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PERFORMANCE OF SOME WHEAT (*Triticum aestivum L.*) CULTIVARS UNDER LATE SOWING IN NEWLY RECLAIMED SOILS

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ABSTRACT

The aim of this research was to determine the effect of three sowing dates (Nov 20th , Dec 5th and Dec 20th) on yield and some yield contributing characters of three wheat cultivars namely Gemmiza 10,Giza 168 and Sakha 94 . Two field experiments were carried out in Tag El-Ezz Agricultural Research Station, Dakahlia Governorate, Agricultural Research Center (A.R.C.), Egypt, during the two successive seasons 2007/2008 and 2008/2009. Split Plot Design with four replicates were used.

According to the results, sowing dates had significant effect on flag leaf area, number of days to heading, plant height, number of spikes/m^2,spike length, 1000-grain weight, number of grains/spike, grain yield and protein percentage. Sowing in Nov 20th resulted in the highest grain yield and its contributing. Sowing in Dec 5th cause reduction in grain yield and its contributing estimated by about 22-23 % in both seasons. Sowing in Dec 20th cause reduction in grain yield about 35-44 % in both seasons.On the other side wheat cultivars significantly differed in all previous mentioned characters. However,the cultivar Gemmiza 10 surpassed both Giza 168 and Sakha 94 cultivars in flag leaf area,number of grains/spike,spike length,protein % and grain yield.Meanwhile, Giza 168 surpassed Gemmiza 10 and Sakha 94 in number of spikes/m^2,and 1000-grain weight in both seasons.Moreever,the results exhibited that interaction effect between sowing date and wheat cultivar was significant in all studied characters in both seasons. This results indicated that Gemmiza 10 was the most tolerant one to late sowing until Dec 5th under these experimental environment.

INTRODUCTION

Wheat (*Triticum aestivum L*.) is the most important cereal crop in Egypt as its grain is used as for human food and its straw used as fodder for animals. The cultivated area reached about 2.6 million feddan wheat in the winter seasons of 2007 and 2008 produced an average of 18.1 Ardab/Feddan of grain and the seed production averaged about 220 tones in the same seasons **(**FAO STAT, 2008). Wheat production in Egypt is limited by various factors among them sowing dates, and cultivars. Sowing time is a crucial factor for obtaining desirable wheat yield so a need was felt to study growth and yield behavior of three wheat cultivars under late sowing conditions. Delayed sowing of wheat not only affects germination and growth but also affects grain development Hayam Mahgoub and Amin (2005). However Tammam and Tawfelis (2004) stated that early sowing during November was favorable to high grain yield because the post anthesis period coincided with relatively lower temperatures.Whereas,late sowing was unfavorable due to higher temperatures during anthesis.Also,Mohamed and Nazeir (1986) found a progressive decrease in yield components; i.e. number

of grains per spike, kernel weight when sowing date of wheat was delayed from November to mid January. So late planting is a major constrain facing increasing wheat production particularly in Middle Egypt. This constrain is actually because most farmers prefer to grow cash crops such as potato and peas for export and local consumption, and they harvest those crop late in December.Sarlach *et al.* (2008) reported that the seed produced from timely-sown crop performed better with respect to 1000-grain weight and yield attributing than seed produced from late-sown crop. Riaz *et al.* (1997) and Kheiralla *et al.* (1992).Improved cultivars and its seed quality are the key to agriculture progress.The present study was mainly directed to maximize the productivity of some wheat cultivars through optimum sowing dates which led to improving grain yield and grain quality of wheat under newly reclaimed soils at North Delta of Egypt.

MATERIALS AND METHODS

Two field experiments were conducted at the Experimental Farm of Tag El-Ezz Agricultural Research Station (A.R.C.) Dakahlia, Egypt during 2007/2008 and 2008/2009 wheat growing seasons to inspect the impact of three wheat cultivars i.e. Gemmiza 10, Giza 168 and Sakha 94 under three sowing dates (Nov 20th ; Dec 5th ; and Dec 20th) on growth, yield and yield components.

The field experiments were laid out in using a Split plot design with four replications.The main plots were devoted to the three sowing dates (Nov 20th; Dec5th; and Dec20th), the sub-plots were allocated to wheat cultivars (Gemmiza 10, Giza 168 and Sakha 94).The plot area was 10.5 m^2 (15 rows, 3.5 m long and 20 cm apart).Seeds were drilled at the rate of 400 seeds/m^2. All recommended cultural practices were applied.

Data were collected for flag leaf area (cm^2),number of days to heading,plant height,number of spikes/m^2,spike length (cm),1000-Grain weight (g),number of grains/spike,grain yield (ardab/fed) and protein percentage.At harvest,the two external rows from each plot were eliminated to avoid the border effect.So,13 rows were harvested,threshed and their grain yields were weighted and adjusted to (ardab/fed).

The data of each season were subjected to the proper statistical analysis of variance and differences among the means of the studied characters were judged by N-LSD at 5% level of significance according to Gomez and Gomez (1984).

Table 1 : The wheat cultivars pedigree

Cultivars	Pedigree
Sakha 94	OPATA / RAYON // KAUZ.CMBW 90Y3180 – OTOPM - 3Y-010M - 010M -010Y - 10M – 015 – OY – OAP - 0S.
Gemmiza 10	MAYA 74'S' / ON // 1160 – 147 / 3/ BB / GLL / 4 / CHAT 'S' / 5/ CROW'S'.CGM 5820 - 3GM -1GM -2GM -OGM.
Giza 168	MIL / BUC // Seri CM 93046 - 8M - 0Y- 0M -2Y -0B.

Table 2: Chemical and physical properties of the experimental site in 2007/2008 and 2008/2009 seasons.

Characters	2007/2008	2008/2009
Soluble cations meq/lit		
Na^+	11.0	12.00
K^+	0.36	0.30
$Ca^{++} + Mg^{++}$	6.20	7.20
Soluble anions meq/lit		
$CO3^-$	-	-
Hco_3^-	2.60	2.20
Cl^-	13.00	14.00
So_4	1.35	1.30
PH	7.80	7.97
EC ds/m	1.80	2.00
O.M.%	1.10	1.20
N (ppm) available	9.00	8.00
P (ppm) available	28.00	30.00
Physical properties		
Sand %	11.5	12.6
Silt %	32.9	35.0
Clay %	55.4	52.3
Texture class	Clay	Clay

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Table 3: Mean of temperature degrees (˚C), relative humidity (%) and rain fall (mm) at the experimental sites during the two seasons.

Months	Temperature (ºC)				R.H. (%)				Rain (mm)	
	2007/08		2008/09		2007/08		2008/09		2007/08	2008/09
	Min	Max	Min	Max	Min	Max	Min	Max	Avera	Avera
November	14.2	26.4	13.2	22.9	48.0	96.3	40.0	87.5	0.1	0.0
December	9.9	21.3	10.5	19.3	54.0	95.7	42.9	87.1	0.0	0.0
January	7.7	17.9	8.2	17.8	46.0	96.6	38.0	84.4	0.1	0.0
February	8.1	18.7	8.5	18.5	28.0	97.3	34.1	89.2	0.1	0.2
March	12.2	25.8	8.8	20.5	44.0	95.2	29.5	89.2	0.0	0.0
April	13.6	28.4	14.5	26.9	26.0	96.6	34.8	93.2	0.0	0.0
May	16.6	31.5	15.5	27.5	26.0	94.4	30.5	93.3	0.0	0.0
June	21.7	34.4	19.5	32.1	46.0	94.9	27.2	87.7	0.0	0.0

Sources : Ministry of Agriculture and Land Reclamation, Agriculture Research Center (ARC), Central Management of Agriculture Guideline, Bulletin of Agriculture Meteorological Data (Meteorological Station in Aga district).

RESULTS AND DISCUSSION

It is evident from Tables 4,5 and 6 that late sowing had negative effects on flag leaf area, days to heading, plant height, number of spikes/ m^2,spike length ,spike weight,number of grains/spike,1000-grain weight,grain yield, while protein % was increased in both seasons.The highest values of yield and yield components were produced when wheat were sowing in 20th of Nov, followed by sowing in Dec 5th and Dec 20th.Sowing in 5th or 20th of

Dec caused 23.35 % and 20.43 % or 42.43% and 35.53 % reduction in grain yield per feddans compared to those sowing in 20th of Nov in 2007-2008 and 2008-2009 seasons,respectively.These results are in accordance with those reported by Mascagni and Harison (2003), Qasim *et al.* (2008), Inamullah *et al.* (2007) and Rachid *et al.* (2004).The reduction in spike grain weight caused by late sowing might be attributed to the decrease in photosynthesis ability during grain filling stage which led to the decrease in metabolites quantity which are translocated and stored in grains resulting in a decrease in 1000-grain weight as shown in Table (2) and led to reduction in spike grain weight.Also,number of days to heading was significantly decreased with delayed sowing.This might be due to that wheat plants were more efficient in converting solar energy with optimum sowing date.Similar trend was found for plant height in both seasons. The plants became shorter than those of earlier sowing .The reduction in grain yield caused by late sowing might be attributed to that late sowing caused a significant decrease in each of the number of spikes/m^2,spike grain weight,number of days to heading and 1000-grain weight .These results are in harmony with those of Andrews *et al.* (1992), Sadeghzadeh *et al.* (2001), Thiry *et al.* (2002),Askary *et al.* (2003), Rashid (2004),Mahmoud *et al.* (2004) and Inamullah *et al.* (2007).It is quit interesting to mention that the mean of the reduction on combined data in the grain yield was 21 % when sowing at Dec 5th followed and reached to 38 % when sowing at Dec 20th.

Table 4: Average of flag leaf area , days to heading and plant height of Sakha 94 ,Giza 168 and Gemmiza 10 wheat cultivars as influenced by sowing dates during 2007/2008 and 2008/2009 seasons.

Treatment	Flag leaf area (cm^2)		Days to heading		Plant height (cm)	
	200//2008	2008/2009	200//2008	2008/2009	200//2008	2008/2009
A-Planting dates						
Nov20th	٣٤,٠	٣٢,٣	99.7	٩٩,٢	102.8	١٠٢,٣
Dec5th	٣٢,١	٣٢,٣	96.4	٩٥,٩	99.0	٩٨,٢
Dec20th	٣٢,٠	٣٢,٠	93.1	٩٢,٦	89.1	٨٦,٨
F-Test	**	**	**	**	**	**
NLSD at 5%	٠,١	٠,١	٠,٢	٠,٢	٠,٧	٠,٥
B-Cultivars						
Sakha 94	٣٢,٣	٣٢,٤	97.5	٩٧,٤	103.8	١٠٢,٥
Giza168	٣١,٣	٣٠,٩	92.6	٩٢,٦	97.6	٩٦,٤
Gemmiza10	٣٤,٥	٣٣,٢	98.1	٩٧,٧	89.6	٨٨,٦
F-Test	**	**	**	**	**	**
NLSD at 5%	٠,١	٠,١	٠,٢	٠,٢	٠,٧	٠,٥
C-Interaction						
AXB	**	NS	NS	*	NS	**

Table 5 : Average of number of spikes , spike length and 1000-grain weight of Sakha 94 ,Giza 168 and Gemmiza 10 wheat cultivars as influenced by sowing dates during 2007/2008 and 2008/2009 seasons.

Treatment	Number of spikes/m²		Spike length (cm)		1000-Grain weight (g)	
	200//2008	2008/2009	200//2008	2008/2009	200//2008	2008/2009
A-Planting dates						
Nov20th	394.6	٤٢١,٨	١٢,٦	١٢,٦	43.0	43.0
Dec5th	379.2	٣٨٩,١	١١,٥	١١,٥	42.0	٤٢,١
Dec20th	364.0	٣٢٦,٨	١٠,٧	١٠,٦	40.6	٤٠,٥
F-Test	**	**	**	**	**	**
NLSD at 5%	٣,٤	٩,٧	٠,١	٠,١	٠,٣	٠,٢
B-Cultivars						
Sakha 94	370.0	٣٩٠,٨	١٠,١	١٠,٤	39.9	٣٩,٨
Giza168	394.8	٣٨٦,٨	١١,٦	١١,٩	44.9	٤٤,٨
Gemmiza10	372.9	٣٦٠,١	١٣,٠	١٢,٤	40.7	٤٠,٦
F-Test	**	**	**	**	**	**
NLSD at 5%	٣,٤	١٠,٨	٠,١	٠,١	٠,٣	٠,٢
C-Interaction						
AXB	**	NS	**	**	**	**

Table 6 : Average of number of grains/spike, grain yield and protein percentage of Sakha 94 ,Giza 168 and Gemmiza 10 wheat cultivars as influenced by sowing dates during 2007/2008 and 2008/2009 seasons.

Treatment	Number of grains/spike		Grain yield (ard/fed)		Protein percentage (%)	
	200//2008	2008/2009	200//2008	2008/2009	200//2008	2008/2009
A-Planting dates						
Nov20th	52	50	١٨,٣٤٠	17.415	١٢,١	١٠,٨
Dec5th	48	48	١٤,٠٥٧	١٣,٨٥٦	١٤,٢	١٢,١
Dec20th	46	46	١٠,٥٥٧	١١,٢٢٦	١٥,٤	١٤,٠
F-Test	**	**	**	**	**	**
NLSD at 5%	٠,١	٠,٣	٠,٢٤٦	٠,١٠٥	٠,١	٠,١
B-Cultivars						
Sakha 94	50	٥١	١٣,٧٣١	١٣,٩٠٠	13.0	١٢,٠
Giza168	٤٣	٤٣	١٤,٣٨٤	١٤,٠٩٩	١٣,٨	١٢,٤
Gemmiza10	٥٢	٥١	١٤,٨٣٩	١٤,٤٩٩	١٣,٨	١٣,٠
F-Test	**	**	**	**	**	**
NLSD at 5%	٠,١	٠,٣	٠,٢٦١	٠,١٢٤	٠,١	٠,١
C-Interaction						
AXB	**	**	NS	**	**	**

Highly significant differences were detected among the tested wheat cultivars regarding to flag leaf area,days to heading,plant height, number of spikes/m^2,spike length,spike weight,number of grains/spike,1000-grain weight,grain yield,as well as protein % (Tables 4,5 and 6).Gemmiza 10 cultivar gave the highest values in flage leaf area,number of grains/spike,spike length,protein % and grain yield.On the other hand Giza 168 gave the highest value in number of spikes/m² and 1000-grain

weight.Morever,Sakha 94 and Giza 168 were earlier in number of days to heading while, Gemmiza 10 was late in heading in both seasons.However Sakha 94 cultivar gave the lowest values in all studied characters in both seasons.The superiority of Gemmiza 10 over Giza 168 and Sakha 94 may be attributed to its genetic make up for highest yielding ability. Similar results were obtained by Andrews *et al.* (1992), Mascagni and Harison (2003), Askary *et al.* (2003), Mahmoud *et al.* (2004),Inamullah *et al.* (2007) and Qassim *et al.* (2008).

Interaction effect:

Data presented in Table 7 show that the interaction between sowing date and wheat cultivars had highly significant effects on grain yield in both seasons.The highest grain yield was produced by Gemmiza 10 variety when sowing in Nov 20th. On the other hand,the lowest values of grain yield produced from Sakha 94 cultivar panted at late sowing in Dec 5th followed by Dec 20th.Morever,at the late sowing the grain yield of Sakha 94 wheat cultivars was reduced by 24.24% and 24.77 at 5th of Dec and by the 42.20% and 40.44% at 20th Dec.similarly, Giza 168 wheat cultivars sown at Dec 5th was reduced by 21.33 % and 14.01 % and by 43.17 and 31.53 when it was power at Dec 20th in 2007/2008 and.On the other hand, the reduction in Gemmiza10 sown at Dec 5th was 24.45 and 22.08% ,while with sowing at Dec 20th the reduction reached to 41.95 and 34.38% in the two seasons,respectively.These results indicated that Gemmiza 10 wheat cultivar more tolerant than both Giza 168 and Sakha 94 wheat cultivars for late sowing in 20th Dec.These data are in accordance with those reported by Andrews *et al.* (1992), Riaz *et al.* (1997), Askary *et al.* (2003) , Subhan *et al.* (2004), Inamullah *et al.* (2007) and Qassim *et al.* (2008).

Table 7: Averages of grain yield as affected by the interaction between sowing dates and cultivars performance in 2007/2008 and 2008/2009 seasons.

Seasons	**2007/2008**			**2008/2009**		
Sowing dates / Cultivars	**Nov20th**	**Dec5th**	**Dec20th**	**Nov20th**	**Dec5th**	**Dec20th**
Sakha94	17.637	13.361	10.194	17.761	13.360	10.577
Giza 168	18.324	14.414	10.413	16.622	14.292	11.381
Gemmiza10	19.058	14.397	11.062	17.861	13.916	11.719
F. Test.	**			*		
N.L.S.D at 5 %	0.856			0.203		

Data presented in Table 8 show that the interaction between sowing date and wheat cultivars had highly significant effect on 1000-grain weight in both seasons. The highest values was produced by Giza 168 variety when sowing in Nov 20th followed by Gemmiza 10 and Sakha 94. On the other hand,the lowest values of 1000-grain weight were produced from Sakha 94 cultivar sown at Dec 5th followed by sown at Dec 20th.At the late sowing also,Giza 168 wheat cultivars had the lowest reduction in 1000-grain weight (0.87% and 1.09% at Dec 5th and at Dec 20th the reduction reached to 3.94

and 4.38%).These data are in accordance with those reported by Sarlach *et al.* (2008) ,Inamullah *et al.* (2007) and Qassim *et al.* (2008).

Table 8: Averages of 1000-Grain weight (g) as affected by the interaction between sowing dates and cultivars performance in 2007/2008 and 2008/2009 seasons.

Seasons	2007/2008			2008/2009		
Sowing dates / Cultivars	Nov20th	Dec5th	Dec20th	Nov20th	Dec5th	Dec20th
Sakha94	41.1	39.7	37.8	41.0	38.6	37.7
Giza 168	45.6	45.2	43.8	45.6	45.1	43.6
Gemmiza10	41.3	40.7	40.1	41.2	40.6	40.1
F. test.		**			**	
N.L.S.D 5 %		0.1			0.1	

Data presented in Table 9 show that the interaction between sowing date and wheat cultivars had highly significant effects on protein percentage in both seasons. The highest values was produced by Sakha 94 cultivar sown at Dec 20th followed by Giza 168 and Gemmiza 10 sown at Dec 20th . On the other hand,the highest values of protein percentage produced from Sakha 94 cultivar sown at Dec 20th followed by that sown at Dec 5th .Meanwhiles, Giza 168 wheat cultivars sown at Nov 20th gave the lowest values in protein percentage estimated by 12 and 11.5 %. These data are in accordance with those reported by Sarlach *et al.* (2008) ,Inamullah *et al.* (2007) and Qassim *et al.* (2008).

Table 9: Averages of protein (%) as affected by the interaction between sowing dates and cultivars performance in 2007/2008 and 2008/2009 seasons.

Seasons	2007/2008			2008/2009		
Sowing dates / Cultivars	Nov20th	Dec5th	Dec20th	Nov20th	Dec5th	Dec20th
Sakha 94	12.3	14.3	15.5	11.8	13.8	15.6
Giza 168	12.0	14.2	15.4	11.5	13.4	14.8
Gemmiza10	11.9	14.1	15.3	11.0	13.6	14.7
F. test.		**			*	
N.L.S.D 5 %		0.2			0.3	

Generally, it can be concluded that raising wheat productivity under late sowing condition could be achieved through sowing high yielding cultivars, such as Gemmiza 10 at Nov 20th under newly reclaimed soils at North Delta of Egypt.

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سلوك بعض اصناف القمح تحت ظروف الزراعة المتاخرة فى الاراضى حديثة الاستصلاح

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يهدف هذا البحث الى دراسة تاثير مواعيد الزراعة (٢٠ نوفمبر-٥ ديسمبر و ٢٠ ديسمبر) على المحصول ومكوناته وذلك لثلاثة اصناف من القمح (جميزة ١٠ – جيزة ١٦٨ و سخا ٩٤) لذلك أقيمت تجربتان حقليتان بمحطة البحوث الزراعية بتاج العز – دقهلية - مصر- خلال موسمي ٢٠٠٧-٢٠٠٨ و ٢٠٠٨-٢٠٠٩ بهدف دراسة سلوك بعض اصناف القمح (جميزة ١٠-جيزة ١٦٨ و سخا ٩٤)لمواعيد الزراعة وتم تنفيذ التجارب فى تصميم القطع المنشقة مرة واحدة في اربع مكررات

و أهم النتائج المتحصل عليها ما يلى:

١-أظهرت النتائج ان الزراعة فى ٢٠ نوفمبر ادت إلى زيادة معنوية في مساحة ورقة العلم وعدد الايام حتى الطرد و طول النبات و عدد السنابل/م٢ وطول السنبلة و وزن حبوب السنبلة و وزن الألف حبة و عدد الحبوب / السنبلة و محصول الفدان من الحبوب في كلا الموسمين. بينما انخفضت نسبة البروتين.

٢-اشارت النتائج ان الزراعة فى ٥ ديسمبر ادت الى انخفاض كل الصفات المدروسة ما عدا نسبة البروتين التى ارتفعت مع التاخير فى ميعاد الزراعة فى كلا الموسمين حيث انخفض فى محصول الحبوب (اردب/فدان) بحوالى٢٢-٢٣ % فى كلا الموسمين على الترتيب.

٣-اوضحت النتائج ان الزراعة الزراعة فى ٢٠ ديسمبر ادت الى انخفاض كل الصفات المدروسة ما عدا نسبة البروتين التى ارتفعت مع التاخير فى ميعاد الزراعة فى كلا الموسمين.حيث انخفض محصول الحبوب (اردب/فدان) بحوالى ٣٥ و ٤٤% مقارنة بالزراعة فى ٢٠ نوفمبر فى كلا الموسمين على التوالى.

٤-أظهرت النتائج أن الصنف جميزة ١٠ تفوق على الصنف جيزة ١٦٨ والصنف سخا٩٤ فى جميع الصفات المدروسة فى كلا الموسمين.وأعطى أعلى كمية لمحصول الحبوب للفدان ١٤,٨٣٩ اردب و ١٤,٤٩٩ اردب / فدان فى موسمى الدراسة على التوالي بينما أعطى الصنف جيزة ١٦٨ ١٤,٣٨٤و١٤,٠٩٩ اردب/فدان والصنف سخا ٩٤ اقل محصول للحبوب للفدان ١٣,٧٣١ و ١٣,٩٠٠ اردب/فدان فى موسم ٢٠٠٧- ٢٠٠٨ و موسم ٢٠٠٨-٢٠٠٩ على التوالى.

٥-أظهرت النتائج أن للتفاعل بين مواعيد الزراعة والأصناف تاثيرا معنويا لمحصول الحبوب/فدان فى كلا الموسمين حيث سجل زراعة الصنف جميزة١٠ والزراعة فى ٢٠ نوفمبر أعلى محصول حبوب للفدان فى كل الصفات المدروسة في كلا الموسمين.

توصى هذة الدراسة بزراعة الصنف جميزة ١٠ والزراعة فى ٢٠ نوفمبر وذلك لتعظيم على إنتاجية محصول القمح من وحدة المساحة تحت ظروف الاراضى حديثة الاستصلاح بمحافظة الدقهلية.

قام بتحكيم البحث

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