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ECONOMIC STUDY ON ONION SEED PRODUCTION FROM SETS UNDER DIFFERENT PLANT SPACINGS AND NITROGEN LEVELS

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ABSTRACT

The aim of this study is to use the sets for onion seed production instead of traditional use of large mother bulbs. Two field experiments were carried out in 1997-98 and 1998-99 on the Farm of the Agricultural Research Station, at Sids, Beni-Suif Governorate, to study the effect of three plant spacing, sets at 10,12.5 and 15cm. and three levels of N (90,120and 150 kg/fad).A split plot design with three replication was used in this investigation. The obtained results can be summarized as follows:

*Number of sprouts per plant was significantly affected in both seasons by two factors .The increasing of spaces between sets increased the number of sprouts /plant in the both seasons(2.03,1.99 respectively), also the lowest level of nitrogen fertilizer gave the lowest value of this character during he two successive seasons(1.76,1.72 respectively).

*Seed yield / umbel, was effected by both factors and their interaction between the two factors was significant in both seasons. The increases of spaces between sets and the increasing nitrogen fertilizer gradual increase in seed yield / umbel. The higher space with the higher level of nitrogen fertilizer gave the highest seed yield per umbel (6.93 gm) in the two seasons.

*Seed yield /plant, increased with increase of spacing and increasing N rate and the interaction in both seasons were significant. Planting sets at wider space gave the highest value of this trait 14.28 gm in the first season and 14.21 in the second one. While the higher rate of nitrogen fertilizer produced 13.48 and 13.57gm/plant in the first and second seasons respectively. Meanwhile, the highest seed yield per plant was produced from planting sets at 15 cm apart with 150kg /fadd. (15.23gm/pant and 15.50 gm /plant in the first and second seasons respectively.

*Seed yield per feddan gradually decreased with increasing the spacing of planting sets from 10, 12.5 up to 15 cm. Also there was gradually increased with increasing the rate of nitrogen fertilizer from 90kg / fadd. to 150 kg / fadd. The highest total seed yield per fadd. was produced through the combination of highest rate nitrogen fertilizer (150 kg /fadd.) with the highest plant density (623.7 in the first season and 619 kg/faddan in the second one).

*Economic evaluation, the highest value of Gross Margin with 10 cm Spacing and 150kg N/fadd. While the highest value for the Benefit Cost (B/C) ratio (10 cm Spacing and 120 kg N/fadd.).

According to the results we recommended that the sets are useful and use the closer spacing (10cm) to obtain high of seed yield /fadd., gross margin and benefit cost ratio.

INTRODUCTION

In Egypt, it is known that the production of onion seed is done by planting large bulbs above 5 Cm diameter at a spacing of 20-25 Cm on one side of the ridge of 60 Cm. wide. Some of the most important agricultural practices which affect onion seed yield are plant spaces, using either large

bulbs or sets as seeds and nitrogen fertilizer. So, these factors are studied in this investigation.

The objective of this study is to investigate the effect of using sets instead of large bulbs in onion seed production, different plant spacings as well as nitrogen levels.

Effect of plant spacings on onion seed production was studied by many researchers, who found that highest seed yield was obtained from the closer spacing between rows and within row, although the yield of individual plants increased with greater spacing (Khandelwal and Marti, 1970, Diazarguelles *et al.*, 1986 and Nehra *et al.*, 1988).

Concerning the effect of nitrogen fertilizer on onion seed yield, Madan and Saimbhi (1984) and Nehra *et al.* (1988) found that the number of sprouts per plant was significantly affected by the increasing of nitrogen levels.

According to interaction between spacing and nitrogen levels, there was a significant effect by Madan and Saimbhi (1984). Abd El-Latif(1995), revealed that increasing spacing between sets increased seed yield per fadd.

Onion is an important vegetable crop which was known at the ancient history in Egypt. Abd-EL-Latif (1995), recorded that the availability of viable pure seeds is a prerequisite for successful production of acceptable onions for both fresh consumption and dehydration. Thus, plant breeders should search for new and better techniques for producing new materials.

MATERIALS AND METHODS

The present investigation was conducted at Sids Experimental Station, Beni Suif governorate of the Agriculture Research Center, Ministry of Agriculture, in 1997-98 and 1998-99,to study the effect of nitrogen fertilizer rates and spacing on onion seed production from sets.

Soil physical and chemical properties were determined according to Black (1965) (Table1).

A split-plot design with three replications was used in this investigation, the spacing between plants which arranged in main plots as follow A1: 15 cm., A2: 12.5 cm., and A3: 10 cm. between sets .

N-rates arranged in sub plots as follow: B1: 90 kg/fadd., B2: 120 kg/fadd. and B3: 150 kg/fadd.

Each plot contained 4 rows of 3.5 m long and 65 cm. wide, were planted on the two sides of rows.

Table 1 : Soil physical and chemical properties.

Soil characteristics	Determination
Soil pH (1:2.5) soil : water	8.1
E.C mmohs/cm. at 25	1.6
Organic matter %	1.86
CaCo3 %	2.54
Soluble cations and anions (meq/L)	
Ca^{++}	3.91

Mg^{++}	3.60
K^{+}	0.28
Na^{+}	10.00
$Co3^{--}$	-----
$Hco3^{-}$	4.51
Cl^{-}	3.01
$S04^{--}$	10.27
Available nutrients in (ppm)	
N	30.01
P	8.50
K	460
Particle size distribution	
Sand %	21.68
Silt %	33.32
Clay %	45
Texture	Clay

Giza 6 Mohassan sets (2-2.5cm. in diameter and 9-12 g in weight) were planted, on 20th November in both seasons. Standard pesticides and cultural practices for this crop was applied. Super phosphate 300 Kg/fadd. and 100 Kg potassium sulphate were broadcast and incorporated to the soil during the soil preparation.

Half of the N-rates were applied one month from planting and the other half one month latter. When about 25% of the capsules dehiced, ten plants per plot were harvested and the following characters were recorded.

1- Average number of sprouts per plant.
2-Seed yield per plant (g.)
3-Seed yield per umbel (g.)
4-The remaining umbels per plot were harvested , put in sacks and left to dry completely.Umbels were threshed and separated. Seed yield (Kg/fadd) was recorded.

Statistical analysis:

Data were statistically analyzed using the analysis of variance procedure and treatment means were compared using the L.S.D method as described by Gomez and Gomez (1984).

The economic evaluation:

Economic evaluation for the results by estimating the average of onion seed yield /faddan, total variable cost, Gross Income, Gross Margin, Benefit Cost (B/C) Ratio and Profitability according to Heady and Dillon (1961). Where;

* Gross Income =(3000 L.E.) X (Seed yield kg/faddan)/102

(The price of unit (ardab)=3000 L.E. & ardab=102 kg seeds).

*Gross Margin = Gross Income – Total cost.

*Benefit Cost (B/C) Ratio = Gross Income / Total cost.

* Profitability = 100 X (Gross Margin / Total cost)

RESULTS AND DISCUSSION

1. Sprouts per plant

Results in Table 2 show that there was a gradual increase in the number of sprouts per plant with the increase of spacing between plants. However, the same results at Table 2 show that the number of sprouts per plant was significantly affected at the two seasons. Also, the highest level of nitrogen fertilizer (150 kg) gave the highest value of No. of sprouts(1.87,1.88 in the two season respectively). While the effect of interaction between the spacing and rates of nitrogen fertilizer was not significantly affected at both seasons of this experiment. Nehra *et al.* (1988) and Abd El-Latif (1995) came to the same conclusion.

2. Seed yield per umbel

Data in Table 2 show that, seed yield per umbel was significantly increased with increasing the spacing of planting sets. The increases of spaces between sets and the increasing nitrogen fertilizer gave gradual increase in seed yield/umbel. The higher space with the higher level of nitrogen fertilizer gave the highest seed yield per umbel (6.93 gm) in the two seasons.

Regarding the effect of interaction between the spacing and the rate of nitrogen fertilizer, Table 2 show that seed yield per umbel was significantly differed in both seasons. Highest weight of seed yield per umbel was produced from planting sets at 15cm with the highest rate of nitrogen. Similar results were obtained by Madan and Saimbhi (1984). Also Deshmukh *et al* (1986) recorded that there was positively correlated between the seed yield /umbel and the seed yield /ha.Abd El-Latif (1995) found that seed/umbel was 5.59 gm and 7.32 gm with 15 and 20 cm between sets respectively ,when he planted at the Nubaria Agmic. Res. Station. Sidhu *et al.* (1996) found that the higher seed yield/ha was related to higher numbers of seed umbel and wider umbel diameter. It was concluded that the number of seed /umbel is the most useful characteristic either independently or in combination with umbel diameter, for selecting seed yield in onion seed crops.

Table 2: Effect of nitrogen level, plant spacing and their interaction on number of sprouts and seed yield.

Treatments	Sprouts per plant		Seed yield per umbel g		Seed yield/plant g		Seed yield/f Kg	
	97/98	98/99	97/98	98/99	97/98	98/99	97/98	98/99
Spacing (A)								
A_1 (15 cm.)	2.03	1.99	6.16	6.07	14.28	14.21	467.00	463.20
A_2 (12.5 cm.)	1.81	1.81	5.28	5.10	12.60	12.51	511.60	503.20
A_3 (10 cm.)	1.64	1.66	4.14	4.00	10.63	10.57	614.90	608.70
L.S.D 5%	0.06	0.06	0.26	0.25	0.58	0.38	3.35	2.96
Rates (B)								
B_1 (90 kg/fad.)	1.756	1.72	4.47	4.24	11.56	11.30	516.00	507.56
B_2 (120 kg/fad.)	1.867	1.86	5.28	5.16	12.48	12.42	529.67	524.00
B_3 (150 kg/fad.)	1.867	1.88	5.83	5.77	13.48	13.57	547.78	543.56
L.S.D 5%	0.07	0.06	0.14	0.15	0.23	0.25	3.09	3.46
Interaction AXB								
A_1 B_1	1.97	1.93	5.20	4.97	13.37	13.07	445.00	439.70
B_2	2.07	2.00	6.33	6.30	14.23	14.07	457.30	452.70
B_3	2.07	2.03	6.93	6.93	15.23	15.50	498.70	497.30
A_2 B_1	1.77	1.73	4.57	4.23	11.57	11.30	501.70	491.70
B_2	1.83	1.87	5.17	5.03	12.50	12.40	512.00	503.70
B_3	1.83	1.83	6.10	6.03	13.73	13.83	521.00	514.30
A_3 B_1	1.53	1.50	3.63	3.53	9.73	9.53	601.30	591.30
B_2	1.70	1.70	4.33	4.13	10.70	10.80	619.70	615.70
B_3	1.70	1.76	4.47	4.33	11.47	11.37	623.70	619.00
L.S.D 5%	N-S	N-S	0.25	0.25	N.S	0.44	5.35	5.98

3. Seed yield per plant

Seed yield per plant as affected by different treatments in both seasons is shown in Table 2. The increasing spacing between plants gave rise to a general increase trend in all the means of the seed yield per plant. Also the same trend was found with the increasing rate of nitrogen fertilizer. Planting sets at wider space gave the highest value of this trait 14.28 gm in the first season and 14.21gm in the second one. While the higher rate of nitrogen fertilizer produced 13.48 and 13.57 gm/plant in the first and the second seasons respectively. Meanwhile, the highest seed yield plant was produced from planting sets and 15 cm apart with 150kg/fadd. (15.23 gm /plant and 15.50 gm /plant in the first and second seasons respectively.

These results are in agreement with those recorded by Ibrahim *et al.* (1990). Similar results were recorded by Verma *et al.* (1994).

4. Seed yield per faddan (kg):

Results in Table 2 show that there was gradually decrease with increasing the spacing of planting sets from 10, 12.5 up to 15cm. Also there was gradually increased with the increasing the rate of nitrogen fertilizer from 90 kg/fadd. to 150 kg/fadd. The highest total seed yield per fadd. was produced through the combination of highest rate nitrogen fertilizer (150 kg/fadd.) with the highest plant density.

Interaction between spacing and N rate was significant (623.7and 619.0 Kg/faddan in 1997-98 and 1998-99 respectively) with the lowest spacing and 150 Kg N/faddan. These results are in agreement with those recorded by Deshmukh *et al* (1986).

It is known that leaves are produced from the apical meristem, which pushes through the pesudostem formed by the sheath leaf bases of the older leaves. However, production of foliage or scale leaves depends on the rate of dry matter accumulation. Meanwhile, the first lateral buds had seven to eight levels. These leaves produced most of the entire rings. Moreover, the second and third lateral buds might be bladeless and thickened leaves (Abdalla and Mann 1963). Yamaguchi (1978) showed that secondary growing points produced the tillers in onion. In general, high numbers of growing centers as well as growing points will be associated with the number of umbels per plant and subsequently the seed yield. Moustafa (1983), found that high temperature during the growing season may delay or inhibit flowering and produce fewer number of seed-stalks per onion plant. Daljeet *et al* (1990) reported that the bolting was difficult at the narrower spacing compared with the other wider used spacing.

5. The economic evaluation:

Well be present as follow:

5.1: The total variable cost:

In Table 3 show that the total variable cost, which calculated as 2159 L.E./fadd. Fixed cost (Land preparation, Sowing, Post-sowing, Fertilization, Irrigation, Chamical control and Rental rate per faddan) and random cost for spacing about 200 L.E. / fadd. for the factor of N fertilization 158 L.E. for 90 kg/faddan, 200 L.E. for 120 kg/faddan and 242 L.E. for 150 kg/faddan.

5.2: The Gross Income:

Table 3 indicates that the average gross income of onion seed yield faddan with 150kg N/faddan reached about, L.E.16111.11, 15986.93/faddan in 1997-98 and 1998-99 respectively and L. E.18343.14, 18205.88/faddan in 1997-98 and 1998-99 respectively for the interaction (10cm & 150 kg N/faddan).

5.3 : The Gross Margin :

In table 3 we show that, the average of gross margin of onion seed yield/ faddan reached about L. E. 15725.97, 15542.96 in 1997-98 and 1998-99 respectively for 10cm between sets, L . E.13710.11, 13585.93 in 1997-98 and 1998-99 respectively with 150 kg N/faddan and L. E. 15942.14, 15804.88 in 1997-98 and 1998-99 respectively for the interaction (10cm. & 150 kg N/faddan).

5.4 Benefit / Cost Ratio:

Data in Table 3 we show that, the average B / C ratio for the onion seed yield faddan reached about 7.67, 7.59 in 1997-98 and 1998-99 respectively for the spacing, 6.71, 6.66 in 1997-98 and 1998-99 respectively with 150 Kg N / faddan and 7.73, 7.68 in 1997-98 and 1998-99 respectively for the interaction (10cm. spacing & 120 Kg N/faddan). These results are in general agreement with those of Sharma *et al.* (1994), who reported that benefit cost ratios increased with increasing rates of N-fertilizer.

Table 3: The Economic criteria for study on onion seed production from sets as influenced by spacings and nitrogen levels

Treatments	1997-1998					1998-1999			
	T-V-Cost L.E.	Gross income L.E.	Gross Margin L.E.	B/C ratio	Profit-ability L.E.	Gross income L.E.	Gross Margin L.E.	B/C ratio	Profit-ability L.E.
Spacing (A)									
A_1 (15 cm.)	2359.00	13735.29	11376.29	5.82	481.98	13624.18	11265.18	5.77	477.24
A_2 (12.5 cm.)	2359.00	15045.75	12686.75	6.38	537.79	14800.65	12441.65	6.27	527.38
A_3 (10 cm.)	2359.00	18084.97	15725.97	7.67	666.63	17901.96	15542.96	7.59	658.83
L.S.D 5%	N.S	98.47	98.47	0.04	4.16	87.10	87.10	.04	3.67
Rates (B)									
B_1 (90 kg/fad.)	2317.0	15176.47	12859.47	6.55	555.01	14928.11	12611.11	6.44	544.29
B_2 (120 kg/fad.)	2359.0	15578.43	13219.43	6.60	560.38	15411.77	13052.77	6.53	553.32
B_3 (150 kg/fad.)	2401.0	16111.11	13710.11	6.71	571.02	15986.93	13585.93	6.66	565.85
L.S.D 5%	N.S	90.86	90.86	0.034	3.86	101.62	101.62	0.04	4.31
Interaction									
AXB									
A_1 B_1	2317.00	13088.24	10771.24	5.65	464.88	12931.37	10614.37	5.58	458.11
B_2	2359.00	13450.98	11091.98	5.70	470.20	13313.73	10954.73	5.64	464.38
B_3	2401.00	14666.67	12265.67	6.11	510.86	14627.45	12226.45	6.09	509.22
A_2 B_1	2317.00	14754.90	12437.90	6.37	536.81	14460.79	12143.79	6.24	524.12
B_2	2359.00	15058.83	12699.83	6.38	538.36	14813.73	12454.73	6.28	527.97
B_3	2401.00	15323.53	12922.53	6.38	538.21	15127.45	12726.45	6.30	530.05
A_3 B_1	2317.00	17686.28	15369.28	7.63	663.33	17392.16	15075.16	7.51	650.63
B_2	2359.00	18225.49	15866.49	7.73	672.59	18107.84	15748.84	7..68	667.61
B_3	2401.00	18343.14	15942.14	7.64	663.98	18205.88	15804.88	7.58	658.26
L.S.D 5%	N.S	157.37	157.37	0.067	6.68	176.01	176.01	0.07	7.47

5.5 The Profitability:

Table 3 Show that, the average of profitability of onion seed yield faddan reached about 666.63, 658.83 in 1997-98 and 1998-99 respectively for 10cm. between sets, 571.02, 565.85 in 1997-98 and 1998-99 respectively with 150 Kg N/ faddan and 672.59, 667.61 in 1997-98 and 1998-99 respectively for the interaction (10cm. spacing & 120 Kg N / faddan).

According to the results we recommended that the sets are useful and use the closer spacing (10cm) to obtain high seed yield /fadd, gross margin and benefit cost ratio.

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دراسة اقتصادية على إنتاج بذرة البصل من البصيلات تحت مسافات زراعة ومستويات تسميد آزوتى مختلفة

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ان هدف هذة الدراسة هو استخدام البصيلات كتقاوى فى انتاج بذرة البصل. الحبة السوداء -بدلا من الابصال الكبيرة ولقد تم اجراء تجربتان حقليتان فى موسمين زراعيين متتاليين هما ١٩٩٨/٩٧ ،١٩٩٩/٩٨ بمزرعة محطة البحوث الزراعية بسدس بمحافظة بنى سويف وذلك لدراسة اثر التسميد الازوتى بثلاث مستويات ١٥٠،١٢٠،٩٠ وحدة أزوتية للفدان تحت ظروف زراعة البصيلات على مسافات زراعة ١٥،١٢,٥،١٠ سم على جانبى الخط . وكانت النتائج على النحو التالى.

- عدد الافرخ الخضرية بكل نبات :- لقد وجدت فروق معنوية بين المعاملات للمسافات ومعدلات التسميد الآزوتى ولكن التفاعل بين العاملين تحت الدراسة كان غير معنوى فى كلا الموسمين وقد أعطت مسافة الزراعة ١٥ سم أعلى قيمة حيث بلغت (٢، ١,٩ /نبات) خلال موسمى ٩٨/٩٧، ٩٩/٩٨ وكذلك أعطى المعدل ١٥٠ كجم / ف تسميد آزوتى (١,٨٦، ١,٨٨ /نبات) على التوالى ٩٨/٩٧، ٩٩/٩٨
- محصول بذرة النورة :- لقد اعطت كل المعاملات زيادة معنوية لمحصول بذرة النورة حيث كانت أعلى قيمة مع مسافة الزراعة ١٥ سم (٦,١٦، ٦,٠٧ جرام/للنورة) خلال موسمى الزراعة ٩٨/٩٧ ، ٩٩/٩٨ كما أن معدل التسميد الآزوتى ١٥٠ كجم/فدان أعطى أعلى قيمة لمحصول بذرة النورة (٥,٨٣، ٥.٧٧ جرام) على التوالى ، كما أن التفاعل بين عاملى الدراسة اعطى فروقا معنوية حيث أعطت أكبر مسافة زراعة مع أعلى معدل للتسميد الآزوتى (٦,٩٣ جرام/نبات) خلال موسمى الزراعة٠.
- متوسط محصول البذرة للنبات :- وجدت فروق معنوية بين المعاملات فى حالة مسافات الزراعة و كانت أعلى قيمة مع المسافة ١٥ سم حيث بلغت (١٤,٢٨، ١٤,٢١ جرام/نبات) على التوالى وكذلك المعدل العالى من التسميد الآزوتى أعطى (١٣,٤٨ جرام/نبات) للموسم الأول ، (١٣,٥٧ جرام/نبات) للموسم الثانى كما كان التفاعل معنويا بين التسميد الآزوتى ومسافة الزراعة حيث أعطت أكبر مسافة مع أعلى معدل تسميد (١٥,٢٣ جرام/نبات) فى الموسم الأول ، (١٥,٥ جرام/نبات) فى الموسم الثانى٠
- محصول البذرة /ف :- وجدت هناك فروق معنوية لكلا عاملى الدراسة وكذلك التفاعل بين العاملين ولكن وجد أن أعلى قيمة لمحصول البذرة /ف مع المسافة ١٠ سم حيث بلغت القيمة (٦١٤,٩، ٦٠٨,٧ كجم /ف) على التوالى لموسمى الزراعة وبالنسبة لمعدلات التسميد الآزوتى فإن أعلى معدل تسميد أعطى أعلى قيمة لمحصول بذرة/ف حيث كانت (٥٤٧,٧٨ كجم /ف) للموسم الأول ، (٥٤٣,٥٦ كجم /ف) للموسم الثانى بينما التفاعل بين عاملى الدراسة أعطت أعلى قيمة مع ١٠ سم مسافة زراعة مع معدل التسميد العالى (٦٢٣,٧ ، ٦١٩ كجم/ف) على التوالى لموسمى الزراعة٠
- كانت النتائج الأقتصادية أعلي ربحية مع معدل مسافة الزراعة ١٠ سم حيث حققت صافي ربح ١٥٧٢٥,٩٧، ١٥٥٤٢,٩٦ جنية خلال عامي ٩٨/٩٧ ، ٩٨ /٩٩ علي التوالي، معدل التسميد الأزوتي ١٥٠ كجم / للفدان بلغت ١٣٧١٠,١١، ١٣٥٨٥,٩٣جنية علي التوالي بينما التفاعل بين المسافة ١٠ سم ومعاملة معدل التسميد ١٥٠ كجم / للفدان حققت أعلي قيمة لصافى الربح حيث بلغت ١٥٩٤٢,١٤ ، ١٥٨٠٤,٨٨جنية.خلال عامي ٩٧/ ٩٨ ، ٩٨/٩٩ في حين نسبة B/C بلغت أعلي قيمة لها (٧,٧٣ ، ٧,٦٨) علي التوالي لمعاملة المسافة ١٠ سم مع معدل تسميد أزوتي ١٢٠ كجم / للفدان