of bulb at beginning of storage}} \times 100$$

C- Sprouted bulbs% calculated as:

$$\text{Sprouting\%} = \frac{\text{No. of sprouting bulbs}}{\text{Total No. of Bulbs at beginning of storage}} \times 100$$

The data for storage parameters are shown by means of frequency histograms.

RESULTS AND DISCUSSION

Yield characters of onion:

1- Exportable bulbs yield (ton fed.$^{-1}$):

The results in Table 2 clearly explain that the studied onion cultivars differed significantly in both seasons. The cultivar Ganoub El-Wady II gave the greatest exportable bulbs yield (8.635 and 8.650 ton fed.$^{-1}$) in the first and second seasons, respectively, while Giza 6 Mohassan was the least in this trait (7.185 and 7.191 ton fed.$^{-1}$) in the first and second seasons, respectively. Same general results were reported by El-Damarany and Obiadalla (2005).

Irrigation systems significantly affected this character in both seasons (Table 2). The highest value (9.100 and 9.115 ton fed.$^{-1}$) was obtained from drip irrigation in comparison with surface irrigation (7.112 and 7.135 ton fed.$^{-1}$) in the first and second seasons, respectively. El-Damarany and Obiadalla (2005) indicated that, drip irrigation system gave the highest weight of exportable bulbs yield in comparison with surface irrigation system.

The combination between the two studied factors (cultivar and irrigation system) significantly affected exportable bulbs yield in both seasons. Under surface irrigation system, the cultivar Ganoub El-Wady II had the highest value (7.571 and 7.585 ton fed.$^{-1}$) for this trait in the first and second season, respectively, while Ganoub El-Wady I gave the lowest value for this trait (6.758 and 6.795 ton fed.$^{-1}$) in the first and second season respectively. Under drip irrigation system, the cultivar Giza 20 had the highest value (9.970 and 9.982 ton fed.$^{-1}$) for this trait in the first and second season respectively, while Giza 6

Mohassan gave the lowest value for this trait (7.467 and 7.473 ton fed.$^{-1}$) in the first and second season respectively. This positive performance for these cultivars may be due to their positive performance in some other traits such as weight of bolters bulbs, double bulbs, large size bulbs and small size bulbs that we will discuses later. The same results were in line with those found by Mohamed and Gamie (2000) and El-Damarany and Obiadalla (2005).

2- Total bulbs Yield (ton fed.$^{-1}$):

The results in Table (2) clearly show that onion cultivars differed significantly in total bulbs yield in both seasons. Cultivar Giza 20 was the greatest in total bulbs yield (15.122 and 15.105 ton fed.$^{-1}$) in the first and second seasons, respectively, while Cultivar Shandaweel 1 was the least in total bulbs yield (12.714 and 12.737 ton fed.$^{-1}$) in the first and second seasons, respectively. El-Damarany and Obiadalla (2005) revealed that cultivar Shandaweel 1 gave the lowest weight of total bulbs yield.

Irrigation system significantly affected this character in both seasons (Table 2). The highest value in total bulbs yield (15.743 and 15.744 ton fed.$^{-1}$) was obtained from drip irrigation in comparison with surface irrigation (11.241 and 11.298 ton fed^{-1}) in the first and second successive seasons respectively. El-Damarany and Obiadalla (2005) indicated that, drip irrigation system gave the highest weight of total bulbs yield in comparison with surface irrigation system.

The combination between the two studied factors significantly affected yield of total bulbs in both seasons. Under surface irrigation system, cultivar Ganoub El-Wady I had the highest yield (11.898 and 12.008 ton fed.$^{-1}$) for this trait in the first and second season respectively, while Shandaweel 1 gave the lowest value for this trait (9.861 and 9.863 ton fed.$^{-1}$) in the first and second season respectively. Under drip irrigation system, cultivar Giza 20 had the highest value (18.404 and 18.332 ton/fed) for this in the first and second season respectively, while Ganoub El-Wady I gave the lowest value for this trait (14.441 and 14.427 ton fed.$^{-1}$) in the first and second season respectively. Similar results were reported by Mohamed and Gamie (1999); Mohamed and Gamie (2000) and El-Damarany and obiadalla (2005)

Table (2): Exportable and total bulbs yield as affected by onion cultivars and irrigation systems in 2006/2007 and 2007/2008 seasons.

Cultivars	Exportable bulbs yield (ton fed.$^{-1}$)						Total bulbs yield (ton fed.$^{-1}$)					
	2007			2008			2007			2008		
	SI	DI	Mean	SI	DI	Mean	SI	DI	Mean	SI	DI	Mean
Ganoub El-Wady I	6.758	8.594	7.676	6.795	8.592	7.694	11.898	14.441	13.170	12.008	14.427	13.218
Ganoub El-Wady II	7.571	9.699	8.635	7.585	9.715	8.650	11.764	15.260	13.512	11.858	15.293	13.575
Giza 6 Mohassan	6.903	7.467	7.185	6.908	7.473	7.191	10.842	15.041	12.941	10.882	15.060	12.971
Giza 20	7.185	9.970	8.577	7.255	9.982	8.619	11.840	18.404	15.122	11.878	18.332	15.105
Shandaweel 1	7.142	9.767	8.455	7.130	9.813	8.471	9.861	15.567	12.714	9.863	15.610	12.737
Mean	7.112	9.100		7.135	9.115		11.241	15.743		11.298	15.744	
LSD 0.05 A		0.091			0.089			0.172			0.126	
B		0.059			0.076			0.136			0.097	
AB		0.083			0.107			0.192			0.136	

(A): for irrigation treatments (B): for cultivars treatments (AB): Interaction
SI = Surface irrigation system DI = Drip irrigation system

3- Bolters bulbs yield (ton fed.$^{-1}$):

The results in Table (3) clearly show that the tested onion cultivars differed significantly in both season. Cultivar Giza 20 was the least in yield of bolters bulbs (0.293 and 0.263 ton fed.$^{-1}$) in the first and second seasons, respectively, conversely the cultivar Giza 6 Mohassan was the greatest in this trait (1.172 and 1.175 ton fed.$^{-1}$) in the first and second seasons, respectively. Same general trend were found by (El-Damarany and Obiadalla, 2005).

Irrigation systems significantly affected this character in both seasons (Table 3). The lowest value (0.162 and 0.164 ton fed.$^{-1}$) was obtained from surface irrigation in comparison with drip irrigation (1.006 and 0.994 ton fed.$^{-1}$) in the first and second successive seasons respectively. El-Damarany and Obiadalla (2005) found that, surface irrigation system was the lowest in weight of bolters in comparison with drip irrigation.

The combination between the two studied factors significantly affected bolter bulbs yield in both seasons. Under surface irrigation system, cultivar Shandaweel 1 had the lowest value (0.096 and 0.099 ton fed.$^{-1}$) for this trait in the first and second seasons, respectively, while cultivar Giza 6 Mohassan gave the highest value for this trait (0.257 and 0.258 ton fed.$^{-1}$) in the first and second seasons, respectively. Under drip irrigation system, cultivar Giza 20 had the lowest values (0.413 and 0.352 ton fed.$^{-1}$) for this trait, while Giza 6 Mohassan gave the highest values (2.087 and 2.091 ton fed.$^{-1}$) in the first and second seasons, respectively. Similar trends were reported by Lancaster *et al.*, 1995; Cheema *et al.*, 2003 and El-Damarany and Obiadalla, 2005, who evaluated some of onion cultivars and they found that these cultivars significantly difference for bolting %.

4- Total double bulbs yield (ton fed.$^{-1}$):

The results in Table (3) show that the studied onion cultivars differed significantly in both seasons. Shandaweel 1 cultivar was the least mean in the first one season (2.419 ton fed.$^{-1}$), while Ganoub El-Wady II cv. was the least (2.171 ton fed.$^{-1}$) in the second season. Giza 20 cv. was the greatest mean in this character (3.709 and 3.684 ton fed.$^{-1}$) in the first and second seasons, respectively. The same general trends were found by (El-Damarany and Obiadalla, 2005).

Irrigation systems significantly affected this character in both seasons (Table 3). The lowest value (2.307 and 2.324 ton fed.$^{-1}$) was obtained from surface irrigation in comparison with drip irrigation (3.368 and 3.854 ton fed.$^{-1}$) in the first and second successive seasons, respectively. El-Damarany and Obiadalla (2005) revealed that, surface irrigation system was the lowest in weight total double bulbs in comparison with drip irrigation.

Table (3): Bolters and total double bulbs yield as affected by onion cultivars and irrigation systems in 2006/2007 and 2007/2008 seasons.

Cultivars	Bolter bulbs yield (ton fed.$^{-1}$)						Total double bulbs yield (ton fed.$^{-1}$)					
	2007			2008			2007			2008		
	SI	DI	Mean	SI	DI	Mean	SI	DI	Mean	SI	DI	Mean
Ganoub El-Wady I	0.171	0.958	0.565	0.170	0.950	0.560	3.612	2.363	2.987	3.683	2.362	3.023
Ganoub El-Wady II	0.115	1.079	0.597	0.117	1.083	0.600	3.122	2.187	2.155	2.655	2.186	2.171
Giza 6 Mohassan	0.257	2.087	1.172	0.258	2.091	1.175	1.934	3.898	2.916	1.950	3.908	2.929
Giza 20	0.173	0.413	0.293	0.174	0.352	0.263	2.108	5.311	3.709	2.070	5.298	3.684
Shandaweel 1	0.096	0.495	0.295	0.099	0.492	0.296	1.757	3.080	2.419	1.762	3.082	2.422
Mean	0.162	1.006		0.164	0.994		2.307	3.368		2.324	2.854	
LSD 0.05 A		0.035			0.005			0.064			0.062	
B		0.039			0.006			0.100			0.081	
AB		0.055			0.009			0.142			0.115	

(A): for irrigation treatments (B): for cultivars treatments (AB): Interaction
SI = Surface irrigation system DI = Drip irrigation system

The combination between the two studied factors significantly affected commercial defect bulbs yield in both seasons. Under surface irrigation system, cultivar Shandaweel 1 had the lowest value (1.757 and 1.762 ton fed.$^{-1}$) for this trait in the first and second seasons, respectively, while cultivar Ganoub El-Wady I gave the highest value for this trait (3.612 and 3.683 ton fed.$^{-1}$) in the first and second seasons, respectively. Under drip irrigation system, cultivar Ganoub El-Wady II had the lowest values (2.187 and 2.186 ton fed.$^{-1}$) for this trait, while Giza 20 gave the highest values (5.311 and 5.298 ton fed.$^{-1}$) in the first and second seasons, respectively. These results were in line with these found by El-Damarany and Obiadalla (2005), who evaluated different cultivars and yield contributing characters of onion

5- Yield of large size bulbs {bulbs > 6cm (ton fed.$^{-1}$)}:

The results in Table (4) show that onion cultivars differed significantly in yield of small size bulbs in both seasons. The cultivar Ganoub El-wady 1 was the least in yield of large size bulbs (0.322 and 0.321 ton fed.$^{-1}$) in the first and second seasons, respectively, while cultivar Giza 20 was the highest in this character (1.226 and 1.255 ton fed.$^{-1}$) in the first and second seasons, respectively.

Irrigation systems significantly affected this character in both seasons (Table 4). The lowest value (0.534 and 0.532 ton fed.$^{-1}$) was obtained from drip irrigation in comparison with surface irrigation (0.608 and 0.613 ton fed.$^{-1}$) in the first and second successive seasons respectively. El-Damarany and Obiadalla (2005) mentioned that, drip irrigation system was the lowest in weight of large size bulbs in comparison with surface irrigation.

The combination between the two studied factors significantly affected commercial defect bulbs yield in both seasons. Under surface irrigation system, cultivar Shandaweel 1 had the lowest value (0.287 and 0.291ton fed.$^{-1}$) for this trait in the first and second seasons, respectively, while cultivar Giza 20 gave the highest value for this trait (1.276 and 1.278 ton fed.$^{-1}$) in the first and second seasons, respectively. Under drip irrigation system, cultivar Ganoub El-Wady I had the lowest values (0.281 and 0.278 ton fed.$^{-1}$) for this trait, while Giza 20 gave the highest values (1.176 and 1.171 ton fed.$^{-1}$) in the first and second seasons, respectively. Similar results were reported by Sargent (2000); Sullivan *et al.* (2001) and El-Damarany and Obiadalla (2005).

6- Yield of small size bulbs {bulbs < 3cm (ton fed.$^{-1}$)}:

The results in Table (4) shows that onion cultivars differed significantly in both seasons. Cultivar Shandaweel 1 was the least in yield of small size bulbs (1.193 ton fed.$^{-1}$) in both seasons, while cultivar Ganoub El-Eady II was the greatest in this trait (1.633 and 1.664 ton fed.$^{-1}$) in the first and second seasons, respectively.

Table (4): Large and small size bulbs yield as affected by onion cultivars and irrigation systems in 2006/2007 and 2007/2008 seasons.

Cultivars	Large size bulbs yield (ton fed.$^{-1}$)						Small size bulbs yield (ton fed.$^{-1}$)					
	2007			2008			2007			2008		
	SI	DI	Mean	SI	DI	Mean	SI	DI	Mean	SI	DI	Mean
Ganoub El-Wady I	0.363	0.281	0.322	0.363	0.278	0.321	0.995	2.246	1.620	0.997	2.244	1.621
Ganoub El-Wady II	0.488	0.495	0.491	0.488	0.494	0.491	1.468	1.799	1.633	1.512	1.815	1.664
Giza 6 Mohassan	0.627	0.298	0.463	0.645	0.299	0.472	1.120	1.291	1.206	1.120	1.289	1.204
Giza 20	1.276	1.176	1.226	1.278	1.171	1.255	1.098	1.533	1.316	1.100	1.528	1.314
Shandaweel 1	0.287	0.418	0.352	0.291	0.417	0.354	0.579	1.807	1.193	0.580	1.806	1.193
Mean	0.608	0.534		0.613	0.532		1.052	1.735		1.062	1.737	
LSD 0.05 A	0.004			0.006			0.014			0.010		
B	0.006			0.007			0.017			0.018		
AB	0.008			0.009			0.023			0.025		

(A): for irrigation treatments (B): for cultivars treatments (AB): Interaction
SI = Surface irrigation system DI = Drip irrigation system

Irrigation systems significantly affected this trait in both seasons (Table 4). The lowest value (1.052 and 1.062 ton fed.$^{-1}$) was obtained from surface irrigation in comparison with drip irrigation (1.735 and 1.737 ton fed.$^{-1}$) in the first and second seasons, respectively. El-Damarany and Obiadalla (2005) found that surface irrigation system was the lowest in weight of small size bulbs in comparison with drip irrigation.

The combination between the two studied factors significantly affected small size bulbs yield in both seasons. Under surface irrigation system, cultivar Shandaweel 1 had the lowest value (0.579 and 0.580 ton fed.$^{-1}$) for this trait in the first and second seasons, respectively, while cultivar Ganoub El-Wady II gave the highest value for this trait (1.468 and 1.512 ton fed.$^{-1}$) in the first and second seasons, respectively. Under drip irrigation system, cultivar Giza 6 Mohassan had the lowest values (1.291 and 1.289 ton fed.$^{-1}$) for this trait, while cultivar Ganoub El-Wady I gave the highest values (2.246 and 2.244 ton fed.$^{-1}$) in the first and second seasons, respectively. The same trend results were obtained by Sullivan *et al.* (2001) and El-Damarany and Obiadalla (2005).

7-Commercial defect bulbs yield (ton fed.$^{-1}$):

The results in Table (5) show that onion cultivars differed significantly in both seasons. Cultivar Shandaweel 1 was the least in yield of commercial defect bulbs (2.714 and 2.718 ton fed.$^{-1}$) in the first and second seasons, respectively, while cultivar Giza 6 Mohassan was the greatest in this character (4.088 and 4.104 ton fed.$^{-1}$) in the first and second seasons, respectively.

Irrigation systems significantly affected this trait in both seasons (Table 5). The lowest value (2.469 and 2.488 ton fed.$^{-1}$) was obtained from surface irrigation in comparison with drip irrigation (4.374 and 4.361 ton fed.$^{-1}$) in the first and second successive seasons respectively. El-Damarany and Obiadalla (2005) found that, surface irrigation system was the lowest in weight of bolters and double bulbs in comparison with drip irrigation.

The combination between the two studied factors significantly affected commercial defect bulbs yield in both seasons. Under surface irrigation system, cultivar Shandaweel 1 had the lowest value (1.853 and 1.862 ton fed.$^{-1}$) for this trait in the first and second seasons, respectively, while cultivar Ganoub El-Wady I gave the highest value for this trait (3.783 and 3.853 ton fed.$^{-1}$) in the first and second seasons, respectively. Under drip irrigation system, cultivar Ganoub El-Wady II had the lowest values (3.266 and 3.268 ton fed.$^{-1}$) for this trait, while Giza 6 Mohassan gave the highest values (5.985 and 6.000 ton fed.$^{-1}$) in the first and second seasons, respectively. Similar results were reported by El-Damarany and obiadalla, 2005.

Table (5): Commercial defect and local bulbs yield as affected by onion cultivar and irrigation system in 2006/2007 and 2007/2008 seasons.

Cultivars	Commercial defect bulbs yield (ton fed.$^{-1}$)						Local marketable bulbs yield (ton fed.$^{-1}$)					
	2007			2008			2007			2008		
	SI	DI	Mean	SI	DI	Mean	SI	DI	Mean	SI	DI	Mean
Ganoub El-Wady I	3.783	3.321	3.552	3.853	3.312	3.582	3.783	3.321	3.552	3.853	3.312	3.783
Ganoub El-Wady II	2.238	3.266	2.752	2.273	3.268	2.771	2.238	3.266	2.752	2.273	3.268	2.238
Giza 6 Mohassan	2.192	5.985	4.088	2.209	6.000	4.104	2.192	5.985	4.088	2.209	6.000	2.192
Giza 20	2.281	5.724	4.002	2.245	5.650	3.947	2.281	5.724	4.002	2.245	5.650	2.281
Shandaweel 1	1.853	3.575	2.714	1.862	3.574	2.718	1.853	3.575	2.714	1.862	3.574	1.853
Mean	2.469	4.374		2.488	4.361		2.469	4.374		2.488	4.361	
LSD 0.05 A	0.073			0.057			0.073			0.057		
B	0.111			0.081			0.111			0.081		
AB	0.156			0.115			0.156			0.115		

(A): for irrigation treatments (B): for cultivars treatments (AB): Interaction

SI = Surface irrigation system DI = Drip irrigation system

8- Local marketable bulbs yield (ton fed.$^{-1}$):

The results in Table (5) clearly show that onion cultivars differed significantly in both seasons. Cultivar Shandaweel 1 was the least in yield of local marketable bulbs (4.259 and 4.265 ton fed.$^{-1}$) in the first and second seasons, respectively, while cultivar Giza 20 was the greatest in this trait (6.545 and 6.487 ton fed.$^{-1}$) in the first and second seasons, respectively.

Irrigation systems significantly affected this character in both seasons (Table 5). The lowest value (4.129 and 4.163 ton fed.$^{-1}$) was obtained from surface irrigation in comparison with drip irrigation (6.643 and 6.629 ton fed.$^{-1}$) in the first and second successive seasons respectively. El-Damarany and Obiadalla (2005) revealed that, surface irrigation system was the lowest in weight of bolters bulbs, double bulbs and small size bulbs as in comparison with drip irrigation system.

The combination between the two studied factors significantly affected yield of local marketable bulbs in both seasons. Under surface irrigation system, cultivar Shandaweel 1 had the lowest value (2.718 and 2.733 ton fed.$^{-1}$) for this trait in the first and second season respectively, while cultivar Ganoub El-Wady I gave the highest value for this trait (5.141 and 5.213 ton fed.$^{-1}$) in the first and second season respectively. Under drip irrigation system, cultivar Ganoub El-Wady II had the lowest value (5.560 and 5.578 ton fed.$^{-1}$) for this in the first and second season respectively, while Giza 20 gave the highest value for this trait (8.434 and 8.350 ton fed.$^{-1}$) in the first and second season respectively. Same results were reported by El-Damarany and obiadalla (2005), who mentioned that cultivar Shandaweel 1, was the least in weight of bolters bulbs, total double bulbs, and small and large size bulbs under surface irrigation system.

9- Culls bulbs yield (ton fed.$^{-1}$):

The results in Table (6) show that onion cultivars differed significantly in both seasons. Cultivar Ganoub El-Wady II was the least in yield of culls bulbs (0.279 and 0.280 ton fed.$^{-1}$) in the first and second seasons, respectively, while cultivar Giza 20 was the greatest in yield of culls bulbs (0.368 and 0.363 ton fed.$^{-1}$) in the first and second seasons, respectively.

Irrigation systems significantly affected this character in both seasons (Table 6). The lowest value (0.322 and 0.315 ton fed.$^{-1}$) was obtained from drip irrigation in comparison with the highest value under surface irrigation (0.333 and 0.333 ton fed.$^{-1}$) in the first and second seasons, respectively.

Table (6): Culls bulbs yield and total soluble solids as affected by onion cultivar and irrigation system in 2006/2007 and 2007/2008 seasons.

Cultivars	Culls bulbs yield (ton fed.$^{-1}$)						Total soluble solids (%)					
	2007			2008			2007			2008		
	SI	DI	Mean	SI	DI	Mean	SI	DI	Mean	SI	DI	Mean
Ganoub El-Wady I	0.340	0.321	0.331	0.347	0.319	0.333	12.980	13.500	13.240	13.000	13.550	13.275
Ganoub El-Wady II	0.283	0.275	0.279	0.288	0.272	0.280	14.900	14.045	14.472	14.938	14.200	14.569
Giza 6 Mohassan	0.365	0.356	0.361	0.350	0.349	0.349	13.900	14.050	13.975	13.880	14.050	13.965
Giza 20	0.373	0.364	0.368	0.375	0.351	0.363	13.350	12.747	13.049	13.320	12.850	13.085
Shandaweel 1	0.303	0.295	0.299	0.305	0.284	0.294	14.150	13.450	13.800	14.090	13.600	13.845
Mean	0.333	0.322		0.333	0.315		13.856	13.559		13.846	13.650	
LSD 0.05 A	0.009			0.004			0.010			0.006		
B	0.026			0.021			0.015			0.011		
AB	NS			NS			0.021			0.016		

(A): for irrigation treatments (B): for cultivars treatments (AB): Interaction

SI = Surface irrigation system DI = Drip irrigation system

Regarding, the combination between the two studied factors non-significant effect on yield of culls bulbs in both seasons was recorded. Cultivar Ganoub El-Wady II had the lowest value (0.283, 0.288, 0.275 and 0.272 ton fed.$^{-1}$) for yield of culls bulbs under surface and drip irrigation system, in the first and second seasons, respectively, while cultivar Giza 20 had the highest value for yield of culls bulbs (0.373, 0.375, 0.364 and 0.351 ton fed.$^{-1}$) under surface and drip irrigation system, in the first and second seasons, respectively.

10- Total Soluble Solids:

The results in Table (6) clearly shows that onion cultivars differed significantly in both seasons. Cultivar Ganoub El-Wady II was the greatest in total soluble solids (14.472% and 14.569%) in the first and second seasons, respectively, while Cultivar Giza 20 was the least in total soluble solids (13.049% and 13.085%) in the first and second seasons, respectively, indicating that this cultivar was worse total soluble solids than the other cultivars.

Irrigation systems significantly affected this character in both seasons (Table 6). The highest value (13.856% and 13.846%) was obtained from surface irrigation in comparison with drip irrigation (13.559% and 13.650%) in the first and second seasons, respectively.

The combination between the two studied factors significantly affected total soluble solids % in both seasons. Under surface irrigation system, cultivar Ganoub El-Wady II had the highest value (14.900% and 14.938%) for this trait in the first and second season, respectively, while cultivar Ganoub El-Wady I gave the lowest value for this trait (12.980% and 13.000%) in the first and second season respectively. Under drip irrigation system, cultivar Ganoub El-Wady II also had the highest value (14.050% and 14.200%) for this in the first and second season respectively, while cultivar Giza 20 gave the lowest value for this trait (12.747% and 12.850%) in the first and second season, respectively.

Storability characteristics:

Data of storability of bulbs after seven months are illustrated in figure 1.

A- Weight loss (%)

Illustration in Figure (1. A) clearly reveals that weight loss decrease (%) after seven months of room storage of onion bulbs was significantly affected by cultivar under the two irrigation systems. The highest value of weight loss decrease (%) after seven months room storage of this trait was recorded by cultivar Ganoub El-Wady I (25.19% and 28.97%) under surface and drip irrigation systems, respectively. While cultivar Ganoub El-Wady II showed the lowest value for this trait (18.99% and 20.90%) under surface and drip irrigation systems, respectively. These results were in line with those found by Warid and Ahmed (1960) who reported that the decrease in weight loss was 5.9%,

12.7% and 23.0% after 5,16 and 30 weeks in storage, respectively. Warid *et al.* (1961) and El-Kalla and El-Kassaby (1985) mentioned that the total loss in bulbs weight during storage period for four months was enhanced with the increase in number of irrigations. Shekib *et al.* (1986) revealed that the changes in moisture content of bulbs associated with increase in the other constituents. As well as Gamal (1994), reported that the percentage of weight loss after 150 days storage was 27.72%.

B- Decay %

The results of this trait is illustrated in Figure (1. B), the tested cultivars showed a wide range of variation under two irrigation systems for this trait. The highest value decay % after seven months room storage of this trait was resulted from cultivar Giza 20 (7.50% and 14.75%) under surface and drip irrigation systems, respectively. While, cultivar Shandaweel 1 showed the lowest value for this trait (2.92% and 9.00%) under surface and drip irrigation systems, respectively . These results were in agreement with those reported by Gamal (1994), who found that the percentage of decay after 150 days storage was 9.93%.

C- Sprouting %

The results of this trait is shown in Figure (1. C). All of tested cultivars were significantly different under both irrigation systems. Cultivar Giza 20 showed the lowest value for sprouting (5.00% and 1.67%) under two irrigation systems, respectively, indicating that this cultivar was better sprouting than the other four cultivars. Cultivar Giza 6 Mohassan gave the highest value for sprouting (82.50%and 71.25%) under surface and drip irrigation systems, respectively, indicating that this cultivar was worse sprouting than the other four cultivars. Similar results were reported by Metwally (2002) studied the effect of foliar fertilization with microneutrients on yield and storability of onion (*Allium cepa* L) and garlic (*Allium sativum* L) plants. He found that the bulbs of cultivar Giza 6 was higher percentage of water loss and percent of sprouting after 6 months of normal storage, while cultivar Beheiry was lower percentage of water loss and percent of sprouting.

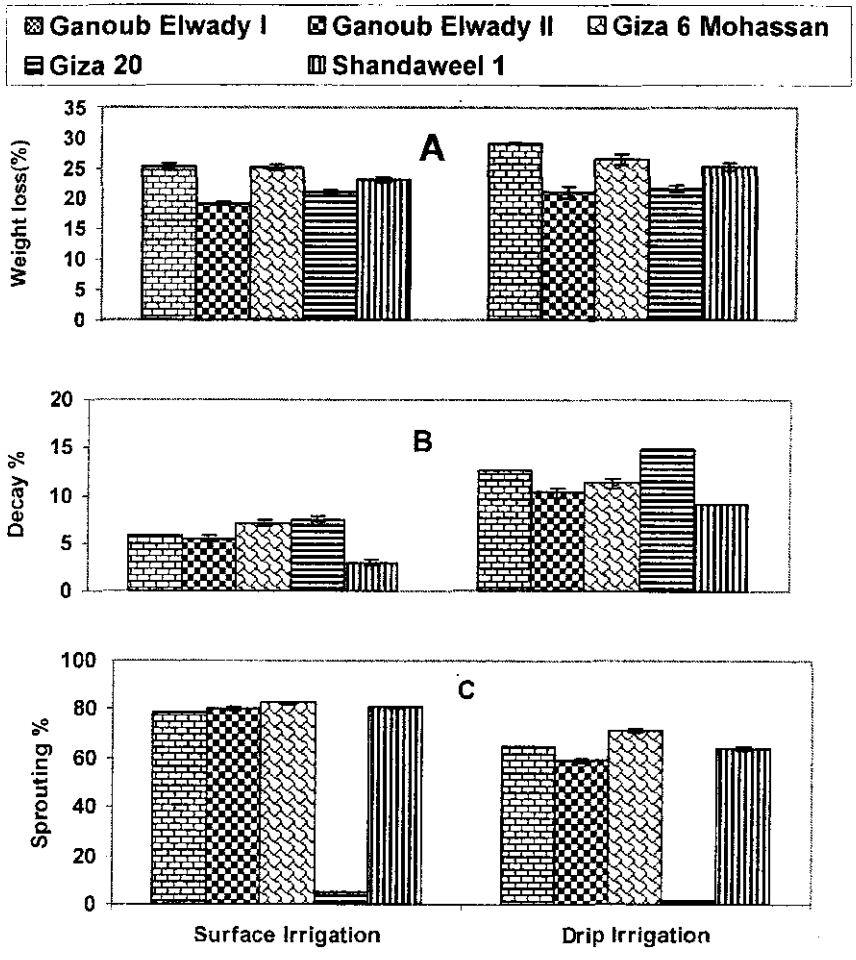

Fig.(1): Storability characteristics in onion cultivars that stored for seven months under two irrigation systems.
(A) Weight loss% (B) Decay% (C) Sprouting%
(Data represent the mean of independent measurements ± SE)

CONCLUSION

From the data presented in this study, it could be concluded that: (1) Cultivars Ganoub El-Wady I and II were the best in total and exportable bulbs yield, respectively, under the surface irrigation system. (2) Cultivar Giza 20 was the best in total and exportable bulbs yield under drip irrigation system. (3) The highest exportable and total bulb yield (ton fed.$^{-1}$) in all cultivars was obtained from the drip irrigation system in comparison with the surface

irrigation system. (4) Cultivar Ganoub El--Wady II was the least in percentage of weight loss decreases under both surface and drip irrigation systems. (5) Cultivar Shandaweel 1 was the least in percentage decay under both irrigation systems. (6) Cultivar Giza 20 was the least percentage of sprouting under both irrigation systems. (7) Cultivar Ganoub El-Wady II had the highest value for total soluble solids under both irrigation systems.

REFERENCES

Adamicki, F. (2006). Effect of climate conditions on the growth, development, quality and storage potential of onions. Plant Sci., (1): 163-173.

Al-Jamal, M.S., S. Ball and T.W. Sammis (2001). Comparison of sprinkler, trickle and furrow irrigation efficiencies for onion production. Agricultural-Water-Management, 46(3): 253-266.

Bolanos, H.A. (1989). Evaluation of ten onion cultivars in Potrero Cerrado de Cartago. Investigacion Agricola, 3: 4–10.

Caraballo, E., M.R. Goyal and C.C. De Beez (1989). Effect of water application rates and planting on growth parameters of drip irrigated onions. J. Agric. Univ. Puerto Rico, 70(2): 135-141.

Chaudhry, A. B. and E. C. Erinne (1984). Determination of optimum irrigation frequency for onion in the Kainji lake region of Nigerian Savanna, Gartenbauwissenschaft, (49): 3, 117-121.

Cheema, K. L., A. Saeed and M. Habib (2003). Bulb yield and other economic Traits in Eight Onion Cultivars under Different Ecological Zones of Punjab-Pakistan. International Journal of Agriculture & Biology, 2: 188-190.

Chung, B. (1989). Irrigation and bulb onion quality. Acta Hort. 247: 233-237.

Costa, N.D., G.M. De. Resende and R.D.C.S. Dias (2000). Evaluation of onion cultivars at Petrolina-De. Horticultura Brasileira, 18: 57–60.

Dhian S., R.P. Sharma and D. Singh (1991). Effect of soil moisture systems and nitrogen fertilization on onion. Indian J. Agron. 36 (1): 125-126.

El-Damarany A.M. and H.A. Obiadalla-Ali (2005). Growing five onion (*Allium cepa* L.) Cultivars under two irrigation systems. Assiut J. Agri. Sci., 36 (6): 83-94.

El-Kalla, S.E. and A.T. El-Kassaby (1985). Yield and quality of onion bulbs as affected by different number of irrigations and system of nitrogen application. J. Agric. Sci., Mansoura Univ., Egypt, 10 (1): 1-6.

Ells, J. E., A.E. Mcsay, P.N. Soltanpour; F.C. Schueissing, M.E. Bartolo and E.G. Kruse (1993). Onion Irrigation and nitrogen leaching in the Arkansas Valley of Colorado, 1990-1991. Hort. Technology, 3 (2): 184-187.

El-Sayed, A.M. and A.A.M. Aita (1999). A comparative study on some onion (*Allium cepa* L.) cultivars. Egypt J. Hort., 26(1): 67-75.

Galbiatti, J.A., P.D. Castellane and A. Garcia (1992). Effect of irrigation and mineral and organic fertilization on development and productivity of the onion cultivar. Piralopes Cientifica Jaboticabal, 20 (2): 371-378.

Gamal, H.A. (1994). Effect of selection and some cultural practices on yield and quality characteristics of onions under Upper Egypt condition. Ph.D. Thesis, Fac. Agric., Assiut Univ., Egypt.

Gamie, A.A., K.A. Mohamed, K.A.O. El-Aref and M.M. Massoud (2000). Studies on some Egyptian onion varieties under Upper Egypt conditions. III- Effect of soil moisture content on storability of some Egyptian onion genotypes. Assiut J. Agric. Sci., 31(5): 129-136.

Glala, A.A. (1997). Studies on the Effect of Irrigation and Preceding Crops on Growth, Yield and Quality of Onion (*Allium cepa. L*). M. Sci. Ain Shams Univ. Cairo, Egypt.

Glala, A.A., M.I. Ezzo and S.A. Saleh (2006). Studies on the response of some onion cultivars to irrigation systems. Proceeding of Sustainable Agricultural Development and Food Security: 29-38.

Gomez, K. A. and A. A. Gomez (1984). Statistical procedures for Agriculture Research. 2nd Ed. John-Willey and Sons, Inc. New York 680 page.

Hurst, W.C., R.L. Shewfelt and G.A. Schuler (1985). Shelf-Life and Quality Changes in Summer Storage Onions (*Allium cepa*). J. Food Sci. 50 (3):761 – 763

Khan, M.Ul.H., M. Imran and T. H. Chattha (2005). Effect of Irrigation Intervals on Growth and Yield of Onion Varieties Swat–1 and Phulkara. J. Appl. Sci. Res., 1(2): 112-116.

Kopsell, D.E. and W.M. Randlew (1997). Onion cultivars differ in pungency and bulb quality changes during storage. HortScience, 32 (7): 1260-1263.

Koriem, S.O., M. M. El-Koliey and H.M. El-Sheekh (1999). Effect of drought conditions on yield, quality and some water relationships of onion. Assiut J. Agric. Sci., 30(1): 75-84.

Kotb, A.M. (2004). Effect of irrigation and harvesting time on yield and quality of onion cv. Giza 6. MSc. Thesis, Fac. Agric., Assuit Univ., Egypt.

Laila, M.E.A., A.M. Adam, M. Safia and O.M. Nadia (2007). Economic Impaction of Producing and Storing Some Onion Cultivars under Different Irrigation Systems in newly reclaimed Land. J. Appl. Sci. Res., 3(12): 1979-1986.

Lancaster, J. E., E.P. McCartney, W.A. Jermyn and J.V. Johnstone (1995). Identification of onion cultivars for commercial production in Canterbury, New Zealand. New Zealand J. Crop and Horticultural Science, 23: 299-306.

Martin, De Santa Olalla, F., J.A. Juan, C. De Fabeiro Cortes and J.A. De Juan Valero (1994). Growth and production of onion crop (*Allium cepa* L.) under different irrigation schedulings European. Agron. J. 3 (1): 85-92.

Metwally, A.K. (2002). Effect of foliar fertilization with micronutrients on yield and storability of onion (*Allium Cepa* L.) and garlic (*Allium Sativum* L.) Plants. The 3rd Scientific Conference of Agricultural Sciences, Assiut. 20-22 October 2002: 245-262.

Mohamed, E. I. and A. A. Gamie (1999). Evaluation of some organic fertilizers as substitutions of chemical fertilizers in fertilizing onion. Egypt J. Appl. Sci., 14 (7): 667-678.

Mohamed, K.A. and A.A. Gamie (2000). Studies on some Egyptian onion varieties under Upper egypt conditions 2 effect of irrigation systems on yield and some bulb quality characters of onion varieties. Assiut J. Agric. Sci., 31(5): 115-127.

Mondal M.F. and M.H.R. Pramanik (1992). Major factors affecting the storage life of onion. International journal of tropical agriculture 10(2):140-146.

Muniy, J.O, D. E. L. Silva, L. A. De and C. C. Gomes (1989). Evaluation of onion cultivar for the Baturite region of Ceara. Hortcultura Brasileira, 7; 9-18.

Patil, J. D., G.Y. Desale and P.N. Kale (1987). Correlation studies on morphological and storage characters of some onions varieties. J. Mahar. Agric. Univ. 12 (1): 114-115. (C.F. Hort. Abst. 57, No. 9360).

Patil, R.S. and P.N. Kale (1985). Correlation studies on bulb characteristics and storage losses in onion. J. Mahar. Agric. Univ. 10 (1): 38-39. (C.F. Plant B. Abst. 10, No. 8199).

Rafika, S. B., D. R. Mejda, B. K. Mohamed and C. Hatem (2006). Onion storage ability and an inventory of onion post-harvest fungi in Tunisia. Tropical Science, 46: 105-112.

Sargent, S. A. (2000). Harvest date affects yield and post-harvest quality of non-dried short-day onions. HortScience 36(1): 112-115.

Shekib, L. A., A. A. Y. Shehata and A. El-Tabey (1986). The effect of storage of fresh egyptian onions on some of its quality aspects. Alex. J. Agric. Res. 31(2): 167-174.

Shinde, K. G., S. D. Warade and T.A. More (2001). Storage of onion under ambient conditions. J. Maharashtra Agric. Univ., 26 (1-3): 12-18.

Smittle, D. A. (1988). Evaluation of storage methods for 'Granex' onions. J. Amer. Soc. Hort. Sci. 113: 877-880.

Steiner, J. J. and D. C. Akintohi (1998). Effect of irrigation interval on harvest maturity of onion bulb size. Hort. Sci. 21(3): 1220-1221.

Sullivan, D. M., B.D. Brown, C.C. Shock, D.A. Horneck, R.G. Stevens, G.Q. Pelter and E.B.G. Feibert (2001). Nutrient management for onions in the pacific northwest. Pacific Northwest Extension Publication PNW 546. 26p.

Vijay, A., V. Palanisamy, T. Jayaraj and R. Arumugam (2002). Effect of different irrigation intervals on onion varieties. South-Indian-Hort. 39(5): 296-299.

Warid, A.W. and M.W. El-Shafie (1976). Yield components in some cultivars of onion. Agric. Resea. Revi. 51 (9): 115-125.

Warid, W.A. and A.A. Ahmed (1960). Nature of storage losses in the Egyptian varieties of onion. J. Agric. No. 3 and 4.

Warid, W.A., M.M. El-Gammal and Abdel-Razik (1961). Effect of irrigation on the keeping quality of onion. 1st. Hort. Congress. Bull. Res. No. B26: 10-12. Sci. Council Cairo.

القدرة المحصولية والتخزينية لبعض أصناف البصل النامية تحت نظامين من الرى

حازم عبدالرحمن عبيد الله على[1] - نيفين على السواح(٢)

(١) قسم البساتين-كلية الزراعة- جامعة سوهاج- مصر

(٢) قسم البساتين- كلية الزراعة- جامعة الفيوم- مصر

الملخص العربي

تم دراسة القدرة المحصولية والتخزينية لبعض أصناف البصل (جيزة ٦ محسن- جيزة ٢٠- شندويل ١- جنوب الوادى ١- جنوب الوادى ٢) النامية تحت نظامين للرى (السطحى والتنقيط) وذلك بمزرعه ومعامل كلية الزراعة - جامعة سوهاج خلال موسمى ٢٠٠٦/٢٠٠٧، ٢٠٠٧/٢٠٠٨ .

وتشير أهم النتائج المتحصل عليها إلى :

- أظهرت جميع الأصناف المستخدمه فى الدراسه مدى واسع من التباين فى معظم الصفات التى تمت دراستها والمتعلقة بالقدرة المحصولية والتخزينية لهذة الأصناف تحت أنظمه الرى المستخدمة.

- بخصوص القدرة المحصولية والجودة لأصناف البصل التى تم دراستها وجد الأتى:

١- الصنف جنوب الوادى ٢ أعطى أعلى محصول تصديرى تحت نظام الرى السطحى فى حين اعطى الصنف جيزة ٢٠ أعلى محصول تصديرى تحت نظام الرى بالتنقيط. واعطى الصنف جنوب الوادى ١ أعلى محصول كلى تحت نظام الرى السطحى فى حين اعطى الصنف جيزة ٢٠ ايضاً أعلى محصول كلى تحت نظام الرى بالتنقيط.

٢- الصنف شندويل ١ أعطى أقل محصول حنبوط تحت نظام الرى السطحى فى حين اعطى الصنف جيزة ٢٠ اقل محصول حنبوط تحت نظام الرى بالتنقيط. واعطى الصنف شندويل ١ أعطى أقل محصول مزدوج كلى تحت نظام الرى السطحى فى حين اعطى الصنف جنوب الوادى ٢ أقل محصول مزدوج كلى تحت نظام الرى بالتنقيط.

٣- الصنف شندويل ١ أعطى أقل محصول كبير الحجم تحت نظام الرى السطحى فى حين اعطى الصنف جنوب الوادى ١ اقل محصول كبير الحجم تحت نظام الرى بالتنقيط. واعطى الصنف شندويل ١ ايضاً أقل محصول صغير الحجم تحت نظام الرى السطحى فى حين اعطى الصنف جيزة ٦ محسن أقل محصول صغير الحجم تحت نظام الرى بالتنقيط.

٤- الصنف شندويل ١ أعطى أقل محصول معاب تجارى وتسويقى محلى تحت نظام الرى السطحى فى حين اعطى الصنف جنوب الوادى ٢ اقل محصول معاب تجارى وتسويقى محلى تحت نظام الرى بالتنقيط. واعطى الصنف جنوب الوادى ٢ أقل محصول نقضة تحت كلا النظامين من الرى (السطحى والتنقيط). واعطى الصنف جنوب الوادى ٢ أعلى نسبة مواد صلبة ذائبة (%) تحت كلا النظامين من الرى (السطحى والتنقيط).

٥- المحصول التصديرى والكلى لكل الأصناف كان الأعلى تحت نظام الرى بالتنقيط عن الرى السطحى

٦- محصول الأبصال الحنبوط والأبصال المزدوجة والأبصال صغيرة الحجم والأبصال المعابة تجارياً والمسوقة محلياً كان الأقل تحت نظام الرى السطحى عن الرى بالتنقيط

٧- محصول الأبصال الكبيرة الحجم والأبصال النقضة كان الأقل تحت نظام الرى بالتنقيط عن الرى السطحى

٨- نسبة المواد الصلبة الذائبة كانت الأعلى تحت نظام الرى السطحى عن الرى ب

٩- فيما يتعلق بالقدرة التخزينية لأصناف البصل محل الدراسة اظهر الصنف جنوب الوادى ٢ اقل نسبة نقص فى وزن الأبصال تحت كلا النظامين من الرى (السطحى والتنقيط). و اظهر الصنف شندويل ١ اقل نسبة فى عدد الأبصال العفنة تحت كلا النظامين من الرى (السطحى والتنقيط). واظهر الصنف جيزة ٢٠ اقل نسبة فى عدد الأبصال المزرعة تحت كلا النظامين من الرى (السطحى والتنقيط).