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Incidence of Bolting in Onion Cultivars Grown from Sets in Libya

M. W. EL-SHAFIE[1]

ABSTRACT

The present study was conducted in a split plot design with four replicates during two seasons in Tripoli.

Small sets of three promising onion cultivars, namely; Texas Yellow Grano 502, Giza Synthetic, and Giza 6 Mohassan, were planted in the second week of October. These sets resulted from three different sowing dates in the previous season from October to March. With the exception of the second sowing date in the first season, the percentage of bolters was not affected by sowing dates of seeds to get sets. Results were explained and discussed.

In the second part of the study, small sets of similar sowing date of two cultivars; namely, Texas Yellow Grano 502, and Giza Synthetic cultivars, were planted in two years at three planting dates from late September to early December. The statistical analysis of the data showed that the effect of the planting date of sets was significant. Earlier planting in late September and early October produced the highest percentage of bolters. The combined analysis indicated that year × cultivar and year × cultivar × planting date were significant. The percentages of bolters were 51.1, 21.0, and 5.2% in the early, medium and late planting dates, respectively. Late planting produced significantly lower bolters.

INTRODUCTION

Bulb production from sets is not well known in Jamahiriya. It is used mainly for producing early grown onions during winter months. Bolting has been a major problem in onion production from sets. Therefore, bolting should be reduced to a minimum. It was previously reported (2) that planting small sets had significantly reduced the percentage of bolters as compared with medium and large sets. Set planting date and prevailing temperatures were reported as factors contributing to this inferior quality (1,5). In Yugoslavia, better yield and marketable quality was obtained from spring than from autumn planting of onion sets (6). In Poland, onion sets of three cultivars were planted in the autumn (early October), and spring (late March and early April). It was found that planting in the autumn advanced harvest by about 2 weeks but losses due to winter damage were so high that is not recommended (4).

In Czechoslovakia (6), sets with different sizes of short- and long-day onion cvs were planted on different dates in the autumn. It was reported that bolting ranged from 0–100% and was determined genetically and by set size but not by planting date. Further, autumn planting of sets did not advance the harvesting date compared with autumn sowing. It resulted, however, in larger bulbs and is also suitable for very early production of bunching onions.

[1]*Department of Horticulture, Faculty of Agriculture, University of Al-Fateh, Tripoli, Libya.*

For the production of onion bulbs from sets two steps must be taken. First, seeds are sown to get onion sets. Second, sets are planted for the production of a bulb crop. The objective of the present study was to investigate the incidence of bolting in onion bulbs produced from sets. Two experiments were conducted separately:

(1) The first experiment was planned to study the effect of three different sowing dates to get sets, on the percentage of bolters. Sets used were of small size (less than 15 mm) and planted in November, i.e. set size and planting date of sets were constant.
(2) In the second experiment, the effect of three planting dates of onion sets on the percentage of bolters was studied. Sets were small and resulted from sowing seeds in December and January of the previous season, i.e. set size and sowing date of seeds were as constant as possible.

MATERIALS AND METHODS

Experiment 1

A split plot experiment with four replicates was conducted at the Experimental Station of the Faculty of Agriculture, Al-Fateh University, Tripoli during the two successive seasons of 1977–78 and 1978–79. Two cultivars, namely: Giza Synthetic and Texas Yellow Grano 502, were used the first season. Giza Synthetic and Giza 6 Mohassan cultivars were used the second season. The cultivars were allotted to the main plots. Small sets (less than 15 mm) were planted on 9/10/77 and 14/10/78 during the first and second seasons, respectively. These sets resulted from sowing seeds in the previous season at three different sowing dates as follows:

	Season	
Sowing date	1977–78	1978–79
First (October)	18/10/76	2/10/77
Second (December)	8/12/76	3/12/77
Third (March)	21/3/77	2/3/78

The three sowing dates occupied the subplots. Plot size was 2.7 m^2 and contained 3 rows, 30 cm apart. 30 plants, 10 cm apart were grown in each row.

Late in the season (17/5/78 and 7/5/79 for the first and second seasons, respectively) plants were harvested. Plants that developed seedstalks were counted and the percentages of bolters were determined and analysed by the analysis of variance after angle transformation.

Experiment 2

At the same farm in Tripoli, a split plot experiment was conducted during the two successive seasons 1976–77 and 1977–78. Two cultivars were used, namely: Texas Yellow Grano 502 and Giza Synthetic. They occupied the main plots. Plants were raised from sets of small sizes (less than 15 mm) that resulted from sowing seeds in December and January of the previous season. These sets were planned at three different planting dates during the two seasons and were as follows:

Planting date of sets	Season	
	1976/77	1977/78
First (late September and early October)	September 28	October 4
Second (late October and early November)	October 28	November 6
Third (late November and early December)	November 22	December 4

The three planting dates of sets occupied the subplots. Plot size was 3.6 and 2.7 m^2 in the first and second seasons, respectively.

During the season of 1976/77, plants were harvested on May 3, 8 and 24 for the first, second and third planting dates, respectively. During the season of 1977–78, the harvesting dates were May 8 for the first and second planting dates and June 6, 1978 for the third. The angle transformed means of the percentages of bolters were determined and statistically analysed.

RESULTS AND DISCUSSION

Experiment 1

Means and transformed means of bolter percentages as affected by three sowing dates and two cultivars are shown in Tables 1 and 2 for the 1977–78 and 1978–79 seasons, respectively. Size and planting dates of the sets were constant as earlier indicated.

In the 1977–78 season no significant differences in the transformed means of bolter percentages between Texas Yellow Grano 502 and Giza Synthetic cultivars were found. No significant effect was found on the interaction (cultivar × sowing date). Significant difference was found between sowing dates. The percentages of bolters were 57.8, 75.9 and 52.2% for the October, December and March sowing dates, respectively. This indicated that the December sowing date was significant over the

Table 1 Means and angle transformed means of the percentages of bolters as affected by the three sowing dates and two cultivars during 1977–78 season.

Cultivar	Sowing date						Cultivar mean	
	October		December		March			
	Transformed	%	Transformed	%	Transformed	%	Transformed	%
Texas Yellow Grano 502	57.84	71.7	69.69	88.0	50.25	59.1	59.29	73.9
Giza Synthetic	41.20	43.4	51.51	61.3	42.27	45.2	44.99	49.9
Sowing Date Mean	49.52	57.8	60.60	75.9	46.28	52.2	52.13	62.3

Cultivars: F = 10.06 not significant.
Cultivars × sowing date: F = 3.46 not significant.
Sowing date: F = 25.89** highly significant.
LSD 0.05 among sowing date transformed means = 4.55.
C.V. = 7.46%.

Table 2 Means and angle transformed means of the percentages of bolters as affected by three sowing dates and two cultivars during 1978–79 season.

Cultivar	Sowing date						Cultivar mean	
	October		December		March			
	Transformed	%	Transformed	%	Transformed	%	Transformed	%
Giza Synthetic	33.47	30.4	32.76	29.3	28.43	22.7	31.55	27.3
Giza 6 Mohassan	24.66	16.4	20.33	12.1	22.18	14.3	22.39	14.5
Sowing Date Mean	29.07	23.6	26.54	20.0	25.31	18.2	26.97	20.5

Sowing dates: F = 1.93 not significant.
Cultivar × sowing date: F = 1.27 not significant.
Cultivars: F = 14.12* significant.
LSD = 0.05 among cultivar transformed means = 5.31.
C.V. = 22.14%.

October and March sowing dates, but the October and March sowing dates were not different from each other.

In the 1978–79 season, significant difference in the transformed means of bolter percentages between cultivars was found. This might have been due to the utilization of different cultivars in that season. Giza Synthetic gave a higher percentage of bolters than Giza 6 Mohassan. The percentage of bolters was 27.3 for the former and 14.5 for the latter. Coefficient of variation for cultivars was 22.14%. Giza 6 Mohassan appeared to be more adapted for bulb production from sets than Giza Synthetic. The effects of sowing dates and the interaction of cultivar × sowing date were not significant.

With the exception of the second sowing date in the first season, the percentage of bolters was not affected by the date of the seed sowing to obtain sets. This could be explained on the basis that the period of exposure to cool temperatures during the season of set production that depends on the sowing date has no effect on bolters in the season of bulb production, because small sets (less than 15 mm) only were used. This confirms the results of Thompson and Smith (5) who reported that small bulbs or plants showed little or no induction of flowering by cool temperature. Bolting in bulb crops resulting from large sets is expected to be different. Therefore, future research should be focused on the behaviour of large sets resulting from different sowing dates.

Experiment 2

Means and angle transformed means of the percentages of bolters resulting at three planting dates of sets during 1976–77 and 1977–78 seasons and the combined analysis are shown in Table 3. In the 1976–77 season, significant differences in the percentages of bolters existed due to the effect of cultivar and cultivar × planting date interaction. The coefficient of variation of the transformed means of bolter percentages was 8.74% for cultivars. In each of the two seasons, there were highly significant differences as to the effect of planting dates of sets. The highest percentage of bolters was obtained from the first planting date of sets. The third planting date produced the lowest percentage of bolters, i.e. there was a significant decrease in bolters by late planting dates of the sets from October to December. In the 1976–77 season, the bolter percentages were 49.4, 14.0 and 0.8% in the first, second, and third planting dates, respectively. In 1977–78, it was 52.9, 29.1 and 13.3%. The coefficient of variation of the transformed means of bolter percentages were 26.98% and 25.26% for the planting dates in the first and second seasons, respectively.

Table 3 Means and angle transformed means of bolters percentages as affected by three planting dates of sets and two cultivars during 1976–77 and 1977–78 seasons.

		1976–77 Planting date				1977–78 Planting date				Combined analysis Planting date			
Cultivar		First	Second	Third	Mean	First	Second	Third	Mean	First	Second	Third	Mean
Texas Yellow	T.	56.57	28.39	0.00	28.32	49.54	25.94	14.76	30.08	53.05	27.16	7.38	29.19
Grano 502	%	69.6	22.6	0.00	22.5	57.9	19.1	6.5	25.1	63.9	20.8	1.6	23.8
Giza Synthetic	T.	32.76	15.56	10.24	19.52	43.83	39.39	27.99	37.06	38.29	27.47	19.11	28.29
	%	29.3	7.2	3.2	11.1	48.0	40.3	22.0	36.3	38.4	21.3	10.7	22.5
	T.	44.66	21.97	5.12	23.92	46.68	32.66	21.37	33.57	45.67	27.31	13.24	28.74
Mean	%	49.4	14.0	0.8	16.4	52.9	29.1	13.3	33.6	51.1	21.0	5.2	23.1
Cultivars:													
F					106.25**								
LSD 0.05 for													
T. means					2.72								
Planting Dates:													
F			75.58**				17.98**						
LSD 0.05			7.03				9.23						
Cultivar × P.D.:													
F			14.49**										
2 C at 1 P.D.			12.48										
2 P.D. for 1 C			9.94										
Year × Cultivar:													
F												8.66*	
Year × Cultivar × P.D.:													
F												14.12**	

LSD 0.05: (for transformed means)
1. for the comparison of 2 years: 4.49
2. for the comparison of 2 cultivars: 4.49
3. for the comparison of 2 cultivars in the same year: 6.35
4. for the comparison of 2 years for the same cultivar: 7.15
5. for the comparison of 2 planting dates: 5.49
6. for the comparison of 2 P.D. in the same year: 7.77
7. for the comparison of 2 years at the same P.D.: 5.97
8. for the comparison of 2 P.D. for the same cultivar: 7.77
9. for the comparison of 2 cultivars at the same P.D.: 6.35

The combined analysis showed that the percentages of bolters were also affected by year × cultivar and year × cultivar × planting date interactions. When the two cultivars were compared in the first year, Texas Yellow Grano 502 produced more bolters than Giza Synthetic. The opposite was true in the second year. When the two years were compared for one cultivar, Giza Synthetic produced significantly higher bolters in the second than in the first year. Texas Yellow Grano 502 showed no significant differences in bolters when the two years were compared. Similarly, through year × cultivar × planting date interaction, two years at the same planting date, two planting dates in the same year, two cultivars at the same planting date and two planting dates for the same cultivar can be compared. Their LSD 0.05 were provided at the end of Table 3.

According to Jones and Mann (3) and Thompson and Smith (5), the bolting of onions are induced by a cool temperature. Growing plants may be induced to bolt but size is of critical importance since small bulbs or plants show little or no induction of flowering by cool temperatures. The results of the present experiment can be explained on the basis that earlier planting of sets, relative to other planting dates, of both cultivars permitted the development of large size plants before the cool temperatures of winter months prevailed. The exposure of these large plants to cool temperatures for a reasonable period of time (during winter), induce them to develop seedstalks. Therefore, to reduce bolters to a minimum in crop production from small sets, the results of the present experiment indicate that the third planting date of sets produce significantly lower bolters in comparison to the first and the second planting dates.

The results of the present study are not in agreement with that reported by Tronickova (6) in Czechoslovakia. It was reported that bolting was not determined by planting dates of sets in the autumn planting. This disagreement may be due to different temperatures and other environmental conditions in the two countries.

LITERATURE CITED

1. Ahmed, F. A. and M. M. El-Gammal. 1971. Study on onion production from sets of Egyptian onion. Proceedings of Vegetable Crops Third Conference, Alexandria University.
2. El-Shafie, M. W. 1979. Effect of set size on the yield of onion under Libyan conditions. Libyan J. Agric. Vol. 8.
3. Jones, H. A. and L. K. Mann. 1963. Onions and their allies. Interscience Publishers, Inc., New York.
4. Kossowski, M. and M. Tendaj. 1979. Dependence of early yield of bunching onions on planting time of sets. (Hort. Abstracts No. 361, 1979).
5. Thompson, H. C. and Ora Smith. 1938. Seedstalk and bulb development in the onion (*Allium cepa* L.) Cornell Univ. Agric. Expt. Sta. Bull. 708.
6. Tronickova, E. 1977. Short-day forms of onion (*Allium cepa* L.) as applied for cultivation from fall plantation of setts. (Hort. Abstracts No. 1387, 1977).
7. Vasic, A. 1975. Influence of the sowing time and the size of sets on the yield and marketable quality of onions. Acta Hort. 52: 253–258.

نسبة الحنبوط فى أبصال بعض أصناف البصل الناتجة من البصيلات فى ليبيا

د. محمد وفيق الشافعى

أجريت هذه الدراسة خلال موسمين زراعيين فى مزرعة كلية الزراعة جامعة الفاتح بطرابلس فى قطع منشقه ذات أربعة مكررات .

زرعت البصيلات الصغيرة لثلاثة أصناف من البصل وهى تكساس يلوجرانو ٥٠٢ ، جيزة التركيى ، جيزة ٦ محسن وذلك فى الأسبوع الثانى من اكتوبر . وكانت هذه البصيلات ناتجه من زراعة البذور فى ثلاثة مواعيد مختلفة فى الموسم السابق ، وقد كانت فى الفترة من أكتوبر حتى مارس .

أوضحت النتائج أنه باستثناء الميعاد الثانى فى الموسم الزراعى الأول فان نسبة الحنبوط لم تتأثر معنويا بميعاد زراعة البذور للحصول على البصيلات اذا تم تثبيت حجم وميعاد زراعة البصيلات .

فى الجزء الثانى من الدراسة زرعت البصيلات الصغيرة للصنفان تكساس يلوجرانو ٥٠٢ وجيزه التركيى ـ الناتجه من بذور سبق زراعتها فى شهرى ديسمبر ويناير ـ فى ثلاثة مواعيد مختلفة من أواخر سبتمبر حتى أوائل ديسمبر . وأوضح التحليل الاحصائى للنتائج أن تأثير ميعاد زراعة البصيلات على نسبة الحنبوط كان معنويا حيث أعطى الميعاد المبكر أعلى نسبه . وتبين من التحليل الاحصائى للموسمين معا أن التفاعل الموسم الزراعى × الصنف والتفاعل الموسم الزراعى × الصنف × ميعاد زراعة البصيلات كان معنويا حيث أعطى ميعاد زراعة البصيلات الأول والثانى والثالث ١٠ر٥١ ، ـر٢١ ، ٢ر٥ نباتات ذات حنبوط على التوالى .

وعلى ذلك فانه لتخفيض نسبة الحنبوط الى أقل حد ممكن فى محصول البصل الناتج من البصيلات الصغيرة فانه ينصح بالزراعة المتأخرة لأنها أدت الى انخفاض نسبة الحنبوط معنويا .