Performance Of Some Local Egyptian Onions Strains Under Different Planting Dates

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Abstract

Nine local onion strains (collected from different districts of Egypt) were evaluated under three transplanting dates during 1996/97 and 1997/98 seasons. The main results could be summarized as follows:

Early transplanting onion (20 Dec.) resulted in marked increases in fresh weight of tubular blades, days to maturity, bulb weight, cullus and marketable bulb yields, length and diameter of bulbs as well as total and non-reducing sugars. On the other hand, mid season transplanting (10 Jan.) resulted in marked increases of fresh weight of bulb and neck. The late transplanting (1 Feb.) produced the highest bulbing ratio, total soluble solids , dry matter and reducing sugar percentage.

Local onion strains markedly differed in most of growth and yield characteristics. El-Nobaria strain (Giza 20) produced the highest bulbing ratio. Mansouria and South El-Tahrir strains surpassed other evaluated strains in fresh weight of tubular blades, bulb and neck. The earliest maturity strains were Namol and New nucleus 961. El-Nobaria and New nucleus 961 strains produced the highest bulbing ratio. Moshtohor and South El-Tahrir strains gave the highest marketable and total bulb yields / ha, followed by the New nucleus 961 strain.

South El-Tahrir and Moshtohor strains, which transplanted early (20 Dec.) and transplanted in mid season (10 Jan.) and Santrees strain transplanted late in the season gave highest yields with best qualities of onion bulbs under Gemmiza conditions.

Introduction

Onion, (*Alluim cepa*, L.) is of an outstanding importance among the other crops in Egypt on account of its great value as an exportable commodity. It ranks fourth in this aspect after cotton, rice and citrus. It is

grown in Egypt as winter, summer crop and as an interplanted crop for mature dry bulbs and, to some extent, for the green bunch. More than 70 % of the winter crop is shipped all over the world especially to European countries, which are generally the chief recipients.

Wide variations in bulb yield and its quality were observed among the cultivated local strains by several workers. Shalaby and Kandeel (1991), reported that marketable and exportable yields were greater for Shandaweel 1 than Giza 6 Mohassan. El-Kafoury *et al.,* (1996) found that Hazera 7 cv. was the earliest in maturity, followed by other cultivars which did not show wide variations in between. The highest bulb weight, marketable and total bulb yields were produced from Composite 16 cv., whereas Composite 8 and Ben Shamen produced the lowest means from the previous mentioned traits. Meanwhile, other cultivars, i.e. Behairy nopink, Giza 20, 1866 one center and Hazera 7 ranked middle position in this respect. The highest culls yield was obtained from Hazera 7, followed by Giza 20, Behairy nopink and Ben Shemen. Bulbs of Composite 16, Giza 20 and Behairy nopink proved to be the best in keeping quality, while Hazera 7 was the worst one in storability. The highest means of T.S.S and dry matter percentages were obtained from Giza 20 and Behairy nopink, followed by Composite 16, Composite 8 and 1866 one center. Bulbs of Egyptian strains gave the highest values of reducing and total sugars, whereas Ben Shamen and Hazera 7 ranked last in this aspect. The highest means of non-reducing sugars in bulbs were found with Ben Shemen. In general, the results of this study revealed that Composite 16, Behairy nopink and Giza 20 strains. were the most favorable strains for yield and quality of bulbs under Middle Delta conditions. Mostafa (1998) in Egypt, concluded that earlier maturity occurred with Fayoum and Bani Sweif. Whereas, culls yield / fad decreased with Nobareia and Bani Sweif seeds. Planting Mansoura or Gemmeiza seeds increased marketable and total bulb yields, average bulb weight, bulb diameter, stem plate diameter and neck thickness. Total soluble solids, dry matter content and storability of bulbs were not affected by source of seeds. Hegazy and El-Sheikh (1999) found that Yellow creole and Composite 12 ranked last in this respect. Also they found that Behairy nopink and Yellow Creole had higher percentage of dry weight / plant in which were low in Composite 8 and Texas E.Y. G x Giza 20. Also they found that Assiut

Globe, Giza 6 DMR and Beth Alfa cvs. were the earliest in maturity followed by Composite 9 and yellow Creole 1866 nopink and Behairy nopink cvs. were the latest and descendants than Giza 20 x Texas E.Y.G and hybrid Texas E.Y.G x Giza 20 which had heavier bulbs, more marketable and total bulb yields followed by Composite 9 and Giza 20. Assuit Globe, Yellow Creole and Composite 12 cvs were the least in these characters. Composites 12, 9 and 16 cvs had more culls bulb yield. Giza 6 DMR and Assiut Globe cvs had less culls than Giza 20. They also stated that Behairy nopink, Giza 20 bulk and Composite 12 cvs had more total soluble solids % (TSS) and dry matter % (DM) than hybrid Giza 20 cv., whereas composite 9 and hybrid Texas E.Y.G. x Giza 20 cvs. were lowest, yellow Creole, Behairy nopink and hybrid Texas E.Y.G. x Giza 20 cvs. showed the highest bulb percentage of total carbohydrates (T.C), whereas Giza 6 DMR and Beth Alfa cvs. had the lowest. The highest rate of weight loss during storage for four months were observed in Beth Alfa and descendants of hybrid Texas E.Y.G. x Giza 20 in both seasons and in Composite 9 in the second season only, while Assuit Globe, Giza 6 DMR, Behairy nopink, Giza 20 and Giza 20 bulk cvs were the lowest.

Attempts have been made by several workers to find out an optimum date for transplanting onion to maximize yield with best quality. Under Egyptian conditions, Mostafa (1979) and El-Hindi, *et al* (1981) found that the shortest plants were recorded in case of transplanting on 5th February. In most stages of growth, the difference in plant height between 5th December and 5th January did not reach the level of significance. Delaying transplanting to 5th February resulted in a significant decrease in fresh and dry weights of plant, caused earlier bulbing and latest maturity, produced minimum weight of culls, reduced marketable bulbs yield, increase percentage of total soluble solids and dry matter content, reduced the average weight of bulb and slightly improved storability of bulbs. Mostafa (1998) showed that early transplanting (25th Nov) resulted in an increase in culls, heavier bulb weight, bulb diameter, and neck thickness. Transplanting on 20th Dec or 15th Jan gave the highest marketable and total bulb yields. Late transplanting on Feb 10th increased total soluble solids content and improved storability of bulbs. Zahira (1999) studied the effect of three transplanting dates of onion (15th Dec., 15th Jan. and 15th Feb.) on growth,

yield and quality of bulbs. She found that the highest values of growth, yield and its components were obtained with early transplanting on 15th December

Many workers recommended the importance of the interaction between transplanting dates and onion strains. Khakher *et al.,* (1990) in Pakistan, reported that there was highly significant effect for the interaction between sowing date and cultivars in affecting onion bulb yield. They found that Jaune Easpagnol , followed by Jaunede Hatif and Texas Early Grano gave the highest mature bulb yield / ha in the earliest date of transplanting . Shalaby and Kandeel (1991) in Egypt, reported that bloting, average bulb weight and unmarketable yields were generally the lowest for the earliest planting date and were lower in "Shandaweel 1" than "Giza 6 Mohassan". Mostafa (1998) in Egypt, reported that maximum bulb weight was observed with Gemmeiza when transplanted on the earliest date (Nov 25*th*).

The objectives of this work were (a) to recognize the performance of some Egyptian local onion strains, (b) to study the effect of transplanting dates and (c) as well as their interactions on growth, yield and its components and quality.

Materials And Methods

This study was conducted at the Experimental Farm of Gemmeiza Agricultural Research Station (Gharbeia Province, Egypt) during 1996/97 and 1997/98 seasons. Nine local onion strains (collected from different districts of Egypt) were evaluated under three transplanting dates . The tested nine onion strains are listed in Table (1).

Transplanting dates were : 20^{th} December, 10^{th} January and 1^{st} February.

Each transplanting date was done in a separate experiment which laid out in randomized complete block design with four replications. The tested nine onion strains were randomly distributed in each replication. Each experimental unit contained 6.0 ridges, 3.5 meters length and 50 cm width, occupying an area of 10.5 m^2 .

Table (1)
The tested local onion strains and its brief description

No.	Strain	Description
1	El- Nobareia	Giza 20 collected from El-Nobaria location.
2	El-Fayoum	Giza 20 collected from El-Fayoum location.
3	El-Gemmeiza	Giza 20 collected from El-Gemmeiza location.
4	El-Mansoureia (Giza province)	Yellow colour and thick flat bulbs formed under short day.
5	Moshtohor (Kaliobeia province)	Red colour bulbs, earlier in maturity, bulbs formed under short day, had high content from total soluble solids and dry matter and excellent in keeping quality.
6	Namol (Kaliobeia)	Its bulbs are high thick flat, red colour bulbs, adopted for early transplanting, earlier in maturity than Menofyia strain and excellent in keeping quality.
7	New Nucleus 961	It is new nucleus selected by onion Research Section white flesh and yellow colour bulbs, earlier in maturity and it can be stored for a long period.
8	Santrees (El-Menofyia)	Its bulbs are thick flat, yellow colour bulbs, adapted for late planting. Bulbs formed under short or intermediate day.
9	South El-Tahrir	Its bulbs are flat, yellow colour bulbs, excellent in keeping quality, adopted for south El-Tahrir Province from Behairy type.

Onion seeds were sown in the nursery bed on 18th October, 10th November and 1st December in the first season, whereas the sowing dates were 20th October, 9th November and 1st December in the second season . Transplants (seedlings) of nearly sixty days old (when they usually were 25 cm in height) were transplanted to the permanent land as the aforementioned three transplanting dates. The preceding crop was maize (*Zea mays*, L.) in both seasons. Seedlings were transplanted on both sides of ridges at a distance of 7 cm apart. The top portion of the plants was pruned to a considerable extent for reducing transpiration. Crop was irrigated immediately after transplanting and afterwards irrigation were given at a regular interval of about four weeks. Calcium super phosphate (15.5 % P_2O_5) was soil incorporated during tillage operation at a rate of 450 kg / ha. Nitrogen in the form of ammonium nitrate (33.5 % N) was applied at the

rate of 225 kg N / ha as side dressing. Nitrogen was split into two equal portions, one half was applied before the first irrigation, one month after transplanting, while the remaining portion was applied before the second irrigation, eight weeks after transplanting . Foliar spraying with Redomil MZ 58 % as fungicide at a rate of 2.5 kg / ha, Selecrone as insecticide at a rate of 2.5 liter / ha, and Triton B 56 (600 ml/ha) were taken up every two weeks in order to protect onion plants. Two hand weeding and three hoeings were conducted during plant life after transplanting. Other cultural practices were carried out in the same manner prevailing in the region.

Studied characters:

I- Growth characteristics:

For recording the observations on growth attributes, ten plants were selected at random from the outer ridges following the guard ones from every plot of each experiment at 105 days from transplanting. Plants were carried to the laboratory, in polyethylene bags, where the following data were recorded:

1- Bulbing ratio: i.e. the ratio of the greatest diameter of bulb to the minimum neck diameter (Mann, 1952).
2- Fresh weight of tubular blades (g).
3- Fresh weight of bulb and neck (g).
4- Number of days from transplanting to maturity: It was estimated as a number of days from transplanting date till 50 % of tops were down.

II- Post harvest studies: Plants in the inner rows of each plot when 50 % of tops were down, left in the field to cure for two weeks, then tops and roots were removed and the following data were recorded:

1- Weight of total culls in ton / ha.
2- Marketable yield (weight of single bulbs) in ton /ha.
3- Total yield (marketable yield + total culls) in ton / ha.
4- Bulb weight in grams. i.e. marketable yield / number of single bulbs.
5- Dry matter in bulbs (%) : For determination of dry matter, 10 bulbs from each plot were finely sliced, and 3 samples each of 100 grams were dehydrated in an electric oven at 70 °C for a constant weight.

6- Total soluble solids (T.S.S): Random samples each of 10 single bulbs were taken from every plot of different experiments after harvest to determine the total soluble solids by Refractometer.

7- Average percentage of sugar contents (reducing and non-reducing sugars) according to the procedures reported by A.O.A.C (1975). The results recalculated as percentage on dry weight basis.

8- Average bulb diameter: was measured in cm.

9- Average bulb length: was measured in cm.

10- Average shape index: i.e. the bulb length bulb diameter.

III- Storability:

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 a storage period of four months. Total loss during storage onion bulbs for four months was determined by examining the yield, then rotting and sprouting bulbs were discarded and the remaining yield was weighed.

Statistical analysis:

Collected data in each season were subjected to the combined analysis as mentioned by Gomez and Gomez (1984). Treatment means were compared at 5% level of probability using the Newly Least Significant Difference (N-L.S.D.) test which developed by Waller and Duncan (1969).

RESULTS AND DISCUSSION

- Growth characteristics:

Transplanting date had significant effects on bulbing ratio, fresh weight of tubular blades, fresh weight of bulb and neck and number of days from transplanting to maturity as shown in Table (2). In both seasons, maximum bulbing ratio was noticed with delaying transplanting date (1st February), Meanwhile, the maximum fresh weight of tubular blades was achieved with the earlier transplanting date (20th Dec.). Data in Table 1 show that delaying the date of transplanting caused a rapid bulb initiation. It could be concluded that there was a progressive bulb development with the advancement of age of onion plant towards maturity. However, the increased bulbing ratio

observed at the later stages of growth may be a result, at least to some extent, of tubular blades shriveling which reduced neck diameter thus causing the ratio to increase even after swelling of sheath bases and bladless leaves. These findings are supported by those of other investigations such as Abo El-Magd (1973) and Mostafa (1998). Fresh weight of bulb and neck reached its maximal with the mid-date of transplanting (10^{th} Jan). Number of days from transplanting to maturity decreased with each delay in transplanting date. The results are in harmony with those obtained by Abo El-Magd (1973), Caraballo *et al.,* (1990). Early transplanting date increased fresh weight of tubular blades per plant due to the higher capacity of metabolism as a result of favorable climatic conditions. Date of maturity was significantly affected by transplanting date in both seasons. Days to maturity decreased with each delay in transplanting date. The decreased growth period due to delayed transplanting date may be ascribed to the fact that late transplanted of the crop did not get sufficient time for growth before bulbing starts. These findings stand in conformity with those recorded by Mostafa (1979), Hutton and Wilson (1986) and Mostafa (1998)

Onion local strains markedly differed in bulbing ratio, fresh weight of tubular blades, fresh weight of bulb and neck and number of days from transplanting to maturity (Table 2). The highest bulbing ratio was noticed with El-Nobaria strain (Giza 20) in both seasons. The maximum fresh weight of tubular blades was attained with South El-Tahrir Strain, while the minimum fresh weight of tubular blades was recorded with the New Nucleus 961, in both seasons. Moshtohor and Namol onion strains were associated with the maximum fresh weight of bulb and neck per plant. El-Gemmiza strain had the lowest fresh weight of bulb and neck per plant in both seasons. Differences between other local strains were not always significant. These findings are in harmony with those obtained by Hegazy and El-Sheikh (1999). Differences in bulbing ratio due to other strains were not always significant. These results might be attributed to genetic variation between strains. Similar findings were also reported by Haupt (1986), Lopes (1987) and Pakyurek *et al*., (1994). Number of days from transplanting to maturity tended to increase with El-Gemmiza strain followed by South El-Tahrir strain in the first season, and by El-Mansouria in the second season. The earlier maturity was associated to New Nucleus 961 and Namol strain.

These findings may attributed to the genetical variations between strains. These results are in agreement with those of Singh (1993), El-Kafoury *et al*, (1996) and Mostafa (1998).

Post-harvest studies:

Onion bulbs yield was significantly affected by the date of transplanting. Transplanting date of 20th Dec. gave the highest culls, marketable and total bulb yields. With each delay in transplanting date, there were significant decreases in bulb yields (Table 3). The superiority of marketable and total bulb yields with early transplanting date may be attributed to the suitable vegetative growth which has beneficial effect on forming large bulbs. Similar findings were reported by Mostafa (1979) , Singh (1993) and Mostafa (1998).

Average bulb weight, length and diameter were markedly affected by transplanting date as shown in Tables 3&4. Highest averages of bulb weight, length and diameter were obtained with the early transplanting date (20 Dec.), as a general mean over the two seasons. Differences in bulb weight and diameter due to transplanting on 20 Dec. and 10 Jan. were not significant, while this difference reach the level of significant with bulb length. Delay in transplanting resulted in marked reduction in the averages of bulb weight , length and diameter of onion bulb. This might be attributed to the corresponding increase in plant growth with early transplanting date. These results are in harmony with those obtained by Mostafa (1979) and Mostafa (1998).

Shape index of onion bulbs (Table 4) was markedly affected by transplanting dates. Delaying the date of transplanting to 1st February resulted in an increase in shape index towards a spherical shape bulbs. Differences between early and mid season transplanting dates were not always significant. These results agree with those obtained by Grant and Carter (1991), and Pakyurek *et al.,* (1994).

Total soluble solids in onion bulbs was markedly affected by the date of transplanting in the first season. Early date of transplanting decreased total

soluble solids content. In the second season, the differences were not significant. In the first season, there was a significant increase in the dry matter content in onion bulbs with late transplanting date, while this difference did not reach the significant level in the second season. Mostafa (1998) reported similar findings.

Percentage of reducing and non-reducing sugars was markedly affected by transplanting dates in both seasons. These results are in harmony with those obtained by Usik and Batsel (1974), Caraballo *et al,* (1990) and Singh (1993

Keeping quality of marketable yield was significantly affected by transplanting dates. Early transplanting date resulted in marked increase in the percentage of total loss of bulbs during storage period of four months. With each delay in transplanting date, there was a decrease in the total loss of bulbs during storage period, so the minimum loss recorded with late date of transplanting (1st Feb.). Similar results were recorded by Mostafa (1979), El-Kafoury *et al,* (1996) and Mostafa (1998).

South El-Tahrir strain gave the heaviest marketable and total bulb yields / fad, followed by Moshtohor and the New nucleus 961 strains. On the other hand, the least marketable yield was observed with Sntress (El-Monofyia) strain. These results may be attributed to the genetic variation between strains. Similar observations were obtained by Warid and Loaiz (1993) and El-Kafoury *et al,* (1996).

Averages of bulb weight and diameter were markedly affected by the evaluated onion strains in both seasons (Tables 3&4), while bulb length was not significantly affected by different local strains. El-Mansouria strain was associated with the maximum weight of bulb, followed by South El-Tahrir strain. Moshtohor strain produced the maximum bulb diameter, whereas, Santrees and El-Nobaria strains were associated with the minimum values compared to other studied strains. The minimum weight of bulb was produced with El-Gemmiza strain. These results may be attributed to the variation in efficiency of nutrient use by different strains, as was reported by Roa (1988), Iortsuun and Khan (1989), Khakher *et al*, (1990), El-Kafoury *et al*., (1996) and Mostafa (1998).

Over both seasons, Namol and El- Gemmiza strains were associated with the highest means of shape index, but the lowest value of shape index of bulbs was associated with Moshtohor strain towards a thick flat shape. These results are in accordance with those of Mingochi and Mpande (1992), Mulkey and Talbot (1992) and Singh (1993).

Results in Tables (4&5) show that total soluble solids and dry matter percentages were not significantly affect by different strains in both seasons. These results are supported by Singh (1993) and Pakyurek *et al.,* (1994). There was a significant difference in reducing and non-reducing sugar percentages of local strains. Santrees strain produced the highest percentage of reducing sugars. Whereas, the lowest value of reducing sugars percentage was associated with Namol strain. El-Fayoum and Moshtohor strains produced the highest value of non-reducing sugars. The lowest values of non-reducing sugar percentage was associated with Santrees strain. These results are in harmony with those of Caraballo *et al,* (1990) and El-Kafoury *et al,* (1996).. Keeping quality of marketable yield was significantly affected by local strains, especially in the first season. The maximum percentage loss of weight was recorded with El-Fayoum strain. The minimum loss was observed with Namol strain. This may be due to the genetic variation between strains. These results are in accordance with those of Warid and Loaiz (1993) and El-Kafoury *et al,* (1996).

The interaction between transplanting dates and onion strains had significant effects on marketable and total bulbs yield as well as an average weight of bulb in both seasons, as shown in Tables 6, 7 and 8. The highest marketable yield was recorded under the treatment combination of early transplanting date (20^{th} Dec.) with Moshtohor and South El-Tahrir strains, while the minimum marketable bulbs yield was obtained from the treatment combination of late transplanting date (1^{st} Feb.) and El-Fayoum strain. The Maximum total bulbs yield was recorded from Moshtohor strain when early transplanted (20^{th} Dec.), but the minimum total yield was observed from Mansouria and El-Fayoum strains when transplanted lately (1^{st} Feb.). Similar results were reported by Hutton and Wilson (1986), Lopes (1987), Singh (1993), Warid and Loaiz (1993) and Mostafa (1998).

The highest bulb weight, over both seasons, was recorded with the treatment including the combination of early date of transplanting (20th Dec.) and South El-Tahrir strain. The minimum weight of bulb was observed under the treatment including the combination of South El-Tahrir strain and the late date of transplanting (1th Feb.). These results were true in both seasons.

Finally, it can be concluded that it is better to choose South El-Tahrir and Moshtohor strain with the early and mid transplanting dates and Santrees strain in case of late transplanting for obtaining higher yields with best storage qualities of onion bulbs under Gemmiza conditions.

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سلوك بعض سلالات البصل المصري المحلية تحت مواعيد زراعة مختلفة

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الملخص :

أجريت هذه الدراسة لتقييم تسع سلالات محلية من البصل (جمعت من مناطق مختلفة من جمهورية مصر العربية) وذلك في ثلاث مواعيد للشتل (٢٠ ديسمبر ، ١٠ يناير ، ١ فبراير). وتلخص أهم نتائج الدراسة في الآتي:

- أدت زراعة البصل مبكراً (٢٠ ديسمبر) إلى زيادة معنوية في الوزن الطازج للأوراق (الأنصال الأنبوبية) وعدد الأيام من الشتل حتى النضج ومتوسط وزن البصلة ومحصول الأبصال النقضة والأبصال الصالحة للتسويق ومحصول البصل الكلي وطول البصلة وقطر البصلة والنسبة المئوية للسكريات الغير مختزلة. في حين أدت الزراعة في ١٠ يناير إلى إحداث زيادة واضحة في الوزن الطازج للرقبة والبصلة. كما أدت الزراعة المتأخرة (١ فبراير) إلى وجود زيادة معنوية في نسبة التبصيل والنسبة المئوية للمواد الصلبة الكلية والمادة الجافة والنسبة المئوية للسكريات المختزلة.
- أظهرت نتائج الدراسة وجود فروق معنوية بين سلالات البصل المحلية في معظم صفات النمو والمحصول بالدراسة، إذ تفوقت سلالة المنصورية وجنوب التحرير عن باقي السلالات في صفات الوزن الطازج للأنصال الأنبوبية والوزن الطازج للرقبة والبصلة. في حين تفوقت سلالات النوبارية ونوية ٩٦١ في نسبة التبصيل. وأوضحت النتائج أن السلالات ناموال ونوية ٩٦١ كانتا الأبكر في النضج، وقد تفوقت السلالات مشتهر وجنوب التحرير في محصول الأبصال الصالحة للتسويق ومحصول الأبصال الكلية وتبعها في هذا نوية ٩٦١ . - توصى هذه الدراسة بزراعة سلالات البصل المحلية المجمعة من منطقتي جنوب التحرير ومشتهر في حالة الزراعة المبكرة (خلال شهري ديسمبر ويناير) والسلالة سنتريس (المنوفية) وذلك في حالة التأخير في الزراعة (فبراير) للحصول على محصول كبير من الأبصال بمواصفات جودة عالية وذلك تحت ظروف منطقة الجميزة.

Table 2: Bulbing ratio, Fresh weight of tubular blades, fresh weight of bulb & neck at 105 days from transplanting and number of days to maturity as affected by planting date and local strains during 1997 and 1998 seasons

Characters	Bulbing ratio		Fresh weight of Tubular blades(g)		Fresh weight of bulb and neck (g)		Days to Maturity	
Treatments	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**
A: Transplanting date:								
20th Dec.	2.50	2.50	94.31	89.90	100.00	109.20	149.31	144.51
10th Jan.	2.70	3.20	70.70	75.30	110.90	116.50	138.60	131.43
1st Feb.	3.90	3.70	23.35	18.90	160.2	80.65	123.91	125.71
F-Test	**	**	**	**	**	**	**	**
N-L.S.D. at 5 %	0.18	0.15	4.37	2.10	4.50	4.57	2.10	1.67
B: Local strains:								
Santrees (El-Menofyia)	3.30	3.60	71.45	62.60	121.40	101.20	139.71	134.35
Namol (Kaloubia)	3.30	3.60	64.70	62.80	120.45	106.35	138.81	133.18
Mansouria (Giza)	3.40	3.70	66.10	74.90	109.70	99.00	142.63	139.19
New nucleus 961	3.90	3.70	49.40	51.35	99.90	104.20	139.63	132.15
Moshtohr (Kaloubia)	3.60	3.95	57.40	54.95	121.50	106.10	139.55	136.61
El-Nobaria	4.00	3.96	61.40	54.90	114.60	98.45	143.11	135.41
El-Fayoum	3.70	3.90	61.40	58.70	112.10	105.70	140.10	134.17
South El-Tahrir	3.30	3.60	72.10	71.95	104.40	93.90	145.17	137.61
El-Gimmeza	3.60	3.70	61.10	59.90	85.30	87.50	146.51	143.77
F-Test	**	*	**	**	**	**	**	*
N-L.S.D. at 5 %	0.37	0.36	8.36	3.64	13.81	8.73	3.06	2.76

Table 3: Culls , marketable and total bulbs yield (t/ha) and average weight of onion bulb as affected by planting date and local strains during 1997 and 1998 seasons

Characters	Culls yield (t/ha)		Marketable yield (t/ha)		Total yield (t/ha)		Bulb weight (g)	
Treatments	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**
A: Transplanting date:								
20th Dec.	3.262	3.095	43.690	42.262	46.952	45.357	98.85	99.65
10th Jan	2.619	2.262	35.476	35.714	38.095	37.976	96.25	98.90
1st Feb.	1.190	1.190	30.607	28.933	31.798	30.119	93.70	86.95
F-Test*	**	**	**	**	**	**	**	*
N-L.S.D. at 5 %	0.405	0.381	1.667	0.786	0.952	0.833	2.79	2.14
B: Local strains:								
Santrees (El-Menofyia)	2.095	1.905	36.905	34.048	39.000	35.952	97.45	87.95
Namol (Kaloubia)	2.381	2.274	43.571	42.148	45.952	44.421	102.90	85.40
Mansouria (Giza)	2.381	2.281	45.726	43.336	48.107	45.617	106.45	92.10
New nucleus 961	2.143	2.119	45.714	45.238	47.857	47.381	98.30	85.75
Moshtohr (Kaloubia)	1.786	1.910	47.857	47.143	49.643	49.052	100.85	87.70
El-Nobaria	2.619	2.267	42.857	40.845	45.833	43.112	105.50	87.95
El-Fayoum	2.114	1.798	40.012	38.333	42.126	40.131	101.45	83.90
South El-Tahrir	3.226	2.738	47.857	45.238	51.083	47.976	108.45	86.75
El-Gimmeza	2.750	2.357	42.857	41.667	45.607	44.048	83.05	84.20
F-Test	*	N.S	*	**	*	*	**	*
N-L.S.D. at 5 %	1.071	0.000	3.738	1.429	1.310	1.024	5.09	5.95

Table 4: Averages of bulb length, bulb diameter, shape index and Total soluble solids (TSS) % as affected by planting date and local strains during 1997 and 1998, seasons

Characters	Bulb length (cm)		Bulb diameter (cm)		Shape index		TSS	
Treatments	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**
A: Transplanting date:								
20th Dec.	4.65	5.60	6.20	6.15	0.75	0.91	14.55	13.35
10th Jan.	4.90	5.20	6.20	6.05	0.79	0.85	14.75	13.50
1st Feb.	4.20	5.10	5.05	5.60	0.83	0.91	16.25	13.70
F-Test	**	**	**	**	**	*	**	N.S
N-L.S.D. at 5 %	0.21	0.29	0.12	0.18	0.06	0.06	0.46	---
B: Local strains:								
Santrees (El-Menofyia)	4.55	5.40	5.80	5.40	0.78	1.00	15.95	13.77
Namol (Kaloubia)	4.75	5.50	5.75	5.45	0.82	1.00	15.50	13.25
Mansouria (Giza)	4.80	5.40	5.85	5.65	0.82	0.92	16.10	13.40
New nucleus 961	4.60	5.30	5.75	5.70	0.80	0.92	16.30	13.45
Moshtohr (Kaloubia)	4.45	5.25	6.20	5.70	0.71	0.92	16.10	13.60
El-Nobaria	4.40	5.45	5.60	5.55	0.78	0.98	17.15	13.15
El-Fayoum	4.65	5.10	5.85	5.55	0.79	0.91	16.30	13.75
South El-Tahrir	4.45	5.45	5.70	5.65	0.78	0.96	16.15	13.60
El-Gimmeza	5.65	5.00	5.90	5.65	0.95	0.88	16.25	13.75
F-Test	N.S	N.S	**	*	*	*	N.S	N.S
N-L.S.D. at 5 %	---	---	0.24	0.20	0.15	0.11	---	---

Table 5: Averages of dry matter content, reduced and nonreduced sugars and total loss in bulbs weight after four months of storability (%) as affected by planting date and local strains during 1997 and 1998, seasons

Characters	Dry matter (%)		Reducing Sugar (%)		Non reducing Sugar(%)		Total Loss in bulbs Weight (%)	
Treatments	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**
A: Transplanting date:								
20th Dec.	16.05	14.00	3.98	6.02	24.07	26.13	25.80	36.33
10th Jan.	16.10	14.15	4.35	5.41	23.60	25.70	19.65	28.25
1st Feb.	16.80	14.70	4.91	5.89	22.10	24.11	19.60	34.40
F-Test	**	N.S	*	*	*	*	*	**
N-L.S.D. at 5 %	0.46	---	0.30	0.40	0.80	0.90	2.28	2.73
B: Local strains:								
Santrees (El-Menofyia)	15.90	14.40	5.01	8.41	23.10	23.60	22.8	33.49
Namol (Kaloubia)	15.56	13.90	3.98	5.11	24.11	24.90	17.95	30.90
Mansouria (Giza)	16.45	13.90	4.94	6.90	24.13	25.11	21.40	32.64
New nucleus 961	16.45	13.55	4.91	7.04	23.90	24.11	21.55	30.45
Moshtohr (Kaloubia)	16.70	14.20	5.00	6.35	24.11	25.26	15.45	35.35
El-Nobaria	17.20	13.80	5.03	7.11	24.05	25.30	23.10	35.75
El-Fayoum	16.35	14.20	5.10	7.20	24.07	25.31	26.05	33.75
South El-Tahrir	16.20	14.20	4.98	7.38	23.12	24.15	23.65	33.75
El-Gimmeza	16.30	14.25	5.08	7.36	24.10	25.00	24.55	30.75
F-Test	N.S	N.S	*	*	*	*	**	N.S
N-L.S.D. at 5 %	---	---	0.50	0.60	0.60	0.70	3.75	---

Table 6: Averages of marketable yield (t/ha) as affected by interaction between planting date and local strains during 1997 and 1998, seasons

Seasons		1997			1998	
Planting dates	20th Dec.	10th Jan.	1st Feb.	20th Dec.	10th Jan.	1st Feb.
Santrees (El-Menofyia)	36.907	37.857	34.295	34.055	34.536	30.952
Namol (Kaloubia)	43.571	41.726	32.876	42.160	39.298	28.836
Mansouria (Giza)	45.833	35.012	28.571	43.352	274.048	27.162
New nucleus 961	45.721	32.874	28.571	45.238	37.879	29.781
Moshtohr (Kaloubia)	47.869	41.019	34.536	47.160	39.545	31.207
El-Nobaria	42.857	35.000	28.571	40.845	274.067	28.338
El-Fayoum	40.019	28.571	26.190	38.352	31.200	26.429
South El-Tahrir	47.857	32.876	32.876	45.238	31.433	29.293
El-Gimmeza	42.857	33.814	28.583	41.679	35.714	27.871
F-Test		*			*	
N-L.S.D. at 5 %		7.286			3.429	

Table 7: Averages of total yield (t/ha) as affected by interaction between planting date and local strains during 1997 and 1998, seasons

Seasons		1997			1998	
Planting dates	20th Dec.	10th Jan.	1st Feb.	20th Dec.	10th Jan.	1st Feb.
Santrees (El-Menofyia)	38.940	37.883	32.036	37.388	34.524	30.740
Namol (Kaloubia)	47.181	41.560	32.988	44.183	37.883	30.281
Mansouria (Giza)	49.302	36.917	30.740	45.495	35.714	31.926
New nucleus 961	49.526	35.257	32.274	47.336	37.036	32.150
Moshtohr (Kaloubia)	49.733	38.571	30.952	49.293	37.645	31.198
El-Nobaria	46.083	37.381	30.845	43.226	35.952	30.717
El-Fayoum	42.390	30.952	31.210	40.369	34.179	28.829
South El-Tahrir	52.036	34.538	32.283	48.933	33.702	30.952
El-Gimmeza	44.550	36.455	31.198	44.798	36.167	30.710
F-Test		*			*	
N-L.S.D. at 5 %		8.000			4.005	

Table 8: Averages of bulb weight (g) as affected by interaction between planting date and local strains during 1997 and 1998, seasons

Seasons	1997			1998		
Planting dates	20th Dec.	10th Jan.	1st Feb.	20th Dec.	10th Jan.	1st Feb.
Local strains:						
Santrees (El-Menofyia)	98.95	92.65	100.85	90.05	86.05	87.90
Namol (Kaloubia)	102.35	103.65	130.60	80.85	86.55	88.70
Mansouria (Giza)	106.85	125.00	78.85	96.50	96.50	83.40
New nucleus 961	68.50	108.65	98.35	85.60	88.50	95.20
Moshtohr (Kaloubia)	92.80	108.65	130.00	87.40	89.25	88.25
El-Nobaria	107.00	111.35	133.85	77.45	84.95	100.55
El-Fayoum	94.35	111.00	98.70	96.90	86.70	87.40
South El-Tahrir	138.00	98.30	76.30	91.70	85.40	77.10
El-Gimmeza	81.05	88.30	79.85	91.70	77.70	83.30
F-Test		**			**	
N-L.S.D. at 5 %		8.49			8.02	