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Yield, Yield Traits and Grain Properties of some Bread Wheat Cultivars as Influenced by Planting Dates under Egyptian Conditions

El Sayed, A. A.[1]; A. M. Omar[1]; S. A. Elsaied[2] and Basma E. El Samahey[2]
[1] Agronomy Department, Faculty of Agriculture, Kafrelsheikh University.
[2] Field Crop Research Institute, Agricultural Research Center, Giza, Egypt.

ABSTRACT

A field Experiments were carried out during two winter successive seasons 2011/2012 and 2012/2013 at Sakha Agricultural Research Station. Agricultural Research Center at the north region of Delta Egypt, to illustrate the importance of studying sowing dates of some wheat cultivars. Ten cultivars of bread wheat (Sakha 93, Sakha 94, Giza 168, Misr 1, Misr 2, Gemmeiza 9, Gemmeiza 11, Sids12, Shandawel 1 and Giza 171) were sown at 20th October, 20th November and 20th December. Sowing date were separated and wheat cultivars were distributed randomly in the every experiment. The results indicated that there were significant differences among the three sowing dates for all studied traits in both seasons. Sowing on 20th October recorded the lowest days to heading and straw yield, longest time to maturity. Meanwhile, sowing on 20st November recorded the tallest plants, highest number of spikes/m^2, number of grains/spike and grain yield. On the other hand, sowing on 20th December recorded the decreases in yield and increases in protein percentage. The differences among bread wheat cultivars were significant in both seasons. Misr 2 recorded the highest number of days to heading and maturity. Sakha 94 recorded the highest number of tillers/m^2. Giza 171 produced the highest values for 1000- grain weight. Misr 2 and Sakha 94 recorded the highest number of grains/spike and straw yield. Meanwhile, Misr 1 and Gemmeiza 9 recorded the highest grain and straw yields/Fed. Giza 168 recorded the highest values for both of harvest index and protein percentage. Sakha 94 recorded the highest number of days to heading and maturity and plant height when sowing on 20 November. Gemmeiza 11and Giza 171 recorded the highest values for 1000- grain weight in two seasons when sowing on 20 November. It can be concluded that sowing Giza 168 and Misr 1 on different sowing dates, sowing Gimaza 9, Gemmeiza 11, Shandaweel 1 and Giza 171 on optimum date and sowing Misr 2 on the late date are recommended for optimum grain at Kafr elsheikh area.

Keywords: Wheat, cultivars, varieties, genotypes, sowing dates, planting dates, yield, yield components, quality.

INTRODUCTION

Bread wheat (*Triticum aestivum* L.) is the world's most important grain crop and it covers more of the earth's surface than any other food crop. It is an essential staple crop around the world and it is yield is positively affected by global climatic change. The productivity of wheat is influenced by various biotic or abiotic stresses (Abdelaal *et al.,* 2018).The global requirements for wheat by the year 2020 is forecasted around 950 million tonnes to face the food requirements imposed by the increase in population growth and this target will be achieved only, if global wheat production is increased by 2.5% per annum (Barutçular *et al*., 2017).

In Egypt, wheat is the main winter cereal crop. Wheat has a special importance in Egypt because the local production is not sufficient to face the annual requirements (Gharib *et al*., 2016).The cultivated area reached about 3.1 million feddan wheat in the winter season of 2016/2017 produced an average of 18.1 ardab/fed of the grain production averaged about 8.2 million tons. However, total wheat consumption has increased drastically due to overall population growth of about 2.5 % per year. Egypt, therefore imports about 55 percent of wheat requirements.

Cereals respond positively to different environmental features as heat stress and moisture stress on their growth and grain development (Eslami *et al*., 2014). The wheat yield and its components were decreased due to the delay in planting date (high temperature), which decreased season length (Suleiman *et al*., 2014).The effect of various sowing dates on growth, grain filling traits and yield and its components as well as grain quality properties of wheat was significant and the sowing date on 15th November surpassed the other sowing dates in all of yield studied parameters and grain filling rate (Seleiman *et al*., 2011).However, sowing on 15th December caused an increase in most of technological properties (protein) (Khokhar *et al*.(2010) and El-Kalla *et al*.(2010). Ouda *et al*. (2005) studied the effect of six sowing dates (1st Oct. 15th Oct. 1st Nov., 15th Nov. , 1st Dec. and 30th Dec.) on physiological maturity date, grains number/m^2, grains number/spike, grain, straw and biological yields and clarified that, sowing wheat in Oct. reduced grain yield by about 10%. While, the delay of sowing date till the end of December decreased yield by about 16% . Further, the maximum grain yield was achieved when wheat was sown on the first of December, followed by 15th of November as compared with other sowing dates.

Wheat specialist are continuously trying to improve the wheat productivity under various conditions, but paying less attention on its quality characteristics. However, the quality of wheat grains greatly affects the quality of flat breads (Rehman *et al*., 2009).It was observed a significant differences in yield and its components among wheat genotypes under normal and late planting further, the delaying sowing date reduced number of grains spike^{-1}, 1000-grains weight and grain yield (Tawfelis, 2006 and El hag (2012).Warm environment (heat stress) caused significant reductions in grain weight. While, the delay in sowing associated with high temperature resulted in the increase of protein content (Barutçular *et al*., 2016).

Among the important goals in this study was to identify the superior wheat cultivars under different sowing dates and to investigate the interactive effects of planting dates and wheat cultivars on grain yield, yield components and quality.

MATERIALS AND METHODS

Site description of the present research

A field experiment was conducted during 2011/2012 and 2012/2013 wheat growing seasons at the

Experimental Farms of Sakha Agricultural Research Statation Field Crop Research Institutes, ARC, Egypt. The present work aimed to study the effect of three planting dates, on yield and its components and grain quality of ten bread wheat cultivars. A randomized completely block design in four replicates were used. Sowing dates were distributed in the main plots and wheat cultivars allocated in sub plot. Wheat cultivars were assigned to the sub plots.

Experimental procedure

The sub - plot area of the experimental unit was 1.2 m width (6 rows × 20 cm apart) and 3.5 m long ($4.2m^2$). Experimental factors included the following treatments:

Planting dates: Three sowing dates every 30 days *i.e*20th October (S 1), 20th November (S 2), and 20th December (S 3)

Wheat cultivars: Ten cultivars of bread wheat *i.e*., Sakha 93(S 93), Sakha 94(S94), Giza 168 (G168), Misr 1(Mis1), Misr 2(Mis2), Gemmeiza 9 (Gem 9), Gemmeiza 11(Gem 11), Sids12(Sids 12), Shandawel 1 (Shan 1) and Giza 171 (G 171) were used.

In both seasons, wheat was preceded by Maiz (*Zea maiz*). The soil of experimental sites was well prepared. Phosphorus fertilizer in the form of super-phosphate (15.5% P_2O_5) at the rate of 100 kg/fed was incorporated in the soil after the leveling, 75 Nitrogen fertilizer at the rate of 75 kg N/fed was applied in two portions before the first and second irrigations. Normal agricultural practices for growing wheat were applied. The mechanical of the experimental soil and chemical analysis are presented in Table 1.

Table 1. Physical and chemical properties of the experimental soil at the experimental site during 2001/2012 and 2012/2013 seasons.

	Characters							
	Chemical analysis			Physical character				
Seasons	N (Available ppm)	P (Available ppm)	K (Available ppm)	Soil pH	Sand %	Silt %	Clay %	Soil texture
2011/2012	19.0	23.5	320.0	8.75	19.12	36.10	44.15	clay
2012/2013	17.0	26.7	345.0	7.88	19.3	37.5	42.2	clay

Data and their recording procedure:

Agronomic traits: Days to heading, days to maturity, plant height (cm), number of spikes/m^2, number of grains/spike, 1000-grain weight (g), grain yield (t/fed), straw yield (t/fed) and harvest index (HI) was estimated at harvest.

Quality traits: Grain protein content was determined by using the modified micro-kieldahl apparatus. Crude protein percentage in wheat grains was calculated by multiplying total nitrogen percentage by 6.25 according to the procedures outlined in A.O.A.C (1990).

Statistical analysis

All data collected for the two seasons was subjected to analysis of variance. The means of treatments were compared using Duncan Multiple Range Test (Duncan, 1955). All technique by "MSTAT-C" (1990) computer software package.

RESULTS AND DISCUSSION

A. Growth characters:

Means of heading date (number of days from sowing to 50% heading), maturity date (number of days from sowing to maturity) and plant height as affected by sowing date and wheat cultivars and there interaction in 2011/12 and 2012/13 are presented in Table 2.

Table 2. Mean of heading date, maturity date, plant height of wheat as affected by sowing dates and cultivars and their interaction in 2011/12 and 2012/13 seasons.

Factor	Heading date (day)		maturity date (day)		plant height (cm0	
	2011/12	2012/13	2011/12	2012/13	2011/12	2012/13
Sowing date:						
20 Oct.	78.8c	78.9c	147.3a	145.7a	107.9b	109.2b
20 Nov.	95.3a	95.6a	141.9b	142.2b	112.6a	114.2a
20 Dec.	90.8b	89.9b	134.9c	136.9c	98.4c	98.9c
F test	**	**	**	**	**	**
Cultivar:						
Sakha 93	82.3e	84.8c-d	140.8b	141.4bc	92.5d	94.4d
Sakha 94	96.0b	95.8a	141.7b	141.7b	112.1b	113.0b
Giza 168	80.8ef	82.8e	139.7c	140.3d	101.7c	103.1c
Misr 1	94.9b	91.2b	141.7b	141.5bc	108.3b	109.4b
Misr 2	99.1a	96.6a	145.4a	144.8a	117.1a	116.8a
Gemmeiza 9	96.3b	94.9a	145.0a	144.4a	111.3b	112.7b
Gemmeiza 11	82.1e	83.0de	139.3c	140.6cd	110.4b	111.3b
Sids12	79.3f	79.9f	137.5d	139.2e	95.4d	97.8d
Shandawel 1	86.9c	87.0c	141.5b	141.4bc	104.6c	104.7c
Giza 171	85.0d	85.4cd	141.2b	140.8b-d	109.6b	111.3b
F test	**	**	**	**	**	**
Interaction	**	*	*	*	*	*

*** and ** indicate P< 0.05 and P< 0.01, respectively. In each factor, means designated by the same letter are not significantly different at 5 % level according to Duncan's Multiple Range Test.**

Sowing date had a significant effect on the mentioned traits in both seasons. Optimum sowing date (20 November) resulted in significant delay in heading and increase in plant height compared with the other two sowing dates. However, days from sowing to maturity were gradually decreased by delaying sowing date in both seasons. These differences between the sowing dates in mentioned traits were probably related to differences in weather conditions. These results agreed with the findings of Rahman *et al*.(2009), Kaur *et al*. (2010), Pandey *et al*. (2010), Haroun *et al*. (2012), El-Nakhlawy *et al* (2015), Fazal *et al*. (2015) Mumtaz *et al*. (2015). Sandhu *et al*. (1999) found that days to physiological maturity were shortened with delay in sowing of wheat.

The ten wheat cultivars exhibited substantially difference in heading date, maturity date and plant height in both seasons. The cultivar Sids 12 was earlier in heading and maturity than the other cultivars in the two seasons. On the other hand, the cultivar Misr 2 was the latest one in heading and maturity. The heading date of the ten cultivars was ranged from 79.3 to 99.1 days, while mature date was ranged from 137.5 to 145.4 days. Misr 2 cultivar produced the tallest plants, while Sakha 93 cultivar produced the shortest ones in both seasons. The varietal differences in mentioned traits as here obtained, reflect different genetic makeup. Several researchers such as Omar *et al*. (2014), EL-Hawary and Shahein (2015) Fazal *et al* (2015), Mumtaz *et al*. (2015), Hendawy (2017) and Kandil ***et al***., (2016) observed varietal differences in the most growth characters.

The interaction between sowing date and wheat cultivar had a significant effect on heading date, maturity date and plant height in both seasons (Table 3). At the same cultivar, the second sowing date (optimum) delayed heading and maturity in both seasons. However, plant height was decreased by delaying sowing date for any cultivar in both seasons. The cultivar Misr 2 sown on 20 November and on 20 October recorded the latest of heading and maturity dates, respectively. The earlier cultivar in heading was Sids 12 at the first sowing date, while the cultivar Misr 1 at the third sowing date was the earlier in maturity date than the other cultivar at all sowing date in both seasons. The tallest plants were obtained from Misr 2 at the first sowing date, while the shortest ones were obtained from Sakha 93 at the latest sowing date in the two seasons.

Table 3. Mean of heading date, maturity date, plant height of wheat as affected by the interaction between sowing dates and cultivars in 2011/12 and 2012/13 seasons.

Sowing date	Cultivar	Heading date (day)		maturity date (day)		plant height (cm)	
		2011/12	2012/13	2011/12	2012/13	2011/12	2012/13
20 Oct.	Sakha 93	68.0	70.0	148.5	146.8	95.0	96.5
	Sakha 94	95.5	94.5	148.3	146.3	115.0	117.0
	Giza 168	65.8	67.8	145.3	143.3	102.5	102.3
	Misr 1	94.3	87.3	149.5	147.0	110.0	111.3
	Misr 2	100.3	98.5	154.8	152.8	121.3	122.3
	Gemmeiza 9	90.5	90.5	151.8	150.0	113.8	114.5
	Gemmeiza 11	68.8	71.0	142.8	142.5	110.0	112.0
	Sids12	61.3	63.0	140.8	141.8	95.0	95.5
	Shandawel 1	71.8	73.3	146.3	144.0	107.5	109.3
	Giza 171	71.5	73.5	144.8	142.8	108.8	111.5
20 Nov.	Sakha 93	89.5	92.5	139.5	141.5	96.3	98.5
	Sakha 94	102.0	100.0	142.5	142.5	116.3	118.0
	Giza 168	88.0	90.3	139.8	141.8	105.0	107.5
	Misr 1	100.0	98.0	141.8	141.8	116.3	117.3
	Misr 2	104.5	101.3	145.0	143.0	120.0	119.3
	Gemmeiza 9	103.0	101.0	146.3	144.3	121.3	123.8
	Gemmeiza 11	87.3	90.0	140.0	142.0	118.8	121.5
	Sids12	86.5	88.8	137.8	139.8	102.5	106.5
	Shandawel 1	98.5	99.5	143.5	143.5	112.5	110.0
	Giza 171	93.5	94.8	143.3	141.8	117.5	119.8
20 Dec.	Sakha 93	89.5	92.0	134.3	136.0	86.3	88.3
	Sakha 94	90.5	93.0	134.3	136.3	105.0	104.0
	Giza 168	88.5	90.3	134.0	136.0	97.5	99.5
	Misr 1	90.5	88.3	133.8	135.8	98.8	99.8
	Misr 2	92.5	90.0	136.5	138.5	110.0	109.0
	Gemmeiza 9	95.5	93.3	137.0	139.0	98.8	99.8
	Gemmeiza 11	90.3	88.0	135.3	137.3	102.5	100.5
	Sids12	90.0	88.0	134.0	136.0	88.8	91.3
	Shandawel 1	90.5	88.3	134.8	136.8	93.8	94.8
	Giza 171	90.0	88.0	135.5	137.8	102.5	102.5
LSD 5%		2.7	4.1	1.8	1.6	5.9	5.8

B. Yield, yield attributes and harvest index:

Data in Tables 4 and 5 shows that number of spikes m-2, number of grains spike-1, 1000-grain weight, grain yield; straw yield and harvest index of wheat were markedly influence by sowing dates in both seasons. Sowing wheat seed on optimum date (20 November) resulted in significant increase in all the mentioned traits compared with those sowing on the other two dates in the two seasons, except 1000-grain weight in the second season. The first sowing date recorded the heaviest of 1000-grain weight in this season. The increase in yield and its attributes at the second sowing date may be due to prolonging vegetative growth stage resulting in more tillers formation, leaf numbers and photosynthetic area (leaf area), which resulted in more photosynthetic production and consequently increased yield attributes (number of spikes m-2, number of grains spike-1,1000-grain weight) and in turn increased grain yield. The results are in harmony with El Hag (2011),Haroun *et al*. (2012), El-Nakhlawy *et al*. (2015), Fazal *et al* (2015) and Mumtaz *et al*. (2015) who they reported that delay in sowing suppressed the yield caused by reduction in the yield contributing traits; number of productive tillers, grains spile-1 and grain yield.

Table 4. Mean of spikes number m^{-2}, grains number $Spike^{-1}$,1000-grain weight and grain yield of wheat as affected by sowing dates and cultivars and their interaction in 2011/12 and 2012/13 seasons.

Factor	Spikes (no m^{-2})		Grains (no $Spike^{-1}$)		1000-grain weight (g)		Grain yield (t fed^{-1})	
	2011/12	2012/13	2011/12	2012/13	2011/12	2012/13	2011/12	2012/13
Sowing date:								
20 Oct.	215.9b	223.2c	57.2c	55.4b	47.9b	46.3a	2.913b	2.629b
20 Nov.	277.9a	283.3a	69.7a	61.4a	49.9a	41.9c	3.437a	3.261a
20 Dec.	217.7b	226.2b	67.0b	59.0a	44.3c	43.9b	2.720b	2.572b
F test	**	**	**	**	**	**	*	**
Cultivar:								
Sakha 93	231.3ab	236.5a-c	59.2c	57.0b-d	45.3bc	42.1de	2.418c	2.258cd
Sakha 94	285.3a	292.8a	69.4a	61.2a	42.6c	41.1e	3.031b	2.829a-c
Giza 168	248.2a	253.5ab	59.3c	57.8a-d	46.3bc	41.3e	3.408ab	3.220ab
Misr 1	280.0a	285.3ab	68.5a	60.4ab	48.5ab	43.8b-c	3.685a	3.450a
Misr 2	284.8a	293.5a	70.2a	60.9a	45.5bc	40.5e	3.096ab	2.869a-c
Gemmeiza 9	228.2ab	236.2a-c	68.8a	58.8a-c	49.1ab	45.7b	3.045b	2.765b-d
Gemmeiza 11	186.0bc	194.2cd	60.3c	55.0d	50.7a	49.4a	3.196ab	2.947ab
Sids12	145.7c	153.3d	60.3c	56.0cd	49.1ab	44.6bc	2.338c	2.208d
Shandawel 1	253.3a	261.8ab	65.4b	59.8ab	46.3bc	42.6c-d	3.001b	2.809a-d
Giza 171	228.7ab	234.7bc	64.7b	59.2a-c	50.8a	49.3a	3.018b	2.851a-c
F test	**	**	**	**	**	**	**	**
Interaction	NS	NS	*	*	*	*	**	**

***, ** and NS indicated P< 0.05, P< 0.01 and not significant, respectively. In each factor, means designated by the same letter are not significantly different at 5 % level according to Duncan's Multiple Range Test.**

Table 5. Straw yield, harvest index and protein content in grain of wheat as affected by sowing dates and cultivars and their interaction in 2011/12 and 2012/13 seasons.

Factor	Straw yield (t fed^{-1})		Harvest index (%)		Protein (%)	
	2011/12	2012/13	2011/12	2012/13	2011/12	2012/13
Sowing date:						
20 Oct.	5.357b	4.601b	35.14ab	36.36b	13.3b	13.2b
20 Nov.	6.243a	5.349a	35.55a	37.09a	13.0c	13.0c
20 Dec.	5.430b	4.558b	33.40b	36.07c	13.8a	13.5a
F test	*	*	*	*	*	*
Cultivar:						
Sakha 93	4.540d	3.725de	33.7bc	38.1bc	13.90ab	13.77ab
Sakha 94	5.459bc	4.571b-c	35.6bc	38.2bc	12.14d	12.01bc
Giza 168	5.202cd	4.305c-e	40.4a	44.3a	14.32a	14.19a
Misr 1	6.242ab	5.366ab	37.1ab	39.1ab	13.99ab	13.86ab
Misr 2	6.962a	6.173a	31.0c	32.1cd	12.83cd	12.70cd
Gemmeiza 9	6.780a	6.027a	31.0c	31.6d	12.09d	11.96d
Gemmeiza 11	5.778bc	5.028bc	35.4bc	36.7b-d	13.15bc	11.02d
Sids12	4.331d	3.483e	34.6bc	37.5b-d	13.73ab	13.60ab
Shandawel 1	5.625bc	4.699bc	34.7bc	37.1b-d	13.26bc	13.13bc
Giza 171	5.868bc	4.966bc	34.1bc	36.8b-d	14.45a	14.31a
F test	**	**	**	**	**	**
Interaction	**	*	*	*	NS	NS

***, ** and NS indicated P< 0.05, P< 0.01 and not significant, respectively. In each factor, means designated by the same letter are not significantly different at 5 % level according to Duncan's Multiple Range Test.**

Wheat cultivars exerted a significant effect on number of spikes m-2, number of grains spike-1, 1000-grain weight, grain yield, straw yield and harvest index in both seasons (Tables 4 and 5). The relative ranking of cultivar with respect to the mentioned traits was inconsistent in the two seasons. Misr 2 and misr 1 cultivars were among those having great number of spikes m-2, number of grains spike-1, grain yield, straw yield and harvest index in both seasons, while Giza 171 and Gemmeiza 11 cultivars produced the heaviest of 1000-grain weight. However, The Sids 12 cultivar recorded the lowest values of number of spikes m-2, grain yield and straw yield in both seasons. Some cultivars recorded the lowest values in some traits such as Sakha 94 in 1000-grain weight, Gemmeiza 11 in number of grains spike-1 and Gemmeiza 9 in harvest index in both seasons. There was no significant difference in grain yield among Giza 168, Gemmeiza 11, Misr 2 and misr 1 cultivars in both seasons. The superiority of these cultivars might have been resulted from its better growth and all or some yield attributes. Data indicated that the 1000-grain weight appeared to be independent of grain yield. Varietal difference in yield and its attributes were also found by the previous researchers such as Abdel-Hameed (2012), Hasina *et al*. (2012), Omar *et al*. (2014), EL-Hawary and Shahein (2015), Kandil *et al*. (2016) and Hendawy (2017).

The interaction between sowing date and wheat cultivar had no significant effect on number of spikes m-2 in both seasons and 1000-grain weight in the first seasons, but the interaction exerted a significant effect on the other yield attributes, grain yield; straw yield and harvest index of wheat (Tables 6 and 7). Sowing Misr 1, Misr 2 and Gemmeiza 9 cultivars on 20 November were among those combination having high number of grains spike-1 and straw yield without significant differences in the two seasons. The cultivar Giza 168 sown on the first date recorded the highest harvest index and the lowest number of grains spike-1 and straw yield. Sowing Misr 2 on the first date produced the lowest of 1000-grain weight and harvest index in both seasons. The cultivar Gemmeiza 11 at the first sowing date was superior to the other cultivars at any sowing date in 1000-grain weight in the second season. Data indicated that Giza 168 and Misr 1 cultivars practically produced the same grain yield, when sown on the different sowing dates in the two seasons. In addition, Sowing Giza 168 and Misr 1 cultivars at any dates, sowing Gemmeiza 9, Gemmeiza 11, Shandaweel 1 and Giza171 on the second date and sowing Misr 2 at the third date were among those interactions, which produced the highest grain yield without significant difference in both seasons. The lowest grain yield was obtained from sowing Sids 12 on the first date in both seasons.

C. Protein content:

Protein content in grains was significantly affected by sowing date in both seasons (Table 5). Early or late sowing date resulted in a significant increase in protein content in grains compared with optimum sowing date in both seasons. The late sowing date recorded the highest values in this respect in the two seasons. Data reflected the inverse correlation between grain size and protein content. The climatic was played the important role for this trait in both seasons. These results was in agreement with those reported by Jiang *et al*. (2009), where recorded that adverse environmental conditions leads to negative effect on grain quality.

Wheat cultivars significantly varied in protein content in their grains in both seasons (Table 5). Grains of Giza 168 and Giza 171 cultivars were contained the highest protein percentage compared with the Gimaza 9 cultivar in both seasons. There were no significant among Giza 168, Giza 171, Sakha 93, Misr 1 and Sids 12 cultivars in this trait in both seasons. The superiority of these cultivars in protein content in grains may be due to the earliness in maturity and shorting filling period, which led to less carbohydrate content and seed size and in turn increased protein content. Hasina *et al.* (2012), omar *et al* (2014),Hawary and Shahein (2015) and Mahboob *et al*. (2005) foud varietal difference in protein content in grains.

Table 6. Mean of spikes number m^{-2}, grains number $Spike^{-1}$,1000-grain weight and grain yield of wheat as affected by the interaction between sowing dates and cultivars in 2011/12 and 2012/13 seasons.

Sowing date	Cultivar	Grains (no $Spike^{-1}$)		1000-grain weight (g)	Grain yield ($t\ fed^{-1}$)	
		2011 /12	2012 /13	2012 /13	2011 /12	2012 /13
20 Oct.	Sakha 93	47.0	50.8	46.0	1.905	1.725
	Sakha 94	66.3	59.8	41.8	3.235	2.890
	Giza 168	46.5	56.8	42.6	3.601	3.274
	Misr 1	65.8	59.3	47.0	3.681	3.326
	Misr 2	68.8	61.0	38.1	2.565	2.265
	Gemmeiza 9	64.0	58.3	48.1	3.130	2.789
	Gemmeiza 11	53.5	51.0	56.0	2.873	2.577
	Sids12	52.0	51.3	46.8	1.891	1.559
	Shandawel 1	54.5	55.3	42.3	3.214	3.135
	Giza 171	53.5	50.5	54.8	3.034	2.754
20 Nov.	Sakha 93	67.0	60.0	40.1	2.800	2.625
	Sakha 94	75.0	65.3	39.5	3.069	2.898
	Giza 168	66.8	58.8	41.1	3.350	3.160
	Misr 1	74.3	64.8	41.2	3.915	3.750
	Misr 2	75.0	63.0	41.2	3.184	3.005
	Gemmeiza 9	74.8	62.0	43.2	3.521	3.175
	Gemmeiza 11	63.5	58.0	42.9	4.178	3.890
	Sids12	63.8	59.5	42.7	3.128	3.215
	Shandawel 1	70.0	61.0	43.2	3.375	3.093
	Giza 171	66.5	61.8	43.5	3.854	3.800
20 Dec.	Sakha 93	63.5	60.3	40.1	2.548	2.425
	Sakha 94	67.0	58.5	41.9	2.790	2.700
	Giza 168	64.5	57.8	40.2	3.274	3.225
	Misr 1	65.5	57.3	43.3	3.458	3.275
	Misr 2	66.8	58.8	42.1	3.539	3.338
	Gemmeiza 9	67.5	56.0	45.7	2.485	2.333
	Gemmeiza 11	64.0	56.0	49.2	2.539	2.375
	Sids12	65.0	57.3	44.2	1.994	1.850
	Shandawel 1	71.8	63.3	42.4	2.414	2.200
	Giza 171	74.0	65.3	49.5	2.165	2.000
LSD 5%		3.13	5.78	3.7	0.951	0.968

The interaction between sowing date and wheat cultivar had no significant effect on protein content in grains in both seasons

It can be concluded that sowing Giza 168 and Misr 1 on different sowing dates , sowing Gimaza 9, Gemmeiza 11, Shandaweel 1 and Giza 171 on optimum date and sowing Misr 2 on the late date are recommended for optimum grain at Kafrelsheikh area.

Table 7. Straw yield, harvest index and protein content in grain of wheat as affected by the interaction between sowing dates and cultivars in 2011/12 and 2012/13 seasons.

Sowing date	Cultivar	Straw yield (t fed^{-1})		Harvest index (%)	
		2011 /12	2012 /13	2011 /12	2012 /13
20 Oct.	Sakha 93	4.200	3.520	31.6	33.3
	Sakha 94	5.320	4.480	37.9	39.2
	Giza 168	3.600	2.850	50.0	54.4
	Misr 1	5.740	4.870	39.1	40.6
	Misr 2	6.370	5.390	25.4	24.5
	Gemmeiza 9	7.050	6.290	31.0	31.1
	Gemmeiza 11	5.180	4.420	36.2	37.3
	Sids12	3.730	3.190	34.1	33.2
	Shandawel 1	5.640	4.570	36.3	40.7
	Giza 171	5.320	4.550	36.3	37.6
20 Nov.	Sakha 93	5.380	4.570	34.3	36.6
	Sakha 94	5.730	4.830	34.8	37.4
	Giza 168	5.700	4.740	37.0	40.4
	Misr 1	6.760	5.820	36.7	39.2
	Misr 2	7.810	7.210	33.3	35.9
	Gemmeiza 9	7.380	6.600	32.3	32.6
	Gemmeiza 11	6.950	6.310	37.5	38.0
	Sids12	5.120	4.080	38.0	43.8
	Shandawel 1	6.520	5.660	34.2	35.3
	Giza 171	6.520	5.530	37.1	40.8
20 Dec.	Sakha 93	4.050	3.080	35.1	44.3
	Sakha 94	5.340	4.400	34.1	37.9
	Giza 168	6.300	5.320	34.3	37.9
	Misr 1	6.220	5.400	35.5	37.5
	Misr 2	6.710	5.910	34.4	35.8
	Gemmeiza 9	5.910	5.190	29.8	31.2
	Gemmeiza 11	5.210	4.350	32.4	34.9
	Sids12	4.130	3.180	31.7	35.6
	Shandawel 1	4.710	3.880	33.5	35.4
	Giza 171	5.760	4.820	28.7	31.9
LSD 5%		1.455	1.446	7.7	9.5

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تأثرالمحصول وصفات المحصول وخصائص الحبوب لبعض أصناف قمح الخبز بمواعيد الزراعه تحت الظروف المصرية

عبد الواحد عبد الحميد السيد [١] ، عبد الحميد محمود عمر [١] ، سعاد عبد الهادى السيد [٢] و بسمة السيد السماحى [٢]

[١]قسم المحاصيل ، كلية الزراعة ، جامعه كفر الشيخ- مصر.

[2]قسم بحوث تكنولوجيا البذور- معهد بحوث المحاصيل الحقلية- مركز البحوث الزراعية-الجيزة- مصر

أجريت تجربة حقلية خلال موسمى الزراعة ٢٠١١/٢٠١٢ و ٢٠١٢/٢٠١٣بالمزرعه البحثية بمحطة البحوث الزراعية– محطة بحوث سخا -كفر الشيخ– مركز البحوث الزراعية , لدراسة أهمية ثلاث مواعيد للزراعة لعشرة أصناف من قمح الخبز .وكانت مواعيد الزراعه فى ٢٠ اكتوبر ، ٢٠ نوفمبر و ٢٠ ديسمبر بينما الاصناف تحت الدراسة هى سخا ٩٣، سخا ٩٤، جيزة ١٦٨، مصر ١، مصر ٢ ، جميزة ٩، جميزة ١١، سدس ١٢، شندويل ١و جيزة ١٧١. تم زراعة الثلاث مواعيد فى تجارب منفصلة . اثرت مواعيد الزراعة معنويا على كل الصفات تحت الدراسة ، حيث سجلت الزراعه المبكرة (٢٠ اكتوبر) إلى سرعة طرد السنابل وأكبر فترة للنضج وأقل وزن للقش. أما الزراعه فى ٢٠ نوفمبر سجلت أعلى ارتفاع لنباتات القمح و أكبر عدد من السنابل/م٢، عدد الحبوب/سنبلة ومحصول الحبوب، بينما الزراعه فى ٢٠ ديسمبر أدت الى نقص المحصول وذيادة من نسبة البروتين. بينت النتائج وجود إختلافات معنوية بين الأصناف في جميع الصفات تحت الدراسة فى موسمى الزراعة. سجل الصنف مصر ٢ أكثر عدد من الايام حتى طرد السنابل والنضج الفسيولجى. سجل الصنف سخا ٩٤ أكبر عدد الاشطاء/م٢، والصنف جيزة ١٧١ سجل اعلى وزن ١٠٠٠ حبه أما الصنفان مصر ٢ وسخا ٩٤ سجلا أعلى عدد من الحبوب/سنبلة وأعلى محصول من القش. بينما الصنفان مصر ١ وجميزة ٩ سجلا أعلى وزن لمحصول الحبوب والصنف جيزة ١٦٨ سجل أعلي معامل حصاد ونسبة البروتين في الحبوب. سجل الصنف سخا ٩٤ أعلى عدد ايام حتى الطرد والنضج الفسيولوجى وارتفاع النبات عند زراعته فى ٢٠ نوفمبر. سجل كل من الصنفين جميزة ١١ وجيزة ١٧١ أعلى وزن لـ ١٠٠٠ حبة عند الزراعة فى ٢٠ نوفمبر فى كلا الموسمين. الخلاصة: زراعة الصنفين جيزة ١٦٨ ومصر ١ في مختلف مواعيد الزراعة ، وزراعة الأصناف جميزة ٩ ، جميزة ١١ ، شندويل ١ وجيزة ١٧١ في الميعاد الأمثل ، وزراعة الصنف مصر٢ في الميعاد المتأخر، هو الأمثل للحصول علي أفضل محصول حبوب وذلك تحت ظروف الزراعة بمنطقة كفر الشيخ.