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EFFECT OF SEEDING RATE, SEED SIZE AND COATING SEEDS ON YIELD AND ITS COMPONENTS OF WHEAT

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ABESTRACT: Two field experiments were conducted at Tag Al-Ezz Agricultural Research Station Farm, Dakahlia Governorate, A.R.C. during 1996/1997 and 1997/1998 seasons to study the effect of seeding rate, seed size and level of seed coating treatments with coatingen as well as interactions between these factors on yield and yield component of wheat (Triticum aestivum, L.) cv. Sakha 69.

The results obtained from this study could be summarized as follows :

- Seeding rate of 45 kg seed/fed significantly exceeded the rates of 60 and 75 kg seed/fed with most estimated characteristics such as flag leaf area, spike length, number of spikelets/spike, number of grains/spike, grains weight/ spike and 1000- grain weight.

- Seeding rate at 75 kg markedly recorded the highest values of plant height, number of spikes/m2, grain yield, straw yield and crude protein percentage.

- Large seed size (3.0 mm) significantly recorded the highest values in studied traits, i.e. flag leaf area, spike length, number of spikelets/spike, number of grains/spike, grains weight/spike, 1000 grain weight and grain yield.

- Coating wheat seeds with coatingen with recommended dose (15g/kg seed) markedly recorded greater values than uncoating seeds in all studied characteristics.

- The interaction among seeding rate, seed size and seed coating treatments had a significant effect on flag leaf area number of spikes/m2 and grain yield in the first season.

- It can be concluded that for obtaining the high productivity from wheat (cv. Sakha 69) under the environmental condition of Dakahlia Gvernorate, it can be sown large seed size (3.0 mm) of wheat at the rate of 75 kg seed/fed and coating grains with coatingen.

INTRODUCTION

Wheat (Tricum aestivum, L.) is considered as one of the most important credits crops in Egypt as well as all over the world. The local consumption of wheat increases each year due to the continuous increase of population. Increasing wheat yield during the last decade and in the future is one of the most important strategic targets. Raising wheat productivity could be possible through planting the promising cultivars and adopting the agricultural practices.

Seeding rate plays an important role in determining the yield. It greatly varies from variety to another depending on kernel (seed) size. So, it has been recognize as one of the most important factor having a very pronounced effect on development of wheat crop. Hagras, (1985) stated that increasing seeding rate to 75 kg/fed increased number of spikes/m2, grain and straw yields/fed as well as harvest index of durum wheat cv. Stork. Abd EI-Gawad et al., (1986) found that the increase in seeding rates caused marked decreases in number of grains per spike and per spikelets while, plant height as well as straw and grain yields/fed, increased by increasing seeding rate from 25 to 30 kg/fed of the two wheat cvs. Sakha 61 and Stork. Essa (1990) indicated that increasing seeding, rate increased plant height, number of spikes/unit area, grain and straw yields, while it decreased grains number/spike, spike length and 1000-grain weight. Heakal and Zohary (1996) indicated that maximum values of grain and straw yields/fed, added to number of spikelets/spike and number of kernels/spike were obtained from seeding rate of 60 kg/fed. EI-Karamity (1998) indicated that plant height, number of spikes/0.25 m2, grain and straw yields in wheat plants were significantly increased with the increase in seeding rate from 45 to 85 kg/fed, while spike length, number of grains/spike and 1000-grain weight were decreased in both seasons and number of spikelets/spike in the first season. Number of spikelets/spike in the second season was not affected by seeding rates.

Concerning seed size many studies had shown that the largest seed size increased number of fertile tillers and grain yields, so wheat producers often screen out small seeds, preferring to plant only large seeds. Douglas et al. (1994) indicated that there was no significant effect of seed size and density. The only significant effect of seed size and density on seedling weight and number of heads. Baalbaki and Copeland (1997) reported that small seeds of both cultivars (Augusta and Hillsdale) produced the lowest grain yields. Planting small seeds resulted in significantly less tillers. Number of seeds per spike was significantly affected by seed size and selecting larger seeds during screening appears to be an inexpensive and efficient method of improving yield.

Seed coating treatment is considered among the most important factors which determine to a far extent the productivity of wheat, under shortage of mineral fertilizers, especially under the Egyptian environmental conditions. Gawade and Somawnshi, (1979) reported that dry matter production of wheat was increased due to the coating of seeds with Zn-sulphate-dicalcium phosphate dehydrate mixture. Attallah and EI-Karamity, (1997) stated that the increase in grain yield/fed due to application of coatingen reached to 5.04 % and 4.14 % in silt clay loam as well as 11.3 % and 11.6,1 % in sandy soil in 1994/1995 and 1995/1996 seasons, respectively.

This study aim to investigate the effect of three seeding rates, three seed size and coating seeds by different levels of coatingen (Zn, Mn, Fe and S) on growth, yield and yield components as well as crude protein percentage of wheat (cv. Sakha 69).

MATERIALS and METHODS

Two field experiments were carried out at Experimental Farm of Tag Al-Ezz Agricultural research Station, A.R.C., Dakahlia Governorate.

Samples of wheat grains were taken at random from one commercial seed lot of wheat cultivar Sakha 69.

A split-split plot design with four replications was used in this study. The main plots were allocated to the three seeding rates (45, 60 and 75 kg seed/fed).The sub-plots were occupied with three seed sizes, according to Douglas et al. (1994) as following : (1) Large, seed retained on 3.0 mm sieves, (2) Medium, seed passed through 3.0 mm sieves but retained on 2.5 mm sieves and (3) Small, seed passed through 2.5 mm sieves but retained on 2.0 mm sieves. The sub-sub plots included seed coating treatments (coating with 15g coatingen /kg seed and without coating).

Each sub-sub plot was 3.5 m long and 3.0 m wide, occupying an area of 10.5 m2, i.e. 1/400 fed. The amount of seeds per plot in kg was calculated according to the site of plot in the main plots (45, 60 or 75 kg seed/fed) without looking at the size of seeds. In both seasons, wheat crop was preceded by rice. Wheat grains were sown on 24th and 21st November in the first and second seasons, respectively. Other agricultural practices were carried out in the manner prevailing in the region except for the factors under study.

Studied characters :

(A) Growth measurements :

At the end of heading stage, ten guarded plants were taken at random from each sub-sub plot to measure the following characters:-

(1) Flag leaf area (cm2): It was determined according to Owen methods (1968).

(2) Plant height (cm): measured in cm from the soil surface to the top of the spike of main stem, exclusive of the own.

(B) Yield and yield components:

(1) Number of spikes/m2: calculated by counting all spikes per square meter.

(2) Spike length (cm).

(3) Number of spikelets/spike.

(4) Number of grains/spike.

(5) Grains weight/spike (g).

(6) 1000- grain weight (g).

(7) Grain yield (ardab/fed): Plants of the central area (one m2) of each sub-sub plot were harvested, threshed and grains at 13 % moisture were weighed in kilogram, and converted to ardab/fed (one ardab of wheat grains = 150 kg).

(8) Straw yield (ton/fed): The straw of the pervious sample was estimated in kilogram/m2 then was converted to ton/fed.

(C) Grain crude protein percentage :

Grain crude protein percentage was estimated according to the improved Kejeldahel method of A.O.A.C., (1980) modified by distilling the ammonia into saturated boric acid solution and titration with (0.1 NhCl) standard. Crude protein percentage was computed by multiplying the total N by 5.7.

Statistical analysis :

All obtained data were subjected to the statistical analysis according to the technique of analysis of variance (ANOVA) of the split-split plot design, and the least significant difference (LSD) method was used to test the differences between the treatment means as published by Gomez and Gomez (1984).

RESULTS and DISCUSSION

(1) Effect of seeding rates:

In the two seasons, results in Tables (1 and 2) indicate that seeding rates had significant effects on all the studied characters. Over both seasons, seeding rate 45 kg seed/fed significantly exceeded the rates of 60 and 75 kg seed/fed with most estimated characteristics such as flag leaf area, spike length, number of spikelels/ spike, number of grains/spike, grains weight/spike and 1000-grain weight. Seeding rate 75 kg markedly recorded the highest values of plant height, number of spikes/ m2, grain yield, straw yield and crude protein percentage in the two seasons of the experiment. Increasing seeding rate from 45 to 60 and 75kg seed/fed significantly increased grain yield from 16.42 to 17.14 and 20.06 ardab/fed and from 16.38 to 17.24 and 19.73 ardab/fed, in the first and second seasons, respectively. Thus, the highest seeding rate (75 kg seed/fed) is the most favourable rate which produced the maximum grain yield, and should be recommended. These results reflect the response of some yield contributing attributes such as spike length, number of spikelets/spike and grains weight/spike. More, these results may be due to the increase in number of spike/m2 with 75 kg seed/fed. These results were reported by El-Karamity, (1998).

(2) Effect of seed size :

Seed size had significant effects on all estimated characters. Data in Tables (1 and 2) reveal that large seed size (3.0 mm) significantly recorded the highest values in flag leaf area, spike length, number of spikelets/spike, number of grains/spike, grains weight/spike, 1000-grain weight and grain yield in both seasons. Small seed size (2.0 mm) significantly recorded the highest values of plant height, number of spikes/m2, straw yield and crude protein percentage in the two seasons of experimentation. Grain yield (ardab/ fed) was significantly differed in the three studied seed sizes in both seasons (Table 2). The highest values (18.76 and 18.91 ardab/ fed, in the first and second seasons, respectively) were obtained from large seed size (3.0 mm). While, the lowest averages of grain yield (17.17 and 16.70 ardab/ fed, in the first and second seasons, respectively) were produced by small seed size (2.0 mm). Increasing seed sizes from small (2.0 mm) through medium (2.5 mm) to

large seed size (3.0 mm) significantly increased averages grain yield from 17.17 through 17.69 to 18.76 ardab/fed and from 16.70 through 17.74 to 18.91 ardab/fed in the first and second seasons, respectively. This increase in grain yield may be due to the increase in yield components such as spike length, number of spikelets/ spike, number of grains/spike, grains weight/spike, and 1000-grain weight. These results were obtained by Douglas et al. (1994); Mian and Nafziger (1994) and Baal-baki and Copeland (1997).

(3) Effect of seed coating treatments:

Results in Tables (1 and 2) show that there were significant effects for seed coating treatments on all estimated traits and this was true in the two seasons of study. Coating wheat grains with coatingen as a source of micronutrients (Zn, Mn, Fe and S) with the recommended dose (15 g/kg seed) markedly recorded greater values in all studied characteristics than the uncoated seeds. Concerning the effect of seed coating treatments on grain yield (ardab/fed), coating seeds by coatingen had a significant effect on grain yield (ardab/fed) in both seasons (Table 2). The highest grain yield (18.17 and 18.81 ardab/fed, in the first and second seasons, respectively) were obtained by coating wheat grains by coatingen compared with control treatment (uncoating seeds) which averaged 17.57 and 16:76 ardab/fed in the first and second seasons, respectively. This increase may be due to the increases occurred in all yield components such as spike length, number of spikelets/spike as well as number of grains/spike. Thus, the present results indicated that coating seed by coatingen should be practiced to attain high grain yield. These results agreed with those of Attallah and EI-Karamity (1997).

(4) Interaction effects:

Number of spikes/m2 was significantly affected by the interaction among seeding rate, seed size and seed coating treatments during 1996/97 season (Table 3). The highest average number of spikes/m2 was noticed with sowing 75 kg of small size (2.0 mm) with seed coating. The interaction between seeding rate and seed size had a significant effect on grains weight/spike in the first season (Table 4). The highest averages of grains weight/spike was noticed with sowing 45 kg seed/fed having large seed size (3.0 mm). Maximum grain yield was obtained with seeding 75 kg seed/fed of large seed size (3.0 mm) in both seasons (Table 5). On the other hand, the lowest averages of grains weight/spike was observed with seeding 75 kg seed/fed of small seed size. The interaction among seeding rate, seed size and seed coating treatments significantly affected grain yield (ardab/fed) in the first season as presented in Table (6). The seeding rate of 75 kg seed/fed markedly recorded the greatest grain yield (20.90 ardab/fed) under large seed size (3.0 mm) with seed coating treatment, while, the lowest grain yield (14.91 ardab/fed) was obtained under 45 kg seed/fed and small seed size (2.0 mm) without coating seeds by coatingen.

In general, it could be concluded that for obtaining the high productivity from wheat (cv. Sakha 69) under the environmental condition of Dakahlia Governorate, it can be sowing large seed size (3.0 mm) of wheat at the rate of 75 kg seed/fed and coating grains with coatingen.

Table (1): Averages of flag leaf area (cm^2) plant height (cm) number of spikes/m^2, spike length (cm), number of spikelets/spike and number of grains/spike as affected by the studied factors in the two seasons.

Treatments	Flag leaf area (cm^2)		Plant height (cm)		Number of spikelets/spike		Spike length (cm)		No.of spikelets/ Spike		No. of grains/ Spike	
	96/97	97/98	96/97	97/98	96/97	97/98	96/97	97/98	96/97	97/98	96/97	97/98
(A) Seeding rates :												
45 kg/fed	36.06	36.59	104.96	100.27	294.02	290.49	10.59	10.42	20.52	20.00	42.72	40.43
60 kg/fed	34.31	32.18	106.75	102.18	313.55	326.76	9.95	10.27	20.15	18.70	41.12	38.70
75 kg/fed	32.01	27.80	109.33	112.00	392.74	386.68	9.86	9.41	19.51	18.64	39.62	35.99
F. Test	**	*	**	**	**	**	**	**	**	**	**	**
LSD at 5 %	2.21	6.62	1.86	2.75	11.74	9.22	0.33	0.34	0.45	0.43	0.96	1.89
LSD at 1 %	3.35	-	2.83	4.17	17.81	13.99	0.50	0.52	0.69	0.65	1.46	2.87
(B) Seed sizes :												
Small (2.0 mm)	30.66	29.53	109.79	107.34	360.97	35.1.53	9.92	9.74	19.40	18.23	39.70	37.00
Medium (2.5 mm)	34.28	31.23	107.00	104.03	333.63	334.16	10.18	10.00	19.97	19.13	41.18	37.09
Large (3.0 mm)	37.45	35.82	104.25	103.08	305.71	318.24	10.31	10.36	20.82	19.99	42.58	41.03
F. Test	**	*	**	**	**	**	*	**	**	**	**	**
LSD at 5 %	2.82	4.62	1.34	1.54	7.35	7.50	0.29	0.29	0.55	0.50	0.52	1.37
LSD at 1 %	3.87	-	1.84	2.11	10.07	10.28	0.40	0.41	0.76	0.69	0.71	1.89
(C) Seed coating :												
Without coating	32.48	30.79	105.31	102.97	321.87	319.99	9.95	9.84	19.73	18.77	40.53	36.77
With coating	35.77	33.60	108.72	106.66	345.00	349.31	10.32	10.22	20.39	19.46	41.78	39.97
F. Test	**	**	**	**	**	**	*	**	**	**	**	**

Table (2): Averages of grains weight/spike (g), 1000- grain weight (g), grain yield (ardab/fed), straw yield (ton/fed) and grain crude protein percentage as affected by studied factors in the two seasons.

Treatments	Grains weight/ splice (g)		1000-gram weight (g)		Grain yield (ardab/fed)		Straw yield (ton/fed)		Protein percentage	
	96/97	97/98	96/97	97/98	96/97	97/98	96/97	97/98	96/97	97/98
(A) Seeding rates :										
45 kg/fed	2.24	1.98	47.91	47.77	16.42	16.38	3.74	3.62	10.06	9.19
60 kg/fed	2.14	1.83	45.15	47.04	17.14	17.24	4.19	3.62	10.10	10.04
75 kg/fed	1.99	1.72	42.51	43.86	20.06	19.73	4.59	4.49	10.18	10.10
F. Test	**	**	**	*	**	**	**	*	**	**
LSD at 5 %	0.06	0.09	1.50	2.59	0.10	0.48	0.12	0.60	0.04	0.13
LSD at 1 %	0.09	0.14	2,27	-	0.15	0.73	0.19	-	0.06	0.20
(B) Seed sizes :										
Small (2.0 mm)	2.05	1.69	43.25	42.71	17.17	16.70	4.43	4.35	10.26	10.19
Medium (2.5mm)	2.13	1.79	45.08	47.66	17.69	17.74	4.16	3.76	10.10	9.84
Large (3.0 mm)	2.19	2.05	47.24	48.30	18.76'	18.91	3.93	3.62	9.98	9.31
F.Test	**	**	**	**	**	**	**	**	**	**
LSD at 5 %	0.03	0.14	1.50	2.67	0.12	0.80	0.11	0.39	0.04	0.11
LSD at 1 %	0.04	0.20	2.05	3.66	0.16	1.09	0.15	0.53	0.06	0.15
(C) Seed coating :										
Without coating	2.10	1.78	44.49	45.20	17.57	16.76	4.07	3.65	10.07	9.63
With coating	2.15	1.90	45,89	47.24	18.17	18.81	4.27	4.17	10.15	9.92
F. Test	**	**	**	**	**	**	**	**	**	**

Table (3): Averages of number of spikes/m^2 as affected by the interaction among seeding rate, seed size and seed coating treatments during 1996/97 season.

Seed coating Treatments	Seed sizes	Seeding rates		
		45 kg/fed	60 kg/fed	75 kg/fed
Without	Small (2.0mm)	295.98	325.04	428.69
	Medium (2.5mm)	286.70	293.75	401.06
	Large (3.0 mm)	274.50	293.48	297.68
With	Small (2.0 mm)	323.28	349.91	442.94
	Medium (2.5 mm)	301.51	316.31	402.46
	Large (3.0 mm)	282.15	302.80	383.63
F. Test		**		
LSD at 5 %		20.46		

Table (4): Averages of grains weight/spike (g) as affected by the interaction between seeding rate and seed size during 1996/97 season.

Treatments	Seed sizes		
	Small (2.0mm)	Medium (2.5mm)	Large (3.0mm)
Seeding rates :			
45 kg/fed	2.14	2.25	2.33
60 kg/fed	2.04	2.18	2.20
75 kg/fed	1.95	1.97	2.04
F. Test		**	
LSD at 5 %		0.05	

Table (5): Averages of grain yield (ardab/fed) as affected by the interaction between seeding rate and seed size during 1996/97 and 1997/98 seasons.

Treatments	Seed sizes					
	1996/97			1997/98		
	Small (2.0.mm)	Medium (2.5.mm)	Large (3.0 mm)	Small (2.0.mm)	Medium (2.5.mm)	Large (3.0 mm)
Seeding rates :						
45 kg/fed	15.45	16.00	17.79	15.36	17.14	16.25
60 kg/fed	16.38	17.13	17.91	15.76	17.55	18.81
75 kg/fed	19.69	19.92	20.57	18.99	18.52	21.68
F. Test	**			**		
LSD at 5 %	0.20			1.45		

Table (5): The ranges of chemical components (in wt %) of the Late Cretaceous- Lower Eocene carbonate rocks, G. Libni.

Age	Late Cretaceous		Lower Tertiary	
	Cenomanian-Turonian	Campanian-Maastrichtian	Paleocene	Lower Eocene
Formation	Halal	Sudr	Esna Shale	Thebes
Oxides in wt%	Range 6 samples	Range 6 samples	Range 6 samples	Range 6 samples
SiO_2	2.37-0.3	0.1	2.12-0.1	0.13-0.1
Al_2O_3	0.56-0.03	0.07-0.04	0.68-0.07	0.13-0.04
Fe_2O_3	0.32-0.04	0.05-0.04	0.74-0.12	0.07-0.04
CaO	52.14-31.8	53.43-52.97	53.43-49.24	53.55-52.97
MgO	19.41-2.51	2.09-1.51	3.60-1.54	1.92-1.55
Na_2O	0.3-0.01	0.3-0.02	0.13-0.01	0.07-0.01
SO_3^-	0.67-0.11	0.18-0.05	0.22-0.08	0.07-0.01
L.O.I.	45.82-43.24	43.72-42.9	43.47-42.35	43.80-43.44
Cl^-	0.23-0.01	0.23-0.02	0.08-0.01	0.04-0.01

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تأثير معدلات التقاوى ، حجم البذور وتغليف التقاوى على المحصول ومكوناته فى القمح

عوض القصبى ، مروءة عطا ، مجدى العبادى

قسم المحاصيل – كلية الزراعة – جامعة المنصورة
قسم بحوث تكنولوجيا البذور ، معهد بحوث المحاصيل الحقلية ، مركز البحوث الزراعية

أقيمت تجربتان حقليتان بمحطة بحوث تاج العز بمحافظة الدقهلية خلال موسمى ١٩٩٦/١٩٩٧ لدراسة تأثير معدلات التقاوى ، حجم الحبوب وتغليف الحبوب .. وكذلك التفاعل بينها على كمية المحصول ومكوناته فى القمح صنف سخا ٦٩ ... ويمكن تلخيص النتائج المتحصل عليها كالآتى :

– أوضحت النتائج أن معدل التقاوى ٤٥ كجم / فدان قد سجل أعلى القيم مقارنة بالمعدلات ٦٠ ، ٧٥ كجم / فدان بالنسبة لصفات مساحة ورقة العلم ، طول السنبلة ، عدد السنيبلات بالسنبلة ، عدد الحبوب بالسنبلة ، وزن الحبوب بالسنبلة بالإضافة إلى وزن ١٠٠٠ حبة .

– أوضحت النتائج أن معدل التقاوى ٧٥ كجم / فدان سجل أعلى القيم بالنسبة لطول النبات ، عدد السنابل /م٢ ، محصول الحبوب ، محصول التبن / فدان وكذلك لنسبة البروتين الخام .

– أوضحت النتائج أن حجم الحبوب الكبير سجل أعلى القيم معنوياً بالنسبة لمساحة ورقة العلم ، طول السنبلة ، عدد السنيبلات بالسنبلة ، عدد الحبوب بالسنبلة ، وزن حبوب السنبلة ، وزن ١٠٠٠ حبة بالإضافة إلى محصول الحبوب .

– سجل تغليف الحبوب بالكونتجين بالجرعة الموصى بها (١٥ حجم / كحجم حبوب) أعلى القيم .

– كان للتفاعل بين معدل التقاوى وحجم الحبوب تأثيرا معنوياً علي وزن حبوب السنبلة ونسبة البروتين الخام فى الموسم الأول وعدد السنابل / م٢ ومحصول الحبوب / فدان خلال الموسمين .

– كان للتفاعل بين حجم الحبوب ومغلفات الحبوب تأثيراً معنوياً على مساحة ورقة العلم ، عدد السنابل / م٢ فى الموسم الأول ، بينما كان معنوياً على طول النبات ، طول السنبلة بالإضافة إلى عدد السنيبلات بالسنبلة فى الموسم الثانى .

– كان للتفاعل بين معدل التقاوى وحجم الحبوب ومغلفات الحبوب تأثيراً معنوياً على مساحة ورقة العلم ، عدد السنابل / م ٢ وكذلك محصول الحبوب / فدان فى الموسم الأول .

توصى الدراسة باستخدام الحبوب الكبيرة (٣٠٠مم) بمعدل ٧٥ كجم تقاوى / فدان مع تغليف التقاوى بالكونتجين للحصول على محصول مرتفع من القمح صنف سخا ٦٩ فى ظروف مماثلة لهذه الدراسة بمحافظة الدقهلية .