INFLUENCE OF PLANTING DATE AND PLANTING METHOD ON YIELD AND QUALITY OF ONION SEEDS

By

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ABSTRACT

Two field experiments were carried out during 1999/2000 and 2000/2001 seasons to investigate the effect of planting date and planting method on seed yield and quality of onion cv. Giza 20. This study was carried out on clay soil at the Experimental Farm of Sakha Agricultural Research Station. Kafr El- Sheikh. Egypt. Bulbs of onion were planted either as a whole bulb or after removing its upper quarter with recover or dipping method at four planting dates namely. Dec. 15th . Jan. 1st . Jan. 15th and Feb. 1st. The experiments were conducted in a split plot design with four replications. The results can be summarized as follows:

Planting onion bulbs at the earliest planting date under this study (Dec. 15th) recorded the highest values of number of sprouts and scapes/plant. diameter of main umbel. dry weight of umbels/plant. seed yield per plant and per feddan as well as seed germination percentage without significant differences with the second planting date (Jan. 1st) in most cases. Seed weight/umbel and 1000-seed weight were not significantly affected by planting date in both seasons. On the other hand. delaying of the planting date significantly increased both emergence and seed setting percentages in the two seasons of this study.

Clipping the upper quarter of mother bulbs and planted either with recover or dipping method resulted in a significant increase in emergence percentage. dry weight of umbels/plant. seed yield per plant and per feddan as well as seed germination percent in both seasons without significant difference between them in most cases. Planting method failed to exert any significant effect on number of sprouts and scapes/plant. diameter of main umbel. seed weight/umbel. seed setting percent and 1000-seed weight in the two seasons.

Planting onion bulbs at early planting dates (in Dec. 15th or in Jan. 1st) with clipping the upper quarter of bulbs and planting with recover or dipping method could be recommended to produce high onion seed yield with best quality at Kafr El-Sheikh Governorate.

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most important vegetable crops grown in Egypt as well as in many other countries. In recent years, onion seed production is an important line of research, which contributes greatly towards improving quality and productivity of cultivar in farmer fields. Thus, maximizing the productivity of onion seed yield with excellent specific quality under the conditions of Kafr El-Sheikh Governorate could be achieved by improving cultural treatments such as choosing the suitable planting date as well as suitable planting method.

With respect to the effect of planting date on seed yield of onion, AbdeL- Latif(1995) pointed out that earlier planting date significantly increased number of sprouts and scapes/plant, diameter of main umbel, dry weight of umbels/plant, seed yield per umbel, per plant and per feddan as well as 1000- seed weight and seed germination percentage. Farghaly (1995); Ibrahim et al. (1996); Rizk et al. (1996) and EL-Aweel and Ghobashi (1999) came to similar results.

Planting method is one of the major factors, which affect the growth and seed production of onion. In this connection, KaLavathi et al.(1990) showed that the use of cut bulbs produced seeds with better quality as compared with whole bulbs. Farag and Koriem(1996) pointed out that removing a quarter of the bulb significantly raised the average number of umbels plant and total seed yield, whereas, increasing the removed part to three quarters of the bulb reduced total seed yield. They found also that cutting the bulb resulted in adverse effect on emergence of plants and seed stalk length. The Lowest values were obtained by topping three quarters of the bulb. They stated also that 1000-seed weight was not significantly affected, whereas, seed germination percent was significantly increased by increasing the removed part of mother bulbs. On the other hand, Nehra et al. (1989) found that cutting mother bulbs had a negative effect on seed yield and its attributes at all planting dates. They found also that the highest values of number of scapes/plant, seed yield/umbel as well as seed yield per plant and per feddan were obtained with whole bulbs.

The present work was initiated in order to study the effect of planting date and planting method on onion seed production of "Giza 20" cultivar.

MATERIALS AND METHODS

This investigation was carried out at the Experimental Farm of Sakha Agricultural Research Station, Agricultural Research Center during the two successive onion-growing seasons of 1999/2000 and 2000/2001. The preceding crop was cotton in the two seasons. The experimental soil was clay in texture. The mechanical and chemical analysis of the experimental soil is presented in Table (1).

Table (1): Mechanical and chemical analysis of the experimental soil (0-30 cm), in 1999/2000 and 2000/2001 seasons.

Determination	Season	
	1999/2000	2000/2001
Mechanical analysis:		
Clay %	44.90	41.50
Silt %	37.00	38.50
Sand %	18.10	20.00
Soil textural class	Clay	Clay
Chemical analysis :		
pH	8.11	8.10
Total soluble salts %	0.26	0.22
Calcium carbonate %	2.41	3.72
Organic matter %	1.71	2.18
Total nitrogen %	0.08	0.09
Available N ppm	22.00	26.00
Available P ppm	12.00	10.00
Available K ppm	420.00	480.00

The experimental design was split plot design with four replicates. Four planting dates; i.e., (December 15th, January 1st, January 15th and February 1st) were arranged at random in the main plots, whereas the four planting methods i.e. recover of whole bulb (Rwb), recover of the clipping the upper quarter of bulb (Rcb), dipping the whole bulb (Dwb) and dipping of the clipping the upper quarter of bulb (Dcb) were assigned at random in the sub plots. The sub plot consisted of four ridges each 3.5 meters length and 60 cm in width. Nitrogen at 90 kg N/fed. in the form of ammonium nitrate (33.5% N) were applied in two equal parts. The first part was applied after thirty days from planting before the first irrigation and the second was given thirty days later. Calcium superphosphate (15.5% P_2O_5) was added during tillage operation at the rate of 300 kg/fed. Other cultural practices for growing onion seed, was carried out as recommended.

Studied characters:

1. Percentage of emergence.
2. Ten plants were randomly labeled as a representative sample of each plot and the number of sprouts/ plant was measured.

3. At harvest. the following characters were determined on the chosen ten plants:

3.1. Number of scapes/ plant. 3.2. Diameter of main umbel (cm).
3.3. Dry weight of umbels/ plant (g). 3.4. Seed- setting percentage*.
3.5. Weight of seed/ umbel (g). 3.6. Seed yield/ plant (g).

* It was calculated according to the following formula:

$$\text{Seed setting percentage} = \frac{\text{Number of capsules/ umbel}}{\text{Total number of flowers/ umbel}} \times 100$$

4. Umbels in each plot were harvested and left two weeks until fully air-dried by sunshine. then onion seed yield as kg/fed. was calculated.
5. Seed quality: onion seed quality was determined as:

5.1. Weight of 1000-seed (g). 5.2. Seed germination percentage.

All collected data were subjected to statistical analysis as described by Snedecor and Cochran (1980). The mean values of treatments were compared according to Duncan's multiple range test (Duncan. 1955). All statistical analysis was performed using analysis of variance technique by means of "IRRISTAT" computer software package.

RESULTS AND DISCUSSION

Effect of planting date:

As shown in Tables (2. 3. 4 and 5) number of sprouts and scapes/plant. diameter of main umbel. dry weight of umbels/plant. seed yield per plant and per feddan as well as seed germination percentage were significantly influenced by different planting dates in the two seasons of this study. However. seed weight/umbel and 1000-seed weight were not significantly affected by planting date in both seasons. Delaying of the planting date significantly reduced all studied traits. except that both emergence and seed setting percentages. The highest values of all mentioned characters were recorded with the earliest planting date (Dec. 15th) without significant differences with the second planting date (Jan. 1st) in most cases. This fact was true in the two seasons. The present results show that the two earlier planting dates (Dec. 15th and Jan. 1st) were more effective with all traits than the two other planting dates (Jan. 15th and Feb. 1st). These results may be attributed to the more favorable climatic conditions and longer duration of the growth period of earlier planting date. Moreover. the increase in seed yield per plant as well as per feddan with the earlier planting date could be due to improvement of plant growth. in terms of increasing number of sprouts and scapes/plant as well as dry weight of umbels/plant. which in turn increased seed yield/plant and seed yield/fed. The obtained results are in full agreement with those reported by Abdel-Latif (1995); Farghaly (1995); Ibrahim et al. (1996); Rizk et al. (1996) and El-Aweel and Ghobashi (1999).

Table (2): Emergence percent, number of sprouts and scapes/plant, diameter of main umbel, dry weight of umbels/plant and seed setting percent of onion cv. Giza 20 as affected by planting date and planting method in 1999/2000 season.

Treatment	Emergence %	Number of sprouts /plant	Number of sprouts /plant	Diameter of main umbel (cm)	Dry weight of umbels (g/plant)	Seed setting %
Planting date (A):						
Dec. 15th	92.42b	4.80a	5.57a	6.31a	46.17a	60.18c
Jan. 1st	98.96a	4.62a	4.58b	6.10a	34.53b	62.54b
Jan. 15th	99.05a	3.85b	4.27b	6.52a	29.63c	62.91b
Feb. 1st	99.43a	3.70b	3.89b	4.97b	21.51d	65.26a
F. test	**	*	**	*	*	*
Planting method (B):						
R_{wb}	98.64a	4.11	4.33b	5.97	30.55b	63.61
R_{cb}	98.81a	4.33	4.78a	5.98	36.42a	64.67
D_{wb}	96.59ab	4.10	4.34b	5.99	30.71b	62.43
D_{cb}	95.81b	4.44	4.88a	5.88	34.16ab	60.19
F. test	*	NS	*	NS	*	NS
Interaction:						
A X B	NS	NS	NS	NS	NS	NS

*, ** and NS indicate P< 0.05, P<0.01 and not significant, respectively. Means of each factor designated by the same latter are not significantly different at 5% level, using Duncan's multiple range test.

Whereas, R_{wb}: Recover of whole bulb; R_{cb} : Recover of the clipping the upper quarter of bulb; D_{wb}: Dipping the whole bulb and D_{cb} : Dipping of the clipping the upper quarter of bulb.

Effect of planting method:

The presented data in Tables (2, 3, 4 and 5) reveal that planting method induced a significant effect on emergence percentage, dry weight of umbels/plant, seed yield per plant and per feddan as well as seed germination percentage in both seasons, but it failed to exert any significant effect on number of sprouts and scapes/plant, diameter of main umbel, seed weight/umbel, seed setting percentage and 1000-seed weight in the two seasons. The highest values of all these traits were recorded with clipping of mother bulbs, either recover or dipping method without significant

difference between them in most cases. In this connection, Farag and Koriem (1996) pointed out that removing a quarter of the mother bulb significantly raised the average number of umbels/plant and total seed yield. They stated also that 1000-seed weight was not significantly affected whereas, seed germination percent was significantly increased by increasing the removed part of mother bulbs.

Table (3): Emergence percent, number of sprouts and scapes/plant, diameter of main umbel, dry weight of umbels/plant and seed setting percent of onion cv. Giza 20 as affected by planting date and planting method in 2000/2001 season.

Treatment	Emergence %	Number of		Diameter of main umbel (cm)	Dry weight of umbels (g/plant)	Seed setting %
		sprouts /plant	Scapes /plant			
Planting date (A):						
Dec. 15th	93.68b	5.77a	5.31a	6.33a	49.33a	55.88c
Jan. 1st	97.09a	5.29a	4.62ab	6.43a	45.45a	58.40c
Jan. 15th	98.79a	4.91b	4.31b	6.10a	36.20a	63.69b
Feb. 1st	99.41a	4.47b	4.20b	5.69b	31.71b	68.15a
F. test	**	*	**	*	*	**
Planting method (B):						
P_{wb}	99.51a	5.08	4.58	6.41	43.98a	63.87
R_{cb}	99.49a	5.26	4.99	6.21	49.65a	59.78
D_{wb}	95.51b	4.8	4.91	5.94	29.29b	62.23
D_{cb}	94.45b	5.28	4.86	5.97	39.76b	60.51
F. test	**	NS	NS	NS	**	NS
Interaction:						
A X B	NS	NS	NS	NS	NS	NS

*, ** and NS indicate P< 0.05, P<0.01 and not significant, respectively. Means of each factor designated by the same latter are not significantly different at 5% level, using Duncan's multiple range test.

Whereas, R_{wb}: Recover of whole bulb: R_{cb} : Recover of the clipping the upper quarter of bulb: D_{wb}: Dipping the whole bulb and D_{cb} : Dipping of the clipping the upper quarter of bulb.

Table (4): Onion seed yield and its quality of onion cv. Giza 20 as affected by planting date and planting method in 1999/2000 season.

Treatment	Weight of seed/umbel (g)	Seed yield		1000-seed weight	Seed germination %
		(g/plant)	(kg/fed.)		
Planting date (A):					
Dec. 15th	3.49	19.48a	429.25a	3.64	83.79a
Jan. 1st	3.41	16.39b	388.75ab	3.81	82.18a
Jan. 15th	3.56	15.10b	346.25b	3.51	73.57b
Feb. 1st	2.99	12.26c	274.10c	3.29	69.27c
F. test	NS	**	**	NS	**
Planting method (B):					
R_{wb}	3.41	15.12b	328.12b	3.49	76.02bc
R_{cb}	3.36	16.44ab	375.94a	3.55	80.72a
D_{wb}	3.31	15.01b	345.81ab	3.56	74.09c
D_{cb}	3.37	16.67a	388.44a	3.65	77.98b
F. test	NS	*	*	NS	*
Interaction:					
A X B	NS	*	NS	NS	NS

*, ** and NS indicate P< 0.05, P<0.01 and not significant, respectively. Means of each factor designated by the same latter are not significantly different at 5% level, using Duncan's multiple range test.

Whereas, R_{wb}: Recover of whole bulb; R_{cb} : Recover of the clipping the upper quarter of bulb; D_{wb}: Dipping the whole bulb and D_{cb} : Dipping of the clipping the upper quarter of bulb.

Effect of interaction:

The interaction between planting date and planting method significantly affected only seed yield/plant in both seasons and seed yield/fed. in the second season (Tables 2, 3, 4 and 5). The highest seed yield/plant was recorded when onion bulbs planted at Dec. 15th with recover of clipping the upper quarter of bulb method without significant difference with other methods under the same planting date in both seasons, (Table, 6). Data presented in Table (7) show clearly that, the highest seed yield/fed. was obtained when onion bulbs were planted at Dec. 15th (earlier planting date) with recover of the clipping for the upper quarter of bulbs method without significant difference with recover of the whole bulbs method under the same planting date. It is also clear from the same Table that yield/fed..

which resulted from the two latest planting dates (Jan. 15th and Feb. 1st) did not differ significantly under different planting methods.

Table (5): Onion seed yield and its quality of onion cv. Giza 20 as affected by planting date and planting method in 2000/2001 season.

Treatment	Weight of seed/umbel (g)	Seed yield		1000-seed weight	Seed germination %
		(g/plant)	(kg/fed.)		
Planting date (A):					
Dec. 15th	4.29	23.12a	504.45a	4.56	87.15a
Jan. 1st	4.21	20.14ab	413.99b	4.86	83.71b
Jan. 15th	3.88	16.70bc	352.78bc	4.60	76.57b
Feb. 1st	3.43	14.48c	298.05c	4.14	71.18c
F. test	NS	**	**	NS	**
Planting method (B):					
R_{wb}	4.18	18.75ab	388.45ab	4.40	79.46b
R_{cb}	4.06	20.98a	452.57a	4.67	82.75a
D_{wb}	3.77	15.94b	325.52b	4.73	76.56c
D_{cb}	3.81	18.77ab	402.74ab	4.46	80.03b
F. test	NS	*	**	NS	*
Interaction:					
A X B	NS	*	**	NS	NS

*, ** and NS indicate P< 0.05, P<0.01 and not significant, respectively. Means of each factor designated by the same latter are not significantly different at 5% level, using Duncan's multiple range test.

Whereas, R_{wb}: Recover of whole bulb; R_{cb} : Recover of the clipping the upper quarter of bulb; D_{wb}: Dipping the whole bulb and D_{cb} : Dipping of the clipping the upper quarter of bulb.

Table (6): Onion seed yield (g/plant) of onion cv. Giza 20 as influenced by the interaction between planting date and planting method in 1999/2000 and 2000/2001 seasons.

	Planting method	Planting date			
		Dec. 15th	Jan. 1st	Jan. 15th	Feb. 1st
1999/2000	R_{wb}	20.27 a	14.55 efg	14.20 e-h	11.48 I
	R_{cb}	20.45 a	16.19 cde	15.62 def	13.51 f-i
	D_{wb}	18.09 abc	16.55 cde	13.17 ghi	12.22 ghi
	D_{cb}	19.13 ab	18.28 abc	17.43 bcd	11.84 hi
2000/2001	R_{wb}	26.73 a	15.68 cde	18.59 b-e	14.02 de
	R_{cb}	26.64 a	20.01 bcd	19.95 bcd	17.31 b-e
	D_{wb}	16.03 cde	21.20 abc	12.84 e	13.69 de
	D_{cb}	23.07 ab	23.69 ab	15.43 cde	12.90 e

Means of each factor designated by the same latter are not significantly different at 5% level, using Duncan's multiple range test.
Whereas, R_{wb}: Recover of whole bulb; R_{cb} : Recover of the clipping the upper quarter of bulb; D_{wb}: Dipping the whole bulb and D_{cb} : Dipping of the clipping the upper quarter of bulb.

Table (7): Onion seed yield (kg/fed.) of onion cv. Giza 20 as influenced by the interaction between planting date and planting method in 2000/2001 season.

Planting method	Planting date			
	Dec. 15th	Jan. 1st	Jan. 15th	Feb. 1st
R_{wb}	573.92 ab	273.57 fg	401.07 c-g	305.23 efg
R_{cb}	644.48 a	446.11 b-e	394.95 c-g	324.73 d-g
D_{wb}	316.32 efg	431.21 b-f	260.81 g	293.72 efg
D_{cb}	483.06 bcd	505.10 bc	354.28 c-g	268.58 fg

Means of each factor designated by the same latter are not significantly different at 5% level, using Duncan's multiple range test.
Whereas, R_{wb}: Recover of whole bulb; R_{cb} : Recover of the clipping the upper quarter of bulb; D_{wb}: Dipping the whole bulb and D_{cb} : Dipping of the clipping the upper quarter of bulb.

REFERENCES

Abdel-Latif, K.G. (1995). Effect of some agricultural treatments on onion seed production from set. M.Sc. Thesis. Fac. of Agric., Moshtohor. Zagazig Univ., Egypt.

Duncan. D.B. (1955). Multiple range and multiple F. test. Biometrics. 11: 1-24.

El-Aweel. M.A.T. and A.A. Ghobashi (1999). Seed production in onion as influenced by dates of planting in the sultanate of Oman. Assiut. J. of Agric. Sci., 30 (2): 43-53.

Farag. I.A. and S.O. Koriem (1996). Influences of size and cutting mother bulb on yield and quality of onion seeds. Assiut J. of Agric. Sci.. 27 (1): 97-106.

Farghaly. M.A. (1995). Effect of planting date and clipping of mother bulb on seed yield of onion under Assiut conditions. Assiut J. of Agric. Sci., 26 (2): 81-91.

Ibrahim. M.Y.; A.K. Mostafa; A.M. Hegazy and A.K. El-Kafoury (1996). Flowering behaviours of Egyption onion cv. "Giza 20" as affected by planting date. Proc. 7th Conf. Agronomy. Faculty of Agric.. Monsoura Univ.. 9-10 Sept.; 635-642.

Kalavathi. D.; K. Vanance mudi and K. Ramamoorthey (1990). Influence of date of harvest and method of bulb planting on the seed quality in Bellary onion. Madras Agric. J.. 77 (2): 61-63 [C.F. Hort. Abst.. 62 (10): 8149. 1992).

Nehra. B.K.; Y.S. Malik and A.C. Yadav (1989). Seed production in onion as influenced by time of bulb planting and cut treatments. Haryana Agricultural Univ. J. of Res.. 19 (3): 225-229. [C.F. CD Rom Computer System].

Rizk. F.A.; A.M. Shaheen and K.M. El-Habbasha (1996). Flowering and seed yield of onion (*Allium cepa* L.) plants as affected by dates of planting and some growth regulators. Egyption J. of Hort.. 23 (1): 113-127.

Snedecor. G.V. and W.G. Cochran (1980). Statistical methods. 12th Ed. Iowa State Univ. Press. Amer. Iowa. USA.

الملخص العربى

تأثير ميعاد الزراعة وطريقة الزراعة على محصول وجودة بذرة البصل

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أجريت تجربتان حقليتان خلال موسمى ١٩٩٩/٢٠٠٠، ٢٠٠٠/٢٠٠١م لدراسة تأثير كل من ميعاد الزراعة وطريقة الزراعة على محصول وجودة بذرة البصل صنف جيزة ٢٠. وقد أجريت هذه الدراسة فى أرض طينية بالمزرعة البحثية بمحطة البحوث الزراعية بسخا- كفرالشيخ- مصر. تمت زراعة الأبصال إما كاملة أومقطوع ربعها العلوى بطريقة الترديم أو طريقة الغرس فى أربع مواعيد زراعة هى ١٥ ديسمبر، الأول من يناير، ١٥ يناير، الأول من فبراير. وقد أستخدم فى تنفيذ هذه التجارب تصميم القطع المنشقة فى أربع مكررات. وتتلخص أهم النتائج فيما يلى:

سجلت زراعة الأبصال فى الميعاد المبكر (١٥ ديسمبر) تحت هذه الدراسة أعلى القيم من عدد الأفرخ الخضرية، عدد حوامل النورات للنبات، قطر النورة الرئيسية للنبات، الوزن الجاف لنورات النبات، محصول البذرة للنبات و للفدان بالإضافة الى نسبة إنبات بذور البصل بدون إختلافات معنوية مع ميعاد الزراعة الثانى (الأول من يناير) فى معظم القياسات. بينما لم تتأثر صفتى وزن البذرة/نورة، ووزن الـ ١٠٠٠بذرة معنويا بميعاد الزراعة خلال موسمى الدراسة. ومن ناحية أخرى أدى تأخير ميعاد الزراعة الى زيادة كل من نسبة التكشف للأبصال ونسبة العقد بكلا موسمى الدراسة.

أوضحت النتائج أن قطع الربع العلوى للأبصال وزراعتها سواء بطريقة الترديم أو الغرس أدت الى زيادة معنوية فى كل من نسبة التكشف للأبصال، الوزن الجاف لنورات النبات، محصول البذرة للنبات والفدان بالإضافة الى نسبة إنبات بذور البصل فى الموسمين بدون فروق معنوية بين طريقتى الزراعة فى معظم القياسات، بينما لم يكن لطرق الزراعة أى تأثير معنوى على كل من عدد الأفرخ الخضرية، عدد حوامل النورات للنبات، قطر النورة الرئيسية، وزن البذرة/نورة، نسبة العقد وكذلك وزن الـ١٠٠٠ بذرة فى كلا الموسمين.

ولذلك يمكن التوصية بزراعة الأبصال بطريقة الترديم أوالغرس مبكرا من ١٥ ديسمبر الى الأول من يناير مع قطع الربع العلوى للأبصال لإنتاج أعلى محصول من بذور البصل ذات الجودة العالية بمحافظة كفرالشيخ.