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Yield and Quality of Onion Sets as Affected by Seeding Rate and Planting Date under Assiut Conditions.

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Abstract:

Field experiments were carried out on the clay soil of the Experimental farm, Faculty of Agriculture, Assiut University, Assiut, Egypt in two consecutive winter seasons 2007-2008 and 2008-2009. The aim of this investigation was to study the effects of four planting dates (November 1st, December 1st, January1st and February 1st) and three seeding rates (7.5, 11.25 and 15 g/m^2) in onion sets of Giza 6 cv. on yield and quality under Assiut province conditions. The obtained results indicated that the first and second sowing dates significantly gave the highest numbers of onion plants and the highest total weight of onion plants per plot in both seasons. Earlier sowing date, November 1st, gave the highest onion sets total yield and the highest larger set size yield in both season of the study. However, the earliest sowing date (November 1st) produced the lowest small onion sets (less than 10 mm) total yield in both seasons of the study. The three sowing densities had no significant effect on total weight of onion plants per plot, duration of the harvest period and onion sets total yield in either season of The study.Moreover, the lower seeding rates (7.5 g/m^2) gave significantly the highest yield of large (> 2cm) set size. Total yield were correlated with each of plant height, bulbing ratio, fresh weight and weight of plants in both seasons.

Keywords: Giza 6; Seeding rate; Vegetative growth; Bulbing ratio; Onion; Sets

Introduction:

Onion(***Allium cepa L.***) is one of the most important vegetable crops grown in Egypt not only for local consumption but also fore exportation. Sets are typically weighing 2-3 g fresh, produced by growing a crop from seed sown at the very high density of 1000-2000 plants/m^2. Sets are sometimes used for planting onions during the late fall

through winter (October through December).The production of onion from sets has traditionally been performed in the Upper Egypt regions of Beni Suef, Menia, Suhage and Assiut and to a minor extent in a few scattered localities in the Lower Egypt like Kalubia, Dakahliya and Gharbia (El-Amir,1981and Awad,1983).

The use of sets in onion pro

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duction is particularly useful for extending the availability of thecommodity throughout the season (Rajesh *et al.*, 2003a and b; Sharma *et al.*, 2007 and Ansari, 2007).

The onion cultivated area in Egypt in 2007 was 202385 feddan (4200 m^2) and the total production was about 1050000 tons*. However, in 2008, it came down to 125917 feddan but the total production was increased to 1728417 tons. This high decrease in area and increasing in production demand a high attention in onion agricultural practices like fertilization, irrigation, new cultivars introducing and pest control.

Onion in Egypt is planted between mid-Aug. and December. Bulbing on onion is controlled by the day length and temperature to which growing onion plants are exposed before bulbing begins. Bulbing requires long photoperiods and warm temperatures **(Steer, 1980).**

Yield of onions is the result of the plant density and the mean size of onions. However, with increasing plant density the proportion of small bulbs will increase (Bleasdale, 1966; Hatridge-Esh and Bennett, 1980; Chapman, 1981). From low plant densities a high proportion of large bulb size will result, but at the cost of a lower total yield (Frapell, 1973).

The purpose of present studies was to get the desirable size of onion set by sowing the seed on different dates and different seed rates, so that diameter of set may be reduced to a desirable size.

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Materials and Methods

Field experiments were carried out in the clay soil of the Experimental Farm, Faculty of Agriculture, Assiut University, Assiut, in two consecutive winter seasons of 2007/2008 and 2008/2009. The aim of this investigation was to study the effects of four planting dates and three seeding rates in cv. Giza 6 on the yield and quality of onion sets under Assiut conditions.

Experimental factors:-

1- Planting dates:

The four planting dates were November 1st, December 1st, January1st and February 1st in both seasons. Unfortunately, seeds planted in the last date, February 1st, failed to germinate in the two seasons. Therefore, from this point onwards, we will only mention the results of the first three sowing dates.

2- Plant density:

The three tested seeding rates were 30, 45 and 60 kg/fed at the rate of 7.5, 11.25 and 15 g/m2, respectively.

In each season, the experiment consisted of 9 treatments, which included the combination of 3 seeding rates in 3 planting dates. The three planting dates and the three seeding rates were arranged in the field as a split plot design in randomized com-

plete block design with four replicates according to Snedecor and Cochran (1986). The three planting dates were in the main plots, while seeding rates were randomly distributed to the sub-plots. Each sub-plot (10.5 m2) consisted of 5 ridges each of 3.5 meters in length and 0.6 meter in width forming a plot area of about 10.5 m2 equal to (1/400Fed). Ridging direction was east-west with sowing on both ridge sides.

Levels of applied fertilizer in the field were at or slightly above the guidelines. The following amounts and types of fertilizers were applied. Local cultivation practice recommendations for control of weeds, insects and diseases were followed and were sufficient to maintain normal crop growth in each sowing date. Data on some physical and chemical properties of experimental site for the two seasons 2007-2008 and 2008-2009 are shown in Table (1).

Table (1): The physical and chemical properties of the soil used for growing onion plants in the two seasons.

Year	Sand %	Silt %	Clay %	Texture	pH 1:1	ECe dS/m	Total CaCO3 %	Total N %	Available nutrients ppm				
									P	K	Fe	Mn	Zn
2007-2008	19.3	31.0	49.7	Clay	7.80	1.42	3.13	1.80	16.4	354	9.7	10.3	1.2
2008-2009	21	29.2	47	Clay	7.5	1.1	3.5	1.72	12.2	325	8.6	12	1.5

The following data were recorded in the two seasons.

1- Growth characters

After 75 and 105 days from planting, plants from both sides of 50 cm length of the second row were taken in each sub-plot for assessment of the following characters.

1-1. Number of onion plants per plot

1-2.Weight of onion plants per plot (kg)

2. Yield and related parameters

When the onion sets leaves begin to turn yellow, irrigation was stopped 2 weeks before pulling up the plants, which were immediately placed in a shady place to cure. Harvesting was done when attained maturity. At harvesting time, yield of the inner three rows was collected and divided into the following three sets sizes small, medium and large.

All harvested bulbs in each plot were weighed and bulb yield per feddan was calculated. Collected sets were divided into 3 sizes according to the bulb diameter, large (bulb diameter more than 20 mm), medium (10 – 20 mm), and small (less than 10 mm).

2-1. Onion sets total yield (ton/fed)

2-2. Large sets total yield (ton/fed)

2-3. Medium sets total yield (ton/fed)

2-4. Small onion sets total yield (ton/fed)

2-5. Duration of the harvest period (days): Number of days from the planting date to the end of the harvesting season

2-6. Average weight of onion set (g)

Statistical analysis

Data were subjected to statistical analysis according to **Gomez and Gomez (1984)**. Significance among means was tested using the LSD range test.

Results and Discussion

1-Growth characters

1-1. Number of onion plants per plot

Data for number of onion sets per plot are presented in Table (2) for 2007/2008 and 2008/2009 seasons. In both seasons, sowing dates significantly affected the number of onion plants only in the second sample (105 days from planting). First and second sowing dates significantly gave the highest numbers of onion plants per plot. The latest sowing date (January 1st) gave significantly the fewest number of plants. It is worth to mention the difference between the two earliest planting dates were quite small in the second season compared with the first season.

Average onion plant numbers were significantly affected by seeding rates in the two sampling dates and in both seasons as an average overall for the three tested planting dates. In the two sampling dates, the 45 kg/fed and the 60 kg/fed significantly gave the highest numbers of plants per plot in both seasons. However, the difference between these two seeding rates was not significant in the first sampling date only. Moreover, the lowest seeding rate (30 kg/fed) significantly resulted in the lowest numbers of onion plants per plot in both seasons and sampling dates. In general, the lowest the seeding rates used, the lowest the harvested total plant numbers of onion, in this experiment. Similar results were obtained by **Rajesh *et al.* (2003a)** who concluded that the total number of sets and small (up to 2 g) sets increased with the increase in the seed rate.

The interaction effects between sowing dates and seeding rates was not significant regarding the average number of onion sets in the two seasons or the two sampling dates.

Table (2): Number of onion plants per plot after 75 and 105 days from planting as affected by the three planting dates and the three seeding rate treatments during the two winter seasons of 2007/2008 and 2008/2009.

After 75 Days				
2007/2008				
Planting Dates (A)	**Seeding rates (B)**			**Mean**
	30 kg	**45 kg**	**60 kg**	
November 1st	6277	9060	13140	9492
December 1st	7500	11617	8655	9257
January 1st	5955	7612	11227	8265
Mean	6577	9430	11007	9005
2008/2009				
November1st	5707	7455	8685	7282
December 1st	7072	9487	10215	8925
January1st	4717	10395	10575	8562
Mean	5832	9112	9825	8256
After 105 Days				
2007/2008				
November 1st	5317	6652	8700	6890
December 1st	6150	7927	11685	8587
January 1st	4830	4530	5092	4817
Mean	5432	6370	8492	6765
2008/2009				
November 1st	5355	7942	8565	7287
December 1st	6247	7432	8977	7552
January 1st	3135	6855	8122	6037
Mean	4912	7410	8555	6959

	2007/2008		**2008/2009**	
L. S. D. 0.05	**75 Days**	**105 Days**	**75 Days**	**105 Days**
A – Planting date	N.S.	2384	N.S.	1183
B – Seeding rate	2218	1371	2083	3447
Interaction (A x B)	N.S.	N.S.	N.S.	N.S.

1-2. Weight of onion plants per plot (kg)

The effect of different sowing dates and three seeding rates (30, 45 and 60 kg/fed) on weight of onion plants per plot is presented in Table (3).

Data for total weight of onion plants per plot as affected by different planting dates and three plant densities are presented in Tables (3) for 2007/2008 and 2008/2009 seasons. In both seasons, sowing dates significantly effected the average weight of onion plants per plot in both sampling dates (75 and 105 days from planting).

Planting onion seeds on November 1st and December 1st, gave

significantly the highest total weight of onion plants per plot in both sampling dates and in both seasons. It is worth to mention that the values of average weight of onion plants per plot in the second sampling date (after 105 days) are almost as much twice as that of the first sampling date (75 days).

It should be mentioned that delaying planting of onion seeds until January 1st resulted in a depressing effect on the average weight of onion plants per plot plants and subsequently the total yield. This, in turn, resulted in the lower values of the total yield in the later sowing date in both seasons. January 1st, as a planting date, gave the lowest average fresh weight of onion plants per plot in both sampling dates and seasons (In the first season, 6.99 and 4.58 kg/plot after 75 and 105 days, respectively, for the second season, 9.27 and 16.13 after 75 and 105 days, respectively, for the second season). These results agree with those reported by Rajesh *et al.* (2003b) who found that sowing in December resulted in the greatest plant height, foliage weight, bulb weight and diameter, number of large (>5-10 g) sets and total bulb yield; these parameters decreased with the delay in sowing.

In the present experiment, different seeding rates at 30, 45 and 60 kg/fed had no significant effects on the total fresh weight of onion plants per plot in either season or sampling date.

The interaction between planting dates and seeding rate treatments was not significant in season or in either sampling date.

Table (3): Total onion plant fresh weight (kg) per plot after 75 and 105 days from planting as affected by the three planting dates and the three seeding rate treatments during the two winter seasons of 2007/2008 and 2008/2009.

After 75 Days				
2007-2008				
Planting Dates (A)	**Seeding rates (B)**			**Mean**
	30 kg	**45 kg**	**60 kg**	
November 1	14.15	13.51	15.36	14.34
December 1	12.53	15.45	10.27	12.75
January 1	6.57	6.77	7.62	6.99
Mean	11.08	11.91	11.08	11.36
2008/2009				
November 1	20.19	20.56	17.49	19.42
December 1	10.72	17.03	17.12	14.95
January 1	7.32	8.95	11.52	9.27
Mean	12.74	15.51	15.38	14.55
After 105 Days				
2007/2008				
November 1	33.89	37.98	47.41	39.76
December 1	25.27	26.34	29.32	26.98
January 1	5.59	4.78	3.37	4.58
Mean	21.58	23.03	26.70	23.77
2008/2009				
November 1	39.53	44.48	45.21	43.07
December 1	34.45	27.79	30.91	31.05
January 1	12.02	17.16	19.22	16.13
Mean	28.67	29.81	31.78	30.09

L. S. D. 0.05	**2007/2008**		**2008/2009**	
	75 Days	**105 Days**	**75 Days**	**105 Days**
A – Planting date	2.27	6.96	4.43	3.54
B – Seeding rate	N.S.	N.S.	N.S.	N.S.
Interaction (A x B)	N.S.	N.S.	N.S.	N.S.

2- Yield and related parameters

2-1. Onion Sets Total Yield (ton/fed)

Table (4) show the data for onion sets total yield per feddan (ton/fed) in the two winter seasons of 2007/2008 and 2008/2009 as affected by three planting dates (November 1st, December 1st and January1st) and the three seeding rates (30, 45 and 60 kg/fed).

Sowing dates significantly affected onion sets total yield (ton/fed) as an average of the

three tested seeding rates in the two winter seasons of 2007/2008 and 2008/2009. Earliest sowing date, November 1st, gave significantly the highest onion sets total yield in both season of the study. It is worth to mention that the second planting date, December 1st, ranked the second after the first planting date, November 1st, in onion sets total yield in the two seasons.

It is known that the relatively short days and low temperatures prevailing in the beginning of the growing season, and the relatively long days and high temperatures prevailing at harvest time are seasonable for onion plant growth, development and subsequently the higher sets total yield. The same trend was recorded by **Manuel and Velasco (1962)** who revealed that short days and lower temperatures favor vegetative growth while long days while higher temperatures favor bulb growth. It seems that both November and December planting dates exposed onion plants to relatively short days and low temperatures in the first two months followed by long days and higher temperature at harvest time. These two planting dates were seasonable for onion plant growth, development and subsequently the higher sets bulb yield.

Sharma *et al.* (2007) revealed that sowing of onion seeds on the 15th of December recorded significantly higher yield of total sets and optimum size (1.5 – 1.95 cm) sets than the later dates of sowing and it was found to be at par with sowing on 31st December. Moreover, **Rajesh *et al.* (2003a)** concluded that sowing on the 1st or 11th of December resulted in the greatest plant height, foliage weight, bulb weight and diameter, number of large (>5-10 g) sets and total bulb yield; these parameters decreased with the delay in sowing.

Generally, delay in planting beyond December 1st had a depressing effect on onion sets total yield. The same was reported by **Cheema *et al.* (2003)**, **Rajesh *et al.* (2003a)** and **Ansari (2007)** who reported that delaying planting date resulted in yield decrease.

Opposite findings were reported by **Gupta *et al.* (1999)** who revealed that the total yield of onion (cv. Agrifound Dark Red) sets was significantly influenced by the sowing dates. However, the bulb total yield was higher when the sowing was done on February 25th, with a seed rate of 15 g/m^2. Inconsistent results were recorded by **Hopen and Peterson (1974)** who reported that the late planting (4th of May) treatments yielded greater weight of bulbs than early plantings (4th April) in 1970 and 1972. In contrast, the 1971 early planting had greater yields than the late planting.

Data presented in Table (4) show the effect of the three sowing densities on onion sets total yield as an average of the three tested sowing dates in the two

winter seasons of 2007/2008 and 2008/2009.

The three sowing densities had no significant effect on onion sets total yield in either season of the study. Similar results were reported by **Tendaj *et al.* (1997a and b)** who found that increasing the sowing rate from 100 to 175 kg/ha did not increase the yield of marketable sets to compensate for the use of poorer quality seeds. Moreover, **El-Amir (1981)** stated that seeding rate of 40 kg/fed tended to give the highest sets production, but there was no significant difference between the yield of this seeding rate and that of the other two seeding rates (50 and 60 kg/fed). In spite of the fact that our results were not significant over growing seasons, the highest onion sets total yield was always obtained from lowest seeding rate (30 kg/fed) in the two seasons.

The effects of sowing dates and seeding rates and their interaction on onion sets total yield are shown in Table (10). The interaction between sowing dates and sowing densities were significant in the second season only. The lower seeding rate treatment (30 kg/fed) significantly gave the highest onion sets total yield (17.712 ton/fed) when sowed in the first sowing date (November 1st). Moreover, the lowest onion sets total yield (5.646 ton/fed) was obtained by planting any of the three seeding rates used in this study in the last sowing date, January 1st.

Table (4): Onion sets total yield of the three planting dates as affected by three seeding rate treatments during the two winter seasons of 2007/2008 and 2008/2009.

2007-2008				
Planting Dates (A)	**Seeding rates (B)**			**Mean**
	30 kg	**45 kg**	**60 kg**	
November 1st	15.639	15.762	14.690	15.364
December 1st	8.574	6.299	7.424	7.432
January 1st	1.640	1.424	0.858	1.307
Mean	8.618	7.828	7.657	8.034
2008-2009				
November 1st	17.712	14.987	13.806	15.501
December 1st	11.738	9.299	12.182	11.073
January 1st	5.646	6.317	5.734	5.899
Mean	11.699	10.201	10.574	10.825

L. S. D. 0.05	**2007/2008**	**2008/2009**
A – Planting date	1.91	0.44
B – Seeding rate	N.S.	N.S.
Interaction (A x B)	N.S.	2.54

2-2. Large sets total yield (ton/fed)

Data for large (>2cm) onion set total yield per feddan as affected by the three planting dates and the three seeding rate treatments are shown in Table (5).

Significant differences were recorded between the three tested sowing dates on the yield of large onion set yield (ton/fed) as an average of the three tested seeding rates, in the two winter seasons of 2007/2008 and 2008/2009. This character showed more or less the same trend of the previous character of the total yield.

Large bulb yield production during the 2008-2009 growing season appeared to be greater than that in the 2007-2008 growing season (Table 5). This was probably due to temperatures being about 2-4 °C higher (more suitable) than those in the first season. In the 2008-2009 season, plants had the chance to grow for about 4-6 weeks under more favorable conditions for vegetative development (temperature and photoperiod) to attain a sufficient growth size before temperature raised and photoperiod were increased.

Results of both seasons revealed that the highest large set size yield were obtained from the first planting date (November 1st) followed by the second planting date December1st. It is worth to mention that the differences between the three planting dates in the first season were more explicit than in the second one. Also, in both seasons, obvious significant differences between the three planting dates regarding the onion large sets yield were recorded. This results confirms the previous findings of **Rajesh *et al.* 2003a** who found that sowing on 1st and 11th December resulted in the highest yield of large sets (1496.0 g/m^2), number of large (>5-10 g) sets and total bulb yield; these parameters decreased with the delay in sowing. Moreover, January 1st as a sowing date gave the lowest large sets total yield in both seasons. This result seems quite logic because January 1st as a sowing date received insufficient period for vegetative growth and subsequent bulb formation. This in turn depressed the vegetative growth and subsequently the total yield **(Manuel and Velasco, 1962)**.

Data presented in Table (5) show the effect of the three seeding rates on onion large set size total yield (ton/fed) in the two winter seasons of 2007/2008 and 2008/2009. Significant differences were found among the three tested seeding rates regarding onion large set size yield as an average of all tested planting dates.

Results obtained from both seasons showed that the lower seeding rates (7.5 g/m^2) gave significantly the highest yield of large (> 2cm) set size. The same results were recorded by **Hopen and Peterson, 1974; Awad (1983); Barakauskienzi *et al.* (2002); Ansari (2007) and**

Sharma *et al.* (2007) who showed that bulb size was inversely related to the seeding rate, but the total yield was not consistently affected by the seeding rate. Moreover, **Rajesh *et al.* (2003b)** raveled that with the increase in the seed rate, the yield of small-sized sets increased, while that of large and very large-sized sets decreased. From low plant densities a high proportion of large bulb size will result, but at the cost of a lower total yield **(Frapell, 1973).**

Sowing of onion at the highest seeding rate 15 g/m^2 resulted in the significantly lowest yield of large onion set size (3.296 and 2.826 ton/fed in the first and second seasons, respectively) over the other lower rates of 7.5 and 11.25 g/m^2. However, the difference between the three seeding rates did not reach the significant level in the first season.

The interaction between sowing date x seeding rate was significant in the second season only. The last sowing date (January 1st) with the highest seeding rate (60 kg/fed) gave the lowest large set size yield in the second season (0.212 ton/fed). The same results were recorded in the first season in spit of the insignificant difference. Moreover, sowing any of the three seeding rates in the last planting date (January 1st) gave no significant effect on the large sets yield. In the second season, the lowest seeding rate (30 Kg/fed) gave the highest large sets yield.

Table (5): Yield of large sets size (ton/fed.) of the three planting dates as affected by three seeding rate treatments during the two winter seasons of 2007/2008 and 2008/2009.

2007-2008				
Planting Dates (A)	Seeding rates (B)			Mean
	30 kg	45 kg	60 kg	
November 1st	14.455	10.685	9.690	11.610
December 1st	3.548	0.323	0.130	1.334
January 1st	0.078	0.071	0.068	0.072
Mean	6.027	3.693	3.296	4.339
2008-2009				
November 1st	13.566	8.091	5.647	9.101
December 1st	7.496	2.503	2.617	4.205
January 1st	1.494	0.855	0.212	0.854
Mean	7.518	3.816	2.826	4.720

L. S. D. 0.05

	2007/2008	2008/2009
A – Planting date	1.32	0.89
B – Seeding rate	1.91	1.04
Interaction (A x B)	NS	1.80

2-3. Medium sets total yield (ton/fed)

Data for medium (1-2cm) onion set total yield per feddan as affected by the three planting dates and the three seeding rate treatments are shown in Table (6).

Planting dates significantly affected weight of onion medium sets (1-2 cm in diameter) yield (ton/fed) as an average of the three tested seeding rates, in the two winter seasons of 2007/2008 and 2008/2009.

Results of both seasons revealed that the highest medium set yield was obtained from the second planting date (December 1st) followed by the first planting date (November 1st); however, the difference did not reach the significant level in the second season. It is known that short days promote top growth and inhibit bulb formation. Long days induce early bulb formation and better bulb growth at early stages, while inhibit leaf growth, simultaneously (**Manuel and Velasco, 1962**).

The same findings were reported by **Gupta *et al.* (1999)** and **Cheema *et al.* (2003)**, who reported that in all cultivars sowed from the 3rd week of December resulted in a desirable set size (1.50-1.94 cm). **Sharma et al. (2007)** revealed that sowing of onion seed on the 15th of December recorded significantly higher yield of total sets with optimum size sets over later dates of sowing. Opposite finding was recorded by **Ansari (2007)** how found that the sowing date had significant effect on the set size. The best date of set production for medium bulbs was late February.

Data presented in Table (6) showed the effete of the three seeding rates on onion medium set total yield (ton/fed.) in the two winter seasons of 2007/2008 and 2008/2009. Significant differences were found among the three tested seeding rates regarding onion medium set size yield as an average of all tested planting dates.

Results obtained from both seasons showed that at the higher seeding rates there was a greater yield of medium set (1-2cm). **Rogers (1977) and Frapell (1973)** described the relationship between plant density and total yield using an equation according to which, onion yield approaches the maximum with increasing plant density, theoretically. Yield of onions is the result of the plant density and the mean size of onions.

Sowing of onion seed at 15 g/m^2 resulted in significantly higher yield of medium onion set (3.992 and 7.242 ton/fed in the first and second seasons, respectively) over the other lower rates of 7.5 and 11.25 g/m^2. However, the difference between the seeding rate 11.25 g/m^2 and the highest seeding rate 15 g/m^2 did not reach the significant level in the second season. The same trend was recorded by many investigators **(Hopen and Peterson, 1974; Awad, 1983; Kossowski**

and Tendaj, 1984; **Tendaj, 1990**; **Bhattarai, 1998**; **Barakauskienzi, *et al.* 2002 and Krawiec, 2004)** who stated that increasing the seed rate promoted the yield of medium. sets size (1-2 cm).

In this study the less the seeding rate the lower the medium sets yield obtained in the two seasons. Similar findings were recorded by **Austin *et al.* (1962)**; **Gaizutiene (1977)**; **El-Amir (1981)**; **Kossowski and Tendaj (1984)**; **Gupta *et al.* (1999)**; **Anant and Raghavendra (2003)**; **Rajesh et al. (2003b)**; **Ansari (2007) and Sharma *et al.* (2007)** who reported that total yield decreased with the increase in seed rate and was the lowest at 25.0 g/m^2. However, **Tendaj *et al.* (1997a)** found that increasing the sowing rate from 100 to 175 kg/ha had no significant effect on the total yield of sets.

The interaction of sowing date x seeding rate was significant in both seasons. The last sowing date (January 1st) with the highest seeding rate (60 kg/fed.) significantly gave the lowest medium set size yield in the first season (0.464 ton/fed), however, in the second season, the lowest seeding rate (30 Kg/fed) gave the lowest medium sets yield (3.950 kg/fed). Seeding rate of 60 kg/fed planted on December 1st resulted in the highest medium sets size yield in the two seasons of the study.

Table (6): Yield of medium sets size (1-2cm) of the three planting dates as affected by three seeding rate treatments during the two winter seasons of 2007/2008 and 2008/2009.

2007-2008				
Planting Dates (A)	**Seeding rates (B)**			**Mean**
	30 kg	**45 kg**	**60 kg**	
November 1st	1.160	4.970	4.862	3.664
December 1st	4.819	5.666	6.649	5.711
January 1st	1.143	0.865	0.464	0.824
Mean	2.374	3.834	3.992	3.400
2008/2009				
November 1st	4.110	6.666	7.806	6.194
December 1st	4.175	6.481	9.020	6.559
January 1st	3.950	5.101	4.898	4.650
Mean	4.078	6.083	7.242	5.801

L. S. D. 0.05	**2007/2008**	**2008/2009**
A – Planting date	0.81	0.85
B – Seeding rate	0.64	0.59
Interaction (A x B)	1.11	1.02

2-4. Small Sets Total Yield(ton/fed)

Data for small onion sets total yield per feddan (ton/fed) in the two winter seasons of 2007/2008 and 2008/2009 as affected by three planting dates (November 1st, December 1st and January1st) and the three seeding rates (30, 45 and 60 kg/fed) are shown in Table (7).

Sowing dates significantly affected onion sets total yield (ton/fed) as an average of the three tested seeding rates in the two winter seasons of 2007/2008 and 2008/2009.

The earliest sowing date (November 1st) gave significantly the lowest small onion sets total yield in both seasons of the study.

The latest planting date (January 1st) significantly gave the highest yield of small (less than 10 mm) onion size total yield per feddan in the two seasons. It is worth to mention that the second planting date, December 1st ranked the second after January 1st in producing small onion sets total yield in the two seasons. Opposite results were recorded by **Rajesh *et al.* (2003b)** who stated that the highest yield of large sets (1496.0 g/m^2) was obtained with sowing on the 1st of December. The proportion of large sets was the highest (approximately 50%) with sowing on December.

Data presented in table (13) showed the effect of the three sowing densities on small onion sets total yield as an average of the three tested sowing dates, in the two winter seasons of 2007/2008 and 2008/2009.

Significant differences were recorded between the three sow-

ing densities used in this experiment in the second season only. The heaviest seeding rates (60 kg/fed) resulted in the highest yield of small onion sets per feddan (0.507 ton/fed). On the other hand, the lighter the seeding rates (30 kg/fed) the lower the small sets yield (0.103 ton/fed) obtained in the second season of in this experiment. Opposite results were recorded by **Rajesh *et al.* (2003b)** who stated that with the increase in seed rate, the yield of small-sized sets increased, while that of large- and very large-sized sets decreased.

The interaction between planting dates and seeding rates was significant in the first season only. Seeding with 60 kg/fed on December 1st resulted in the highest small sets yield (0.645 ton/fed), however, seeding with 30 kg/fed at the earliest sowing date November 1st gave the lowest small sets yield (0.024 ton/fed).

Table (7): Yield of small set size (ton/fed.) of the three planting dates as affected by three seeding rate treatments during the two winter seasons of 2007/2008 and 2008/2009.

2007-2008				
Planting Dates (A)	**Seeding rates (B)**			**Mean**
	30 kg	**45 kg**	**60 kg**	
November 1st	0.024	0.107	0.138	0.089
December 1st	0.207	0.310	0.645	0.388
January 1st	0.419	0.488	0.325	0.411
Mean	0.217	0.302	0.370	0.296
2008/2009				
November 1st	0.036	0.230	0.354	0.207
December 1st	0.068	0.316	0.545	0.310
January 1st	0.204	0.361	0.624	0.396
Mean	0.103	0.302	0.507	0.304

L. S. D. 0.05	**2007/2008**	**2008/2009**
A – Planting date	0.12	0.04
B – Seeding rate	N.S.	0.07
Interaction (A xB)	0.23	N.S.

2-5. Duration of the harvest period (days)

Duration of harvest period as influenced by planting dates and the three sowing densities is presented in Table (8). Duration of the harvest period was significantly affected by planting date in both seasons. The shortest of harvest period was recorded for the latest date whereas the longest was recorded for the earliest planting date. Although, the differences in duration of harvest period among the planting dates of November 1st, December 1st and January 1st were not consistent in the first season, a significant decrease in days of harvest period with each delay in planting date was found in the second season.

There was no significant difference between the different seeding rates used in either season. However, increasing seeding rates slightly decreased the number of days from sowing date to harvest the crop.

The interaction effect of planting date x seeding rates was not significant in either season.

Table (8): Duration of the harvest period (days) of onion sets of the three planting dates as affected by three seeding rate treatments during the two winter seasons of 2007/2008 and 2008/2009.

2007-2008				
Planting Dates (A)	**Seeding rates (B)**			**Mean**
	30 kg	**45 kg**	**60 kg**	
November 1st	153.750	152.250	153.000	153.000
December 1st	133.500	131.500	130.750	131.917
January 1st	127.000	125.000	127.000	126.333
Mean	138.083	136.250	136.917	137.083
2008/2009				
November 1st	148.750	146.500	149.500	148.250
December 1st	127.500	128.500	127.750	127.917
January 1st	123.000	121.750	121.000	121.917
Mean	133.083	132.250	132.750	132.694

L. S. D. 0.05	**2007/2008**	**2008/2009**
A – Planting date	1.32	0.83
B – Seeding rate	N.S	N.S.
Interaction(A x B)	N.S.	N.S.

2-6. Average weight of onion sets (g)

Data illustrated in Table (9) show the effect of planting dates and seeding rates on average weight of onion set in the two seasons of the experiment.

The average weight of onion set was significantly affected by planting date in both seasons as an average over all the tested cultivars. Like other parameters, the early planted onion seeds date (November 1st) produced the sets with the highest average weight whereas the sets with the lowest weight were obtained by late planting date (January 1st). Early planted onion sets weighed 9.157 and 8.495 g while the late planted crop produced onion sets of 1.138 and 3.309 g in the first and second seasons, respectively. From the data presented in Table (9), it is obvious that the difference in average onion set fresh weight between the first sowing date and the other two sowing dates was quite high. The same findings were recorded by **Hopen and Peterson (1974)** who reported that early planting had greater onion set weight than the late planting. This also con-

firms the findings of **Cheema *et al.* (2003)** who observed that planting on November gave the greatest average set size, whereas sowing in the 1st week of March gave the highest average number of sets.

Opposite findings were recorded by (Rajesh *et al.* 2003a) who reveled that sowing on 1st and 11th December resulted in the greatest average bulb weight and diameter, number of large (>5-10 g) sets and total bulb yield; these parameters decreased with the delay in sowing.

Seeding rates had a significant effect on this character in both seasons. The lowest number of seeds 7.5 g per m^2 resulted in the heaviest average onion set fresh weight followed by 11.25 g/m^2 seeding rate in both seasons. In contrast, the highest seeding rate 15 g/m^2 gave the lowest value. It is worth to mention that the highest two seeding rates 11.25 g/m^2 and 15 g/m^2 gave almost the same average onion set fresh weight in both seasons. The same trend was recorded by Frapell, (1973) who revealed that low plant densities result in a high proportion of large bulb size. Moreover, in India, Anant and Raghavendra (2003) found that maximum fresh weight of the whole plant (13.48 g) and the roots (1.09 g) was obtained at a seed rate of 10 g/m^2.

The interaction between sowing date and seeding rates was significant in both seasons. Sowing on November 1st at a seed rate of 30 kg/fed gave the heaviest average onion set weight in both seasons (14.080 and 13.410 g in the first and second seasons, respectively). Moreover, in the first season, sowing any of the three seeding rate on January 1st gave the same average onion set fresh weight.

Table (9): Average onion sets fresh weight (g) of the three planting dates as affected by three seeding rates treatments during the two winter seasons of 2007/2008 and 2008/2009.

Planting Dates (A)	Seeding rates (B)			Mean
	30 kg	45 kg	60 kg	
2007-2008				
November 1st	14.080	6.855	6.535	9.157
December 1st	3.718	1.812	1.785	2.438
January 1st	1.328	1.180	0.908	1.138
Mean	6.375	3.282	3.076	4.244
2008/2009				
November 1st	13.410	6.528	5.547	8.495
December 1st	7.347	4.430	3.883	5.220
January 1st	4.658	3.343	1.928	3.309
Mean	8.472	4.767	3.786	5.675

L. S. D. 0.05	2007/2008	2008/2009
A – Planting date	1.15	0.97
B – Seeding rate	0.97	0.68
Interaction (A x B)	1.69	1.18

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تأثر المحصول والجودة في البصيلات بمعدل التقاوي وموعد الزراعة تحت ظروف أسيوط

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أجريت هذه الدراسة بمزرعة التجارب البحثية – كلية الزراعة – جامعة أسيوط وذلك خلال موسمين زراعيين شتويين هما 2008/2007 و 2009/2008. استخدمت فى هذه الدراسة ثلاث مواعيد للزراعة (الاول من نوفمبر والاول من ديسمبر والاول من يناير) وثلاث كثافات للزراعة هي (30 و 45 و 60 كجم/فدان) بمعدل 5،7 و 11,25 و 15 جم/للمتر المربع في الصنف جيزة 6. دلت النتائج المتحصل عليها على أن الزراعة المبكرة في موعد الزراعة الاول والثاني اعطت اعلي عدد ووزن من البصيلات في موسمي الزراعة. موعد الزراع المبكر (الاول من نوفمبر) هو الاعلي محصول من البصيلات وكذلك اعلي حجم من البصيلات الكبيرة في موسمي الزراعة مع انه اعطي اقل محصول من البصيلات الصغيرة. لم تعطي مسافات الزراعة الثلاث تأثيراً معنويا علي كل من المحصول الكلي من البصيلات للحوض، الفترة حتي الحصاد، والمحصول الكلي للبصيلات في موسمي الزراعة. اعطت الكثافة الاقل من البذور المستخدمة (7.5 جم للمتر المربع) اعلي محصول من البصيلات الكبيرة الحجم (اكبر من 2 سم).