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EFFECT OF PLANT DENSITY ON ONION GROWN BY SETS UNDER ASSUIT CONDITIONS

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ABSTRACT

The objective of this study was to determine the plant density that result in the best marketable yields and gross crop value per fedan of onion Giza 6 cv. that grown by sets .Sets were grown at the Experimental Farm of the Faculty of Agriculture, Assuit University, Assuit on September 13 and 15 in 2007/2008 and 2008/2009 seasons, respectively. Sets were grown on rows of 3.5 m long and 50 cm wide. Three rows were included each plot. Sets were grown at 4, 6 and 8 cm between plants (175,116 and 87 plants when sets grown on two sides of row and 262,175and131 plants when sets grown on three sides of row). Results showed that , plants gave the smallest bulb diameter when sets were grown at 4 cm space(high density) .The largest space between plants (low density) ,the highest value for both percentage of bolters and doubles were. The highest value of marketable yield was obtained when sets grown at 4 and 6 cm (262 and 175 plants/ row) and on 3 sides per row .Maximum economic returns occurred at higher plant populations. High incidence of double onions was closely related to low onion plant population. Doubles clearly decreased with increased plant density. Wide plant spacing reduced onion bulb yield, but it significantly increased individual bulb weight and bulb diameter.

INTRODUCTION

Onion (*Allium Cepa* L.) belongs to the family Lilliaceae and is believed to have originated in Asia.It is the most important of the bulb crop as it is grown for consumption worldwide.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, 1981 and Awad, 1983). The use of sets in onion production is particularly useful for extending the availability of the commodity throughout the season (Rajesh *et al.*, 2003a and b; Sharma *et al.*, 2007 and Ansari, 2007). Basically, this study was aimed at investigating on the effect of plant density on onion production (yield and quality) .

MATERIALS AND METHODS

The present work was conducted at the Experimental Farm, Faculty of Agriculture, Assiut University, Assiut during 2007/2008 and 2008/2009 seasons. The soil of the Farm was clay .Onion Giza 6 cv. used in this work Sets were grown on September 13 and 15 in 2007/2008 and 2008/2009 seasons respectively. Sets were grown on rows of 3.5 long and 50 cm wide. Three rows were included in each plot .Sets were grown at 4,6,and 8 cm between plants (175,116 and 87 plants/row when planting was on two sides of row) and (262,175 and 131 plants/ row when planting was on three sides of row).All cultural practices were done as recommended for production of onion. All treatments were harvest when reached maturity i.e. when about 75% of the vegetative part plants were fall down.

Plant space and density were arranged in Randomized Complete Block design with three replicates.

Data recorded:

When about 75% of vegetative part plants in each plot were fall down, Plants that showed annual bolting in each plot were counted and percentage of bolters were calculated. Then harvesting was done by digging. Ten plants were randomly taken from each plot on which following data were recorded and averaged.

1-Plant height (**cm**):

Measured from the base of the bulb neck to the top of the longest Leaf blade.

2-Fresh weight of whole plant (g): (FW of whole plant)

After harvesting ,bolters were discarded and bulbs were left for curing for about15 days before cutting off dry leaves and roots. The following characters were recorded:

3-Percentage of bolters (%)

4-Percentage of doubles (%)

Percentage of double bulbs were estimated as number of external doubling (split bulbs)/number of planted set.

5-Marketable yield (ton/ fed) :

Bulbs more than 6 cm in diameter, free from any cull bulbs.

6-Total yield (ton/fed):

All harvested bulbs in each plot were weighed and bulb yield/fed was calculated.

7-Bulb diameter (cm):

The fifteen single bulbs were weighed and averaged**.**

8-Total soluble solids (TSS %) :

Five bulbs were randomly taken from each plot ,cut and mixed together after removing the outer 2 leaves .The percentage of total soluble solids was measure by refractometer by pressing a random samples.

Statistical analysis:

Data were subjected to statistical analysis according to Snedecor and Cochran (1986) and means of treatments were compared using L.S.D .

RESULTS AND DISCUSSION

1-Plant height (cm):

Data presented in Table 1 showed that ,plant height was increased by decreasing the plant space. Sets were grown at 4 cm and 6 cm between plants(high density) and planting was on two sides of row, gave the highest plant height with no differences between them while, sets were grown at 8 cm between plants (low density),gave the lowest plant height. On the other hand, sets were grown at 6cm between plants and planting was on 3 sides of row, gave the highest plant height. The increment in plants height could be due to that those plants was in need for light when less space was available and this will force the plants to elongate to get more light exposure. Kanton *et al* (2002), showed that, plant height decreased as population density increase

2 - Fresh weight of whole plant (gm):

Results presented in Table 1 indicated that, the highest value for fresh weight of whole plant was obtained from plants that grown at 8 cm space and planting was on two sides of row (87 plants/row) in both seasons with no differences between values of both116 plants/row and 131 plants/row in the second seasons.

3 - Bulb diameter (cm):

Data presented in Table 1 showed that ,the bulb diameter was increased by increasing the plant space(low density) in both seasons. Sets were grown at 4 cm between plants (175 plants /row when sets grown on two sides and 262 plants / row when sets grown on three sides) gave the smallest bulb diameter(5.49 cm and 5.41cm, respectively in the first season and 5.20and 4.68 cm ,respectively in the second season),whereas sets that grown at 8 cm between plants (87 plants / row when sets grown on two sides and 131 plants / row when sets grown on three sides) gave the highest bulb diameter(6.44 cm and 6.15 cm respectively in the first season and 5.56 cm and 5.36 cm respectively in the second season .It could be ,generally noted that, the highest density and the smallest space were ,the smallest bulb diameter were obtained. This may be was due to high competition between plants when small areas were available to plants. Mahadeen, (2008) indicated that wide spacing significantly increased bulb diameter. Seck and Baldeh (2009), indicated that, the higher the plant density, the smaller the bulbs .

Table 1: Effect of plant density treatments on plant height(cm),fresh Weight of whole plant (g), bulb diameter(cm) and TSS characters of onion Giza 6 during two Seasons under Assiut conditions.

2007/2008 season					
Plant density		**Characters**			
	Plant space treatments	**Plant height (cm)**	**F.W. of whole plant(gm)**	**Bulb diameter (cm)**	**TSS (%)**
Planting on 2 sides of row	4 cm (175plants/row)	62.00	142.53	5.49	14.75
	6 cm (116plants/row)	63.36	170.23	6.03	15.50
	8cm (87plants/row)	58.16	200.50	6.44	13.92
Planting on 3 sides of row	4 cm (262plants/row)	58.66	137.73	5.41	15.42
	6 cm (175plants/row)	62.23	169.23	5.92	14.42
	8 cm (131plants/row)	60.66	172.03	6.15	15.58
LSD 0.05		2.29	18.97	0.27	N.s
2008/2009 season					
Planting on 2 sides of row	4 cm (175plants/row)	60.83	155.92	5.20	14.50
	6 cm (116plants/row)	65.73	170.52	5.21	14.75
	8 cm (87plants/row)	63.50	193.04	5.56	13.91
Planting on 3 sides of row	4 cm (262plants/row)	60.33	142.98	4.68	14.66
	6 cm (175plants/row)	63.96	161.00	5.00	14.08
	8 cm (131plants/row)	64.83	179.01	5.36	14.91
LSD 0.05		3.57	25.44	0.34	0.64

4- Total soluble solid (%):

As shown from Table (1), it was found that, in the second season ,the highest value of TSS was obtained when sets grown at 8 cm space and sets were on 3 sides of row with no significant differences between this treatment and treatment of 6 cm between plants , planting on two sides of row while, in the first season, there were no significant differences between treatments

5- Percentage of bolters(%):

As shown in Table 2, bolting apparently influenced by plant density. The largest space between plants (low density) and growing on 2 sides per row, the highest value of bolters was obtained. Whereas, the lowest value of bolters was obtained when sets grown at 4 cm space between plants and on 3 sides per row.

6- Percentage of doubles (%):

Data on percentage of doubling as affected by plant space and density are shown in Table 2 . It could be generally, noted that, when sets grown at 8 cm space and on 2 sides per row (87plants/row), it gave the highest percentage of doubling. On the other side, the lowest percentage of doubling were obtained when density were (262 plants / row). Shock *et al*. (1989) indicated that high incidence of double onions was closely related to low onion plant population. Doubles clearly decreased with increased plant density.

Table 2: Effect of plant density on bolters (%),doubles (%), marketable yield and total yield characters of onion Giza 6cv. during 2007/2008 and 2008/2009 seasons under Assiut conditions.

2007/2008 season					
Plant density		**Characters**			
	Plant space treatments	**bolters (%)**	**doubles (%)**	**Marketable yield (ton/ fed.)**	**Total yield (ton/fed)**
Planting on 2 sides of row	4 cm (175plants/row)	4.19	1.30	8.346	11.093
	6 cm (116plants/row)	4.98	2.48	6.670	10.404
	8 cm (87plants/row)	7.10	3.05	3.960	10.300
Planting on 3 sides of row	4 cm (262plants/row)	3.51	1.46	12.340	18.080
	6 cm (175plants/row)	4.61	2.09	14.200	16.093
	8 cm 131plants/row	5.73	2.41	5.893	10.573
LSD 0.05		0.30	0.33	1.069	1.0306
2008/2009 season					
Planting on 2 sides of row	4 cm (175plants/row)	4.27	1.62	8.363	11.410
	6 cm (116plants/row)	4.92	2.38	7.182	9.640
	8 cm (87plants/row)	6.54	3.33	3.460	8.991
Planting on 3 sides of row	4 cm (262plants/row)	3.73	1.37	11.833	14.880
	6 cm (175plants/row)	4.66	1.97	10.749	13.614
	8 cm (131plants/row)	5.73	2.57	5.782	9.618
LSD 0.05		0.37	0.22	1.657	1.342

7- Marketable yield (ton/fed):

Data on marketable yield as affected by plant space are shown in Table 2. In the first season, the highest marketable yield was obtained when sets grown at 6 cm space and at 3 sides per row(high density), whereas the lowest marketable yield was obtained when sets grown at 8 cm space and at 2 sides per row (low density) .In the second season , the highest value was obtained when sets grown at 4 and 6 cm and on 3 sides per row(high density). Kanton *et al.*(2002) indicated that, number of marketable bulbs increased significantly with higher planting density.

8- Total yield (ton /fed):

Data presented in Table 2, indicated that the same trend of marketable yield was found in total yield .Seck and Baldeh, (2009) showed that, bulb weight inversely correlated to plant density and was higher in the intensive system. Also, Mahadeen, (2008) indicated that maximum onion bulbs yield was obtained from the closest plant spacing. The plants grown under minimum spacing produced more bulb yield which might have been due to the higher number of plant accommodated in a unit land area.

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تاثيرالكثافة النباتية على البصل المزروع بالبصيلات تحت ظروف اسيوط

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اجريت تجربتان حقليتان بمزرعة كلية الزراعة بأسيوط خلال موسمى 2007/2008، 2008/2009 لدراسة تأثير الكثافة النباتية المختلفة (116،175 و87 نبات فى الخط) عند الزراعة على مسافات (4،6،8) سم على التوالى والزراعة على ريشتين، الكثافة النباتية (131،262،175 نبات فى الخط) عند الزراعة على ريشتين وظهر الخط على طول النبات، الوزن الطازج للنبات الكامل ،قطر البصلة،المواد الصلبة الذائبة الكلية ،النسبة المئوية للازهار الحولى ،النسبة المئوية للابصال المزدوجة،المحصول الصالح للتسويق والمحصول الكلى فى الابصال المزروعة بالبصيلات بهدف تحسين المحصول وجودتة .

وتتلخص اهم نتائج الدراسة فيما يلى :

- تم الحصول على اعلى وزن طازج للنبات الكامل مع الكثافة النباتية الاقل حيث اعطت المسافة 8 سم بين النباتات والزراعة على ريشتين(87 نبات فى الخط) اعلى القيم للوزن الطازج للنبات الكامل .
- ازداد قطر البصلة بزيادة مسافة الزراعة (الكثافة النباتية الاقل) فأعطت المسافة 4 سم والزراعة على ريشتين وظهر اقل(262 نبات فى الخط) قيمة لقطر البصلة .
- بزيادة الكثافة النباتية تقل النسبة المئوية للازهار الحولى وكذلك النسة المئوية للابصال المزدوجة .
- ازداد المحصول الكلى بزيادة الكثافة النباتية فأعطت الكثافة النباتية (262 نبات/ خط)اى عند الزراعة على مسافة 4 سم والزراعة على ريشتين وظهر اعلى القيم للمحصول الكلى .

قام بتحكيم البحث

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