J. Plant Production, Mansoura Univ., Vol. 10 (5): 385 - 391, 2019

Performance of some Wheat Cultivars under Normal and Late Sowing Dates in North Delta

Dalia A. El Hag
Agronomy Department, Faculty of Agriculture, Kafrelsheikh University Kafr El Sheikh, Egypt

ABSTRACT

A field experiments were conducted at Experimental farm Faculty of Agriculture, Kafrelshiekh University, Egypt during 2014/15 and 2015/16 growing seasons. This work was intended to study the effect of late sowing on 30th December compared to normal sowing on 20th November, on growth, yield and yield components of five bread wheat cultivars i.e Sakha 93, Giza 168, Misr 2, Sids 12 and Giza 171cultivars. The results revealed that mean squares due to planting dates, cultivars and planting dates x cultivars interaction were affected significantly for most of the studied traits. The normal sowing on 20th November produced the highest values of studied traits, while late sowing on 30thDecember significantly declined yielding capacity of wheat genotypes. Varietal differences were significant for all traits under investigation. The cultivars Misr 2, Giza 171 and Giza 168 produced highest grain yield in both seasons. In addition, all tested wheat cultivars produced highest grain yield when planted on 20th November. Giza 168 recorded the highest values for germination percentage, EC and hectoliter weight, and Giza 171 for protein percentage. While, Sakha 93 recorded the lowest electrical conductivity. It could be concluded that wheat cultivars produced the highest values of traits under sowing on 20th November. Misr2 was more susceptible to late sowing date.

Keywords: wheat cultivars, sowing time, yield and its components, seed quality and susceptibility index**.**

INTRODUCTION

Wheat (*Triticum aestivum* L.) is an important cereal crop worldwide and it is commonly known as the king of cereals. Egypt produces about 50% of the total local consumption (9 million ton) annually. There for, increasing the productivity of this crop is the main goal of wheat researches to decrease the gap between national production and consumption .It belongs to globally, after maize and rice, (FAOSTAT, 2017). Wheat cultivars could achieved maximize yield by fertilizer levels, irrigation treatments and other agricultural practices under the present conditions, but environmental constraints still being the main factors affecting wheat productivity in many regions of the world (Abd El-Maaboud *et al.* 2004). Heat stress usually reduces yield potential during the period of grain formation (Simane *et al.* 1993; Lloveras *et al.* 2004). The challenge to increase wheat yield is even more difficult by projected climate changes, particularly higher temperatures and changes on rainfall distribution and amount (Parry and Hawkesford, 2010; Lobell *et al.* 2011). Under irrigated conditions, early sowing will cause increased yield of spring wheat (Dengpan *et al.* (2017).

There are a lot of factors dependable for low yield of wheat such as wheat cultivar, sowing date, inadequate seed rate, and low fertilizer rates. Lathwal *et al.(*2012), Chaudhry *et al.* (2014) found that the normal yield was significantly higher on 30th October, as compare to sowing in 15th , 30th November, December and 15th January. Donaldson *et al.(*2013) found that early sowing increased wheat straw production and generally higher grain yield compared with mid to late sowing date.

Phenology of wheat is generally considered as the variation occurred from emergence to maturity and is influenced by sowing dates and the cultivars. The duration and stages of phonological traits are significant indicators for potential yield of the crop (Munsif *et al.* 2015). Late planting produced poor tillering and slow crop growth in general, due to low temperature. In late planting, variety should have short duration that may help escape from high temperature at the grain filling stage (Phadnawis and Saini, 1992).

The objectives of this investigation were to study the effects of planting dates and cultivars on growth, yield components, grain, and quality.

MATERIALS AND METHODS

A field experiments were conducted in (2014/15 and 2015/16 seasons) at the Experimental Farms of Faculty Agriculture Kafrelsheikh University, Egypt. The objective of this investigation was aimed to evaluate the effect of two planting dates on yield and its components as well as grain wheat quality of five bread wheat cultivars (*Triticum aestivum* L). Each sowing date experiments were separated and in each one the cultivars were distributed in randomized complete block design (RCBD) experiment with four replications one experiment for each sowing date on 20th November and 30th December. The plot size of the experimental unit (plot) was (6 rows × 20 cm apart) and 3.5 m long (4.2m^2). The experimental factors included five wheat cultivars i.e Sakha 93, Giza 168, Misr 2, Sids12 and Giza 171. In both seasons, wheat was preceded by rice (*Oryza sativa*, L). The experimental sites was prepared as recommended of ministry of agriculture and reclaimed land.

As a recommended package both of phosphorus and nitrogen fertilizer were applied. The other practices for growing wheat were applied. The analyses of the experimental soil are show in Table 1. The air temperature during both growing seasons are show in Table 2.

Table 1. Physical and chemical analysis of the soil site during 2014/15 and 2015/2016.

	Character							
	Physical			Soil texture	Chemical analysis			
Seasons	Sand %	Silt %	Clay %		N (exchangeable ppm)	P (exchangeable ppm)	K (exchangeable ppm)	Soil pH
2014/15	21.12	36.10	42.15	clay	24.0	21.5	351	7.90
2015/16	20.30	37.50	41.20	clay	27.0	27.7	320	7.75

Table 2. Air temperature (^{0}C) during the 2014/15 and 2015/16 seasons.

Month	T, ^{o}C					
	2014/15 season			2015/16 season		
	Max	Min	Mean	Max	Min	Mean
Nov. 2015	24.3	13.7	19.0	24.7	14.4	19.6
Dec. 2015	22.2	9.7	16.0	20.3	8.3	14.3
Jan. 2016	18.7	6.4	12.6	18.4	6.3	12.3
Feb. 2016	19.0	7.6	13.3	22.5	6.7	14.6
Mar. 2016	22.6	11.6	17.2	23.7	11.6	17.6
Apr. 2016	25.6	13.7	19.7	30.0	19.2	24.6
Seasonal mean	22.1	10.5	16.3	23.3	11.1	17.2

The following traits were studied:

I- Agronomic traits: Heading date, maturity date, plant height, No.fertile tillers, No.grains/spike, 1000-GW (g), biological yield (ton/fed), grain yield (ton/fed), straw yield (ton/fed) and harvest index. (feddan =4200 m^2 = 0.42 ha.)

II- Seed quality: Germination %, EC (µ), Hectoliter weight and protein content**.**

Germination % (G.P%):

From all treatments (50 seeds)/ plot were son in plastic boxes (40 x 20 x20 cm) and sowing in pure sand. The boxes were irrigated and kept at (25 °C) in an incubating chamber for 8 days. The seedlings were counted at 4 and 8 days according to the International rules of ISTA (2018). G.P was calculated using this equation:-

$$\textbf{Germination percentage} = \frac{\text{No. normal seedlings}}{\text{No. seed tested}} \text{ x } 100$$

Protein content (%):

It measured according to A.O.A.C. (1995) and multiplying the N X 6.25 (Hymowitz *et al.* 1972)

EC (µ):

The electrical conductivity of leached from four replicates of 50 seed weight and soaked in (250 ml) of distilled water for one day and measured in µ- mos using (conductivity meter) under optimum conditions according to international rules (ISTA,2018).

Hectoliter:

Relative density of seed according to (Karmer and Twigg 1962).

Susceptibility index (SI)

Yield potential (optimum planting) (YP) and stressed yield (late planting) (YS), the following quantitative criteria of tolerance to late planting were calculated:

1- Tolerance index (TOL) and mean productivity (MP) (Rosielle and Hambling, 1981):

TOL = YP-YS and MP= (YP+YS)/2

2- Stress Susceptibility index (SSI) (Fischer and Maurer, 1978):

SSI= (1 - YS/YP)/SI & SI= (1 -ÝS/ÝP)

SI=stress intensity, ÝS: mean of all genotypes in the stress and ÝP: mean of all genotypes under no stress conditions.

3- Geometric Mean Productivity (GMP) (Kristin *et al.* 1997; Fernandez (1992):

$$\textbf{GM=}\sqrt{(YP)(YS)}$$

4- Stress Tolerance index (STI) (Fernandez, 1992):

STI= (YP/ÝP) (YS/ÝS) (ÝS/ÝP) = (YP) (YS)/ (ÝP) ^{2}

5- Yield reduction ratio (Yr) (Golestani and Assad, 1998):

Yr= 1 - (Ys/Yp)

6- Relative performance (RP) **(**Abo- Elwafa and Bakheit, 1999):

P= (YS/YP)/R and R= (ÝS/ÝP)

7- Superiority or relative yield (RY) was calculated as the yield of a specific genotype under moisture stress, divided by that of the highest yielding genotype under moisture stress conditions (Lin and Binns, 1988).

Statistical analysis:

Data collected for the sowing dates were subjected to combined analysis of variance (ANOVA) for RCBD for each experiment (sowing dates). The means of cultivars and sowing dates were compared using Duncan Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

1. Agronomic traits.

Sowing date effect:-

The result in Tables 3, 4 and 5 show that the variation in heading date, maturity date, plant height, No. tillers/m^2, 1000 GW (g), No. grains/spike, biological, grain, straw yield and harvest index% were significant in both growing seasons, except for harvest index in 2015/16 as shown in Table 3,4 and 5 Sowing at 20th November (S1) maximized the values for all mentioned traits compared with sowing at the end of December (S2) in both growing seasons. Tahir *et al.* (2009) establish that sowing date significantly influenced the same traits. Maximum grain yield (3.106 and 3.478 ton/fed.) and straw yield (6.0364 and 5.649 ton/fed.) were recorded under early sowing (S1) while the minimum yield (2.813and 3.047 ton/fed.) and straw yield (5.552 and 5.355 ton/fed.) were recorded under late sowing date (S2) in 2014 and 2015, respectively. In north Egypt, the most optimum time of planting of wheat crop is from 15-30 November, because the crop sown on this optimum time produced the maximum No. tillers m^{-2}, grains spike-^{1} and grain yield/fed. The rate of reduction per day after November 25th planting for grain yield, No. grains spike$^{-1,}$ 1000 GW (g) and No. tiller / m^2 row was 42 kg ha^{-1}, 0.097 grain per spike, 0.172 g for grain weight and 0.401tiller/m^2, respectively (Anwar *et al.* (2007). The results were a harmony with Menshawy 2008, Ferrise *et al.* (2010), Rita *et al.* (2013), Dagash *et al.* (2014), Munsif *et al.* (2015), Babiker *et al.* (2017), Dengpan *et al.* (2017), Kalwar *et al.* (2018),Shirinzadeh *et al.* (2017) and Soad *et al.* (2018).

Table 3. Means of days to heading, days to maturity, plant height and fertile tillers/m^2 as affected by sowing date, as well as the interaction in 2014/15 and 2015/16 growing seasons.

Trait	days to heading		days to maturity		Plant height (cm)		fertile tillers/m^2	
Treatment	2014/15	2015/16	2014/15	2015/16	2014/15	2015/16	2014/15	2015/16
				Sowing date				
S1	92.4	93.5	141.1	141.6	108.3	110.3	275.8	281.4
S2	90.1	89.7	134.9	136.9	97.0	98.1	248.5	252.7
F test	**	**	**	**	**	**	**	*
Sakha 93	89.5c	92.3b	136.9c	138.8cd	91.3e	93.4d	271.3b	276.8b
Giza 168	88.25c	90.3c	136.9c	138.9bc	101.3c	103.5b	263.9b	262.5b
Misr 2	98.5a	95.6a	140.8a	140.8a	115.0a	114.1a	262.3b	270.0b
Sids12	88.25c	88.4d	135.9c	137.9d	95.6d5	98.9c	302.5a	304.8a
Giza 171	91.75b	91.4bc	139.4b	139.8	110.0b	111.1a	210.6c	221.1c
F. test.	**	**	**	**	**	**	**	**
Interaction	**	**	**	**	*	*	NS	NS

***, **and NS indicated significant, highly significant and not significant, respectively.**
In a column means designated by the same letter are not significantly different at 5 % level of probability according to Duncan's Multiple Range Test.

Table 4. Means of 1000-GW, number of grains/spike and biological yield as affected by sowing date, varietal differences as well as their interaction in 2014/15 and 2015/16 seasons.

Trait	1000- GW (g)		No. grains/spike		Biological yield (ton/fed.)	
Treatment	2014/15	2015/16	2014/15	2015/16	2014/15	2015/16
			Sowing date			
S1	50.9	41.7	67.8	60.6	9.14	9.13
S2	43.3	43.2	66.8	59.9	8.36	8.40
F test	**	**	**	**	**	**
			Wheat cultivars			
Sakha 93	45.0	40.1c	65.3b	60.1bc	8.76b	8.68bc
Giza 168	46.4	40.6c	65.6b	58.3c	8.90b	8.85ab
Misr 2	44.7	41.6bc	70.9a	60.9b	8.76b	8.73bc
Sids12	48.3	43.4b	64.4b	58.4bc	8.20c	8.50c
Giza 171	51.1	46.5a	70.3a	63.5a	9.13a	9.05a
F. test.	NS	**	**	**	**	**
Interaction	-	*	**	*	**	**

***, **and NS indicated significant, highly significant and not significant, respectively.**
In a column means designated by the same letter are not significantly different at 5 % level of probability according to Duncan's Multiple Range Test.

Table 5. Means of grain yield, straw yield and harvest index %(HI%) as affected by sowing date, varietal differences as well as their interaction in 2014/15 and 2015/16 seasons.

Trait	Grain yield (ton/fed)		Straw yield (ton/fed)		HI%	
Treatment	2015/16	2014/15	2015/16	2014/15	2015/16	2015/16
			Sowing date			
S1	3.106	3.48	6.04	5.65	34.0	38.1
S2	2.81	3.05	5.55	5.35	33.6	36.3
F test	**	**	**	**	NS	*
			Wheat cultivars			
Sakha 93	2.98a	3.05c	5.77ab	5.63	34.0b	35.1b
Giza 168	3.04a	3.37ab	5.86ab	5.48	34.1b	38.1ab
Misr 2	3.04a	3.41a	5.72ab	5.32	34.7a	39.1a
Sids12	2.69b	3.12bc	5.51b	5.38	32.7c	36.8ab
Giza 171	3.03a	3.35ab	6.10a	5.69	33.2c	37.0ab
F. test.	**	*	**	NS	**	NS
Interaction	*	NS	**	**	**	*

***, **and NS indicated significant, highly significant and not significant, respectively.**
In a column means designated by the same letter are not significantly different at 5 % level of probability according to Duncan's Multiple Range Test.

Varietals differences

The variation among wheat cultivars were significant for all traits except for grain yield it was significant in 2014/15 and 2015/16 growing seasons meanwhile for harvest index it was insignificant in the second season. These variations among wheat cultivars might partially reflect their different genetic backgrounds. The result in Tables 3, 4 and 5 illustrate the results of yield and agronomic characters of the tested five wheat cultivars. Misr 2 was the latest cultivar in days to heading, maturity and plant height. Sids 12 had the highest No. fertile tillers (Table 4). Giza 171cultivar recorded the highest 1000-GW, No .grains/spike and biological yield in 2014/15 and

2015/16 (Table 5). Misr 2 and Giza 171 cultivars were produced the highest grain yield (3.040 and 3.030 ton/fed.) in 2014/15 season, respectively, and Misr 2 (3.412 ton/fed.) in the 2015/16 season. Giza 171cultivar was recorded the highest straw yield (6.100 ton/fed) in the 2014/15 and Misr 2 cultivar was gave the highest values of HI (34.7%) in the 2014/15 season Table 4. The earlier sowing crop had long vegetative growth period compared with the late sowing crop which resulted in more values for yield and yield components. Differences in all traits between wheat cultivars due to the genetic structure, which seriously affected the interaction with environmental conditions. Tahir *et al.* (2009) ; Lathwal and Thakral (2012); Mumtaz, *et al.* (2015); Munsif *et al.*(2015); Dengpan *et al.* (2017); Shirinzadeh *et al.*(2017) and Soad *et al.* (2018) agreed with the results of the present study.

Effect of late sowing on grain yield:-

The highest yield potential (under optimum sowing) (YP) over the two seasons were recorded by Giza 171cultivar, which gave 3.35 t/fed. The highest yield under stress (late sowing) (YS) was recorded by Misr 2 cultivar which gave (3.105 t/fed.).The highest tolerance index (TOL) was recorded by Sids 12 cultivar, which gave (0.55).The highest mean productivity (MP) were produced by Misr 2 cultivar which gave (3.213**).** Misr 2 cultivar recorded a SSI of (0.593) showing more tolerant to late sowing than Sids 12 cultivar which gave (1.453) and was susceptible to late sowing. The highest GMP produced from Misr 2 cultivar (3.211) as compared with Sids 12 cultivar (2.895). Misr 2 cultivar recorded the highest value of STI (0.953) as compared with other cultivars. Misr2 recorded the Yr (0.065) as compared with other wheat cultivars. Misr 2 cultivar recorded the highest P (1.050). Under late sowing Giza 168 and Misr 2 cultivars were surprises yield Table 6.

Table 6. Estimate of susceptibility index as affected by sowing dates over mean of the two seasons.

	YP	YS	TOL	MP	SSI	GMP	STI	Yr	RP	RY
Sakha 93	3.240	2.799	0.442	3.019	1.253	3.011	0.840	0.136	0.969	0.92
Giza 168	3.325	3.088	0.237	3.206	0.690	3.203	0.946	0.071	1.036	1.02
Misr 2	3.321	3.105	0.216	3.213	0.593	3.211	0.953	0.065	1.050	1.02
Sids12	3.183	2.634	0.550	2.908	1.453	2.895	0.778	0.173	0.939	0.87
Giza 171	3.360	3.018	0.342	3.189	0.939	3.184	0.930	0.102	1.007	1.00

2-Grain quality:

Sowing date effect

Among sowing data, the results in Table 7 illustrated that the effect of sowing date showed significant effect for germination percentage in both seasons. Sowing at optimum S1 recorded the highest values 98.5 and 96.5 % compared with sowing late S2 which recorded 93.0 and 91.8 % in both growing seasons respectively. Regarding the influences on EC, hectoliter weight and protein percentage, sowing date were insignificant effects in both seasons. Sowing date had larger effects on grain protein (Ferrise *et al.* 2010). Meanwhile Babiker *et al.* (2017) found that sowing date had insignificant effect on seed quality.

Table 7. Means of germination %, EC, hectoliter weight and protein percentage as affected by sowing date, varietal differences as well as their interaction in 2014/15 and 2015/16 seasons.

Trait	Germination %		EC		Hectoliter		Protein%	
Treatment	2014/15	2015/16	2014/15	2015/16	2014/15	2015/16	2014/15	2015/16
				Treatments				
S1	98.5	96.5	18.0	17.3	87.6	83.2	13.9	11.8
S2	93.0	91.8	26.3	27.5	82.7	77.8	13.9	11.6
F test	*	*	NS	NS	NS	NS	NS	NS
				Wheat cultivar				
Sakha 93	97.5a	95.5a	18.2b	18.5c	81.8c	77.1c	13.6bc	11.5bc
Giza 168	98.0a	96.0a	23.3a	24.5a	87.3a	82.5a	14.5ab	12.3ab
Misr 2	96.5a	94.5ab	23.3a	22.9b	86.2ab	81.5ab	12.91c	10.7c
Sids12	94.5b	93ab	23.3a	23.4b	84.4b	79.7b	13.7bc	11.5bc
Giza 171	92.2c	91.7b	22.7a	22.6b	86.2ab	81.5ab	14.8a	12.6a
F. test.	*	*	**	**	**	**	**	**
LSD	1.9	3.1	1.16	0.87	2.41	2.4	0.92	0.92
Interaction	**	**	**	**	*	*	*	*

***, **and NS indicated significant, highly significant and not significant, respectively.**

In a column means designated by the same letter are not significantly different at 5 % level of probability according to Duncan's Multiple Range Test.

Varietal differences

The results indicated that there were significant variation for germination percentage in both seasons and highly significant for EC, hectoliter weight and protein percentage during 2014/150and 2015/16 seasons. Sakha 93, Giza 168 and Misr 2 cultivars were recorded highest germination percentage; 97.5, 98.0, 98.5 in 2014/15 and 95.5, 96.0, 94.5 and 93.0 with Sids 12 cultivar in 2015/16, respectively. For EC Sakha 93 cultivar recorded 18.2 and 18.5 in 2014/15 and 2015/16 respectively. Giza 168 weighted the heaviest hectoliter 87.3 and 82.5 in both seasons. Giza 171 recorded the highest protein percentage14.6 and 12.6 in both seasons. Sowing date had superior effects on grain yield and grain protein (Ferrise *et al,.* 2010). The results agreement with Babiker *et al.* (2017) which mentioned for wheat cultivars had significant effect on seed quality.

Interaction effects:-

Data presented in Table 8 showed that sowing dates x wheat cultivars interaction significantly affected

days to heading, days to maturity in 2014/15 &2015/16 but plant height and No. fertile tillers at in 2015/16 season. Misr 2 cultivar recorded the highest days to heading and maturity with sowing on 20th November in both seasons. Meanwhile Giza 171 and Sids 12 were produced the tallest plants and highest No. fertile tillers/m^2 with sowing on 20th November.

Effects of sowing dates X wheat cultivars on 1000-GW were significantly effect on No. grain/spike and biological yield in 2014/15 & 2015/16 (Table 9). Giza 171cultivar had the highest 1000-GW under sowing on 30th December (S2), Misr 2 and Giza 171 were recorded the highest No. grain/spike with sowing on 20th November in both seasons. Giza 171cultivar was recorded the highest yield of biological yield with sowing on 20th November in 2014/15 & 2015/16.

Table 8. Mean of number of days to heading, number of days to maturity, plant height and number of fertile tillers/m^2 as affected by the interaction between sowing date and wheat cultivars in 2014/15 and 2015/16 seasons.

Trait		days to heading		days to maturity		Plant height (cm)	fertile tillers /m^2
Treatments		2014/15	2015/16	2014/15	2015/16	2015/16	2015/16
	Sakha 93	89.5c	92.5c	139.5c	141.5b	98.5de	298.8ab
	Giza 168	88.0cd	90.3de	139.8c	141.75ab	107.5bc	275.0bc
S1	Misr 2	104.5a	101.3a	145.0a	143.0a	119.3a	275.0bc
	Sids12	86.5d	88.8ef	137.7d	139.7c5	106.5bc	329.5a
	Giza 171	93.5b	94.75b	143.3b	141.7ab5	119.8a	228.5de
	Sakha 93	89.5c	92.0cd	134.3f	136.0e	88.3e	254.8cd
	Giza 168	88.5cd	90.3de	134.0f	136.0e	99.5d	250.0cd
S2	Misr 2	92.5b	90d-f	136..0df	138.5cd	109.0b	265.0c
	Sids12	90.0c	88.0f	134.0f	136.0e	91.3e	280.0bc
	Giza 171	90.0c	88.0f	135.5ef	137.7d5	102.5cd	213.8e
F. test.		**	**	**	**	*	*

***and ** indicated significant, highly significant, respectively.**
In a column means designated by the same letter are not significantly different at 5 % level of probability according to Duncan's Multiple Range Test.

Table 9. Mean of 1000-GW, number of grains/spike and biological yield as affected by the interaction between sowing date and wheat cultivars in 2014/15 and 2015/16 seasons.

Trait		1000- GW (g)	No. of grains/spike		Biological yield (ton/fed)	
Treatments		40.15c	2014/15	2015/16	2015/16	2015/16
	Sakha 93	40.15c	67.0b	60.0b-d	9.15b	9.09b
	Giza 168	41.1bc	66.8b	58.8cd	9.21b	9.20b
S1	Misr 2	41.2bc	75.0a	63.0ab	9.31b	9.30b
	Sids12	42.7bc	63.7b	59.5b-d	8.35d	8.50cd
	Giza 171	43.5bc	66.5b	65.3a	9.69a	9.55a
	Sakha 93	40.1c	63.5b	60.3b-c	8.38d	8.28de
	Giza 168	40.2c	64.5b	57.7d	8.59c	8.50cd
S2	Misr 2	42.1bc	66.7b	58.8cd	8.23d	8.18e
	Sids12	44.27b	65.0b	57.3d	8.06e	8.51cd
	Giza 171	49.5a	74a	61.8a-c	8.58c	8.55c
F. test.		*	**	*	**	**

***and ** indicated significant, highly significant, respectively.**
In a column means designated by the same letter are not significantly different at 5 % level of probability according to Duncan's Multiple Range Test.

The results in Table 10 showed the effect of sowing date X wheat cultivars for grain yield that significantly affected in 2014/15 season, straw yield and HI% in 2014/15 and 2015/16 seasons. Giza 171 wa surprise of grain and straw yield/fed with sowing on 20th November. Meanwhile, Misr 2 cultivar produced the highest harvest index with sowing on 30th December in both seasons.

The results presented in Table 11 illustrated the effect of sowing date X wheat cultivars on germination percentage, electric conductivity, hectoliter weight and protein percentage in both seasons. Giza 171, under sowing late on 30thDec.was recorded the lowest germination %, meanwhile optimum sowing date on 20th Nov. Sakha 93 cultivar recorded the lowest EC. Giza 168 recorded the heaviest hectoliter weight and Giza 171 cultivar recorded the highest protein percentage

In general, sowing in 20th November provides favorable Conditions for vegetative growth of wheat plants, such as cool temperature at tillering stage encourages high tillering and long vegetative, growth followed by better flowers initiation, heading, anthesis, high grain filling rate during moderate temperature, than late sowing date at end of December. Here, late sowing date and consequent short vegetative growth and high temperature during the stage of grain filling are responsible for lower estimates of most characters under investigation.

Therefore, it could be recommended that sowing date of wheat must not be delayed than the recommended date of November 15-30 in North Delta, Egypt. The cultivars Giza 168, Misr 2 and Giza 171 recorded the highest yield in North Delta, Egypt.

Table 10. Mean of grain yield, straw yield and harvest index as affected by the interaction between sowing date and wheat cultivars in 2014/15 and 2015/16 seasons.

Trait		Grain yield (ton/fed)	Straw yield (ton/fed)		HI %	
Treatments		2014/15	2014/15	2015/16	2014/15	2015/16
	Sakha 93	3.13a	6.03c	5.73ab	34.1c	36.9ab
	Giza 168	3.175a	6.05bc	5.72ab	34.4bc	37.9ab
S1	Misr 2	3.18a	6.147b	5.77ab	34.1c	37.9ab
	Sids12	2.92b	5.43f	5.05de	34.9ab	40.6a
	Giza 171	3.14a	6.54a	5.97a	32.5d	37.4ab
	Sakha 93	2.85b	5.53ef	5.53bc	34.0c	33.2c
	Giza 168	2.91b	5.68d	5.24c-d	33.9c	38.4ab
S2	Misr 2	2.92b	5.301g	4.88e	35.5a	40.4a
	Sids12	2.47c	5.59e	5.71ab	30.6e	33.1c
	Giza 171	2.92b	5.65d	5.42b-d	34.0c	36.6b
F. test.		*	**	**	**	*

***and ** indicated significant, highly significant, respectively.**
In a column means designated by the same letter are not significantly different at 5 % level of probability according to Duncan's Multiple Range Test.

Table 11. Mean of germination percentage, EC, hectoliter weight and protein percentage as affected by interaction between sowing date and wheat cultivars in 2014/15 and 2015/16 seasons.

Trait		Germination %		EC		Hectoliter		Protein%	
Treatments		2014/15	2015/16	2014/15	2015/16	2014/15	2015/16	2014/15	2015/16
	Sakha 93	98.0a	96.0ab	16.4e	16.5f	86.3ab	81.7a-c	13.7cd	11.6b-d
	Giza 168	99.0a	97.0ab	17.7e	16.5f	89.0a	84.5a	13.9b-d	11.7bc
S1	Misr 2	98.0a	96.0ab	17.7de	16.5f	87.3ab	82.7a-c	13.1cd	11.0cd
	Sids12	98.0a	96.0ab	19.2cd	18.8e	87.9ab	83.4a	13.6cd	11.5cd
	Giza 171	99.5a	97.5a	18.8cd	18.12e	87.9ab	83.4ab	15.4a	13.3a
	Sakha 93	97.0a	95.0ab	19.9c	20.5d	77.4d	72.4e	13.6cd	11.3cd
	Giza 168	97.0a	95.0ab	28.75a	32.5a	85.6ab	80.6bc	15.1ab	12.8ab
S2	Misr 2	95.0ab	93.0bc	28.8a	29.4b	85.2ab	80.2bc	12.7d	10.4d
	Sids12	91.0ab	90.0cd	27.4ab	28.0c	81.0c	76.0d	13.9bc	11.6b-d
	Giza 171	85.0c	86.0d	26.7b	27.3c	84.6b	79.6c	14.3a-c	12..0c
F. test.		**	**	**	**	*	*	*	*

***and ** indicated significant, highly significant, respectively.**
In a column means designated by the same letter are not significantly different at 5 % level of probability according to Duncan's Multiple Range Test.

REFERENCES

Abd El Maaboud, M. S., A. F. Abou-Hadid, M. Edriss and M. A. Medany. (2004). Climate change and productivity of some wheat cultivars under rainfed and supplementary irrigation conditions. In: C. Cantero-Martínez and D. Gabiñ a (Eds.),pp. 139-146. Mediterranean Rainfed Agriculture: Strategies for Sustainability.

Abo-Elwafa, A. and B.R Bakheit (1999). Performance, correlation and path coefficient analysis in faba bean. Assiut J. of Agric. Sci., 30: 77-91.

A.O.A.C.(1995):Official Methods of Analysis 16thEd, A.O.A.C Benjamin ranklin Station, Washingtion, D.C, U.S.A pp 490-510.

Anwar, J.; S. Khan; I. Rasul; M. Zulkiffal and M. Hussain (2007). Effect of sowing dates on yield and yield components in wheat using stability analysis. J. Agri. Biol., 9(1):129-133.

Babiker, Waheeba A.; A. A. Abdelmula; I. H. Eldessougi and S. E. M. Gasim (2017).The Effect of location, sowing date and genotype on seed quality traits in bread wheat (*Triticum aestevium*) Asian J. Plant Sci. Res., 7(3):24-28.

Chaudhry, M.H; S.Muhammad; G.S Khan,and N.I. Khan (2014). Optimum planting time of wheat (*Triticum aestivum* L.). J. Agric. Resources 30(4), 447-452.

Dagash, Y.M.; A..M.M. Syed and N.A. Khalil. (2014). Effect of nitrogen fertilization, sowing methods and sowing dates on yield and yield attributes of wheat (*Triticum aestivum* L) Universal J. of Plant Sci. 2(6): 108-113.

Dengpan, X.; J. C. H. Bai , Y. Qi and Y. Shen (2017) . Assessing the impacts of climate variables and sowing date on spring wheat yield in the Northern China. Int. J. Agric. Biol., Vol. 19(6):1551-1558.

Donaldson, E., W.F. Schillinger and S.M. Dofing (2013). Straw production and grain yield relationships in winter wheat. Crop Sciences 41,100-106.

Duncun, D.B. (1955). Multiple ranges and multiple F test. Biometrics, 11: 1-42

FAOSTAT(2017). Available in http://www.faostat.fao.org

Fernandez, G.C.J. (1992). Effective selection criteria for assessing plant stress tolerance. In: Proceeding of Symposium. Taiwan, 13-16 Aug. Chapter 25,: 257-270.

Ferrise, R.; A. Triossi; P. Stratonovitch; M. Bindi and P. Martre (2010). Sowing date and nitrogen fertilisation effects on dry matter and nitrogendynamics for durum wheat: An experimental and simulation study. Field Crops Research 1 (17): 24 5 – 25 7.

Fisher, R.A. and R. Maurer (1978). Drought resistance in spring wheat cultivars. I. Grain yield responses. Asut. J. Agric. Res., 29: 897-912.

Hymowitz, T. F.; P. Collins and W.M. Walker (1972).Relationship between the content of oil, protein and sugar in soybean seed . Agronomy J.64:613-616.

I.S.T.A.(2018) International Rules for SeedTesting.Seed Sci. and Technol.21,24-46.

Golestani, S.A. and M.T. Assad (1998). Evaluation of four screening techniques for planting late resistance and their relationship to yield reduction ratio in wheat. Euphytica, 103: 293-299.

Kalwar, Z. A.; A. Tunio; M. Y. Shaikh; I. Khan and J. Q. Jog (2018). Empact of sowing dates on the growth and yield of wheat variety Benazir Int. J. Agron Agri. Rev. 12(5) 65 -71.

Karmer, A. and, B.A. Twigg (1962). Fundameentals of quality control for the food industry. AVI Publishing Co. West. Port, CT, pp.512.

Kristin, A.S.; R.R. Serna; F.I. Perez, B.C.Enriquez, J.A.A Gallegos; P.R.Vallejo; N.Assimi, and J.D. Kelly (1997).Improving common bean Perfor22 mance under planting late stress. Crop Sci. 37: 51-60.

Lathwal, O.P and S.K Thakral (2012). Performance of wheat varieties sown on different dates under rainfed conditions. Crop Research 18,470-471.

Lin, C.S. and M.R. Binns (1988). A superiority measure of cultivar performance for cultivar x location data. Can. J. Plant Sci., 68: 193-198.

Lloveras, J.; J. Manent; J. Viudas; A. Ló pez and P.Santiveri.(2004). Seeding rate influence on yield and yield components of irrigated winter wheat in a mediterranean climate. Agron. J. 96:1258-1265

Lobell, D. B.; W. Schlenker and J. Costa-Roberts (.2011). Climate trends and global crop production since 1980. Science, 333:616-620.

Menshawy,A. M.M (2008). Response of six wheat genotypes to different sowing dates. Egypt. J.Agric. Res., 86 (3):957-971.

Munsif, F. M. Arif; M.T. Jan; K. Ali and M.J. Khan (2015). influence of sowing dates on phonological development and yield of dual purpose wheat cultivars.Pak. j. bot ., 47(1): 83-88.

Parry, M. A. J. and M. J. Hawkesford. (2010). Genetic approaches to reduce greenhouse gas emissions: increasing carbon capture and decreasing environmental impact. In: M. P. Reynolds (Ed.) pp. 139-150. Climate Change and Crop Production. CABI International, Wallingford, U.K.

Phadnawis, B.N. and A. D. Saini, (1992). Yield models inwheat based on sowing time and phonological developments. Ann. PlPhysio. 6: 52-59.

Rita, C. ; N. Pinheiro; A. S. Almeida; C. O Gomes; J. Coutinho; J. O Coco; A. Costa and B.O Maçs (2013). Effect of sowing date and seeding rate on bread wheat yield and test weight under Mediterranean conditions. Emir. J. Food Agric. 25 (12): 951-961.

Rosielle, A.A. and J.Hambling (1981). Theoretical aspects of selection for yield in stress and non-stress environments. Crop Sci., 21: 943-946.

Shirinzadeh, A; H. H.S. Abad; G. Nourmohammadi; E. M. Haravan and H. Madani.(2017) Effect of planting date on growth periods, yield ,and yield components of some bread wheat. IJFAS Journal,6(4):109-119.

Simane, B.; J. M. Peacock and P. C. Struik. (1993). Differences in development plasticity and growth rate among drought-resistant and susceptible Cultivars of durum wheat (*Triticum turgidum* L. Var. durum). Plant Soil., 157:155-166.

Soad, A. EL-Sayed; Eman N. M. Mohamed; Dalia A. A. El Hag and Amany, M. Mohamed (2018). Sowing Dates Effect on Yield and Grain Quality of some Wheat Cultivars.J. Plant Production, Mansoura Univ., 9 (2): 203 – 213**.**

Tahir, M. D; A. Ali; M. A. Nadeem; A. Hussain and F. Khalid (2009). Effect of different sowing dates on growth and yield of wheat (*Triticum aestivum* L.) Varieties in District Jhang, Pakistan. Pak. J. Life Soc. Sci. 7(1):66-69.

أداء بعض أصناف القمح في مواعيد الزراعة الطبيعية و المتأخرة في شمال الدلتا

داليا عبد ربه عبد العزيز الحاج

قسم المحاصيل- كلية الزراعة جامعة كفر الشيخ - كفر الشيخ - مصر.

زرعت تجربتان حقليتان بمزرعة كلية الزراعة جامعة كفر الشيخ- مصر ، خلال موسمي الزراعة 2015/2014 و 2016/2015 الهدف الدراسة معرفه سلوك بعض أصناف من قمح الخبز تحت ظروف الزراعة فى الموعد الموصي به في20 نوفمبر و الزراعة المتأخرة في 30 ديسمبر على النمو والمحصول ومكوناته وصفات الجودة للحبوب. تم زراعه كل موعد فى تجربة منفردة ووزعت الأصناف عشوائيا فى تصميم قطاعات كاملة العشوائية في اربع مكررات.ثم تم عمل تحليل تجميعي بين التجارب للحصول على التأثيرات الرئيسية لمواعيد الزراعة وتفاعلاتها ودرست الصفات الاتيه:- عدد الأيام من الزراعة وحتى التزهير والنضج الفسيولوجي، ارتفاع النبات عند الحصاد، عدد السنابل فى المتر المربع، وزن 1000 حبة، عدد حبوب السنبلة ، المحصول البيولوجي، محصول الحبوب (طن/فدان)، محصول القش (طن/فدان) ومعامل الحصاد (%) صفات الجودة وتشمل (نسبة الإنبات، معامل التوصيل الكهربي، وزن الهكتوليتر ونسبة البروتين في الحبوب) وكانت أهم النتائج المتحصل عليها : 1-أظهرت النتائج أن موعد الزراعة أثر معنويا على جميع الصفات تحت الدراسة حيث قلل تأخير الزراعة من متوسطات تلك الصفات وقلل من جودة الحبوب. 2- كما أشارت النتائج انه يوجد اختلافات معنوية بين الأصناف فى جميع الصفات تحت الدراسة وذلك ناتج عن التركيب الجيني للاصناف بالإضافة إلى تفاعلها مع الظروف البيئية (موعد الزراعة). حيث سجل كل من الأصناف مصر 2، جيزة 171 وجيزة 168 أعلى محصول في موسمى الزراعة. 3- سجلت كل الأصناف تحت الدراسة اعلي متوسطات للصفات تحت الدراسة عند الزراعة في 20 نوفمبر. 4- أوضحت النتائج ان الصنف مصر 2 من أفضل الأصناف تحت الدراسة لتحمل الزراعة المتأخرة. بالنسبة لصفات الجودة. 5- أشارت النتائج ان الصنف جيزة 168 سجل اعلي نسبة إنبات ووزن هكتوليتر فى حين سجل الصنف سخا 93 اقل معامل توصيل كهربي وبينما سجل الصنف جيزة 171 أعلى نسبة بروتين و توصي الدراسة انه لتعظيم إنتاجية وحدة المساحة من محصول القمح في شمال الدلتا بزراعة الصنف مصر 1 في 20 نوفمبر.وزراعه الصنف مصر 2 عند التاخير فى موعد الزراعه.