Egypt. J. of Appl. Sci., 40 (1-2) 2025 *15-29*

EFFECT OF SOWING DATE ON GRAIN YIELD AND ITS COMPONENTS OF SOME BREAD WHEAT GENOTYPES YIELD

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ABSTRACT

Some farmers at Middle Egypt delay sowing data of spring wheat because their farms are planted with some cash crops that will be harvested late in December or January such as onions, potatoes and cabbage beside climate change. Thus, the experiment was suggested and carried out at Assiut agriculture research station (clay soil) at Middle Egypt during two successful seasons. Two field experiments were carried out at the Assuit Agricultural Research Station, Egypt, in two successive season of 2021/2022 and 2022/2023, using a split-plot design in a randomized complete block design arrangement with four replicates. Using three sowing dates (10^{th} November, 5^{th} December and 30^{th} December) were randomly distributed in main plot and sixteen genotypes (fourteen lines and two bread wheat cultivars Misr 3 and Sakha 95) in subplot. The sowing dates had significant effects for all studied traits in both seasons and combined data. The genotype L8 gave the highest number of spikes/ m^2 (369 and 361) in the first and second sowing date respectively, while L7 recorded (266) in the late sowing, while, L12 showed the highest number of kernels / spike (86.62 and 82.75) in the first and second season, and L13 (65.13) under the late planting. The highest value for 1000 (KW) was recorded for L13 (42.71and 40.52 g) in the optimum and second sowing date and L8 (82.98 g) under the late sowing. Concerning grain yield ard/fad (GY ard/fad) the lines L13, L12 and L11 showed the highest grain yield in the first, second and late sowing date, respectively.

Key Words: Wheat, Sowing Dates, Genotypes, Yield.

INTRODUCTION

Wheat is one of the important staple crops around the world. In Egypt, its grains are used as human food and its straw is used for animals feeding. The gap between production and consumption in Egypt remains wide in spite of the exerted efforts for increasing wheat production **(Attia and Barsoum 2013)**. To minimize this gap, it is crucial to use optimum sowing dates and promising genotypes **(Ouda *et al.*, 2017)** to enhance wheat productivity of unit area and to increase total cultivated area. Wheat sowing date and genotype are among the most important factors that affect grain yield and quality, where the optimum sowing date of wheat cultivars leads to increase 1000-grain weight **(Ali *et al.*, 2010)**.

Conversely, late planting and the climate had scarious effect on wheat by genotypes **(Abdelkhalik and Hagras, 2021)**. To increase yield advantage and maximum wheat output per unit area, choosing the right genotype is essential. However, most researchers have focused their studies on growth and yield rather than grain quality**, (Badawi *et al.*, 2014)**.

Sowing time decide the growth habit of the crop as climatic conditions vary from optimum conditions. Cereals significantly respond to varying environmental features as their growth and grain development **Eslami *et al.*,(2014)**. The reduction in wheat yield and its components with delayed sowing date was the result of exposure of plants to high temperature, which decreased season length **(Suleiman *et al.*, 2014)**. **Elhag (2012)**, found significant variation in yield and its components among wheat genotypes under normal and late planting. Also, it was reported that delaying sowing date reduced number of kernels/ spike, 1000- kernel weight and grain yield.

Despite the awareness of the benefits of timely sowing and the hazard resulting from delay, sowing often takes place long after the optimal time, it can be assumed that the breeding progress, changes of climate and used agricultural techniques make it necessary to modify the recommendation regarding the timeliness of sowing.

Therefore the target of the present study was: 1- evaluate the some bread wheat genotypes under optimum and late sowing , 2- investigate the interactive effects of sowing date and wheat genotypes.

MATERIALS AND METHODS

The present study was carried out at Assuit Agricultural Research Station, ARC, Assuit governorate (27°.03'N latitude and 31°.01'E longitude with an altitude of 71.00 meters above sea level), during both successive growing seasons of 2021/2022 and 2022/2023. The preceding crop in the two growing seasons was maize. The experimental materials consisted of fourteen wheat lines selected from introduction program for heat condition from CIMMYT and two commercials cultivars obtained from Wheat Research Department, Filed Crops Research Institute, Agricultural Research Center, Egypt. Name and pedigree of the studied bread wheat genotypes are shown in Table 1.

Table (1): Name, pedigree and origin of the sixteen selected wheat genotypes

Se.No	Name	Pedigree	Origin	Source (2020/2021)
1	Line 1	CHIPAK*2//SUP152/KENYA SUNBIRD	Cimmyt	21HTWYT
2	Line 2	SUP152/BAJ#1*2/3/KINGBIRD#1//INQALAB 91*2/TUKURU	Cimmyt	
3	Line 3	QUAIU #1/BECARD/3/WBLL1*2/BRAMBLING*2//BAVIS	Cimmyt	
4	Line 4	WBLL1*2/BRAMBLING/4/BABAX/LR42// BABAX*2/3/SHAMA*2/5/PBW343*2/KUKUNA*2//FRTL/PIFED	Cimmyt	
5	Line 5	CHIBIA//PRLII/CM65531/3/FISCAL*2/4/TAM200/ TURACO/5/SWSR22T.B./2*BLOUK #1//WBLL1*2/KURUKU	Cimmyt	
6	Line 6	SUP152/BAJ #1*2/4/WHEAR/VIVITSI//WHEAR/3/PANDORA	Cimmyt	
7	Line 7	WBLL1*2/CHAPIO/6/CNDO/R143//ENTE/MEXI75/3/AE.SQ/4 /2*OCI/5/2*CIRCUS/7/WBLL1*2/ BRAMBLING*2/8/MUU/FRNCLN//FRANCOLIN #1	Cimmyt	
8	Line 8	ELVIRA/5/CNDO/R143//ENTE/MEXI75/3/AE.SQ/ 4/2*OCI/6/VEE/PJN//KAUZ/3/PASTOR/7/KIRITATI/4/2*SERI.1 B*2/ 3/KAUZ*2/BOW//KAUZ/8/ELVIRA/5/CNDO/ R143//ENTE/MEXI75/3/AE.SQ/4/2*OCI/6/ VEE/PJN//KAUZ/3/PASTOR*2/9/BORL14	Cimmyt	
9	Line 9	BORL14*2/8/REH/HARE//2*BCN/3/CROC_1/AE.SQUARROSA (213)//PGO/4/HUITES/5/T.DICOCCON PI94624/AE.SQUARROSA (409)//BCN/6/REH/HARE//2*BCN/3/CROC_1/AE.SQUARROSA (213)//PGO/4/HUITES/7/MUTUS	Cimmyt	
10	Line 10	PBW343*2/KUKUNA/3/PASTOR//CHIL/PRL/4/GRACK/ 5/MUU/FRNCLN//FRANCOLIN #1	Cimmyt	
11	Line 11	KACHU/SAUAL//PRL/3/KACHU/KIRITATI	Cimmyt	
12	Line 12	TUKURU//BAV92/RAYON/3/FRNCLN/4/2*FRNCLN*2/TECUE #1	Cimmyt	
13	Line 13	MUTUS*2//TAM200/TURACO*2/3/KFA/2*KACHU	Cimmyt	
14	Line 14	SWSR22T.B./2*BLOUK #1//WBLL1*2/KURUKU/3/BORL14/4/SWSR22T.B./2*BLOUK #1//WBLL1*2/KURUKU	Cimmyt	
15	Misr3	ATTILA*2/PBW65*2/KACHU	Egypt	
16	Sakha95	PASTOR//SITE/MO/3/CHEN/AEGILOPS SQUARROSA (TAUS) //BCN /4/ BLL1	Egypt	

(21th HTWYT) : Heat tolerance wheat yield trial season 2021- 2022

The meteorological data for the two growing seasons were obtained from The Central Laboratory for Agricultural Climate, ARC. Egypt (Table 2).

Table (2): The monthly metrological parameters at Assuit Agricultural research station during 2021/2022 and 2022/2023 growing seasons.

2021/2022					
Month	T max (°C)	T min (°C)	RH %	W.S / km/h	Sunshine
November	28.6	13.4	50.7	9.9	9.4
December	20.3	7.7	54.7	10.7	9.0
January	17.1	4.5	57.1	10.3	8.9
February	20.2	6.4	51	13.8	9.7
March	22.6	8.4	39.2	18	9.9
April	34.6	16.2	26.4	15.4	10.3
May	35.2	19.3	25	18.1	11.4
Average	25.51	10.84	43.44	13.74	9.80
2022/2023					
Month	T max (°C)	T min (°C)	RH %	W.S / km/h	Sunshine
November	25.7	12.1	51.4	12	9.4
December	22.9	9.3	57.6	9.6	9.0
January	21.1	7.1	56	10.1	8.9
February	20.2	6.1	51	11.8	9.7
March	27.1	12.1	34.3	9.9	9.9
April	31.5	15.1	25.5	14.2	10.3
May	34.6	19.2	26.4	13.5	11.4
Average	26.16	11.57	43.17	11.59	9.80

T Max = Maximum temperature (°C) **T min**= Minimum temperature (°C)
RH= Relative humidity (%) **W.S** = Wind speed (Km/h)
Latitude: 27.03 | Longitude: 31.01 | Altitude: 71m

Experimental design

The selected sixteen wheat genotypes were arranged in randomized complete block design with split plot arrangement in four replications in the two seasons. The main plots contain three sowing dates and sub plots contain the studied genotypes. Experimental plot area was 4.2 m^2. (six rows, 3.5 m long and 0.2 m apart). All recommended agricultural practices were applied as recommended for wheat crop. The three sowing dates in a two successive seasons were:

1-The first date (D1) was 10^{th} November (recommended sowing date).
2-The second date (D2) was 5^{th} December (late sowing date).
3-The third date was 30 (D3) of December (very late sowing date).

Data Recorded:

Date were recorded for 1-number of days to 50% heading (DH), 2-number of days to 50% physiological maturity (DM), 3-grain filling period (d) (GFP = DM- DH), 4-grain filling rate (g/d) (GFR = GY/GFP), 5-plant height (cm) (PH), and the agronomic data including 6-number of spikes/m^2 (NSM^2), 7-number of kernels/spike (NKS) , 8-1000- kernel weight (1000-KW), 9-grain yield (GY) in ard/fed (one ard= 150 kg grains and one fed= 4200m^2).

Statistical analysis:

Data were subjected to the proper statistical analysis as the technique of analysis of variance (ANOVA) of split plot design according to **Gomez and Gomez (1984)**. Treatments means were compared using the least significant difference (LSD) test as outlined by **Waller and Duncan (1969)**. Computation was done using SPSS computer software **(IBM crop 2021)**. Combined analysis of variance across the two seasons was also performed if the homogeneity test was insignificant according to **Levene (1960)**.

RESULTS AND DISCUSSIONS

Effect of three sowing dates in both seasons and in combined

Results in Tables 3, 4 and 5 clearly revealed that sowing dates had significant effects on the studied traits in both seasons and in combined data. All wheat genotypes significantly performed better at the optimum sowing date (first date). This demonstrates showed the importance of sowing date to evaluate the performance of different wheat cultivars. **Menshawy (2007)**, reported that environmental factors, viz., temperature and day length are distinct at the time of sowing and during crop growth under different natural photothermal environments. In general, delay in sowing date resulted in a significant decrease in yield and its components for all studied genotypes in this study. These results are in agreement with those obtained by **Upadhyay *et al.*, (2015) Ali *et al.*, (2016) and El Sayed *et al.*, (2018)** who indicated that late sowing subjected wheat grains to low soil temperatures causing poor emergence, and high temperatures at the end of season, which might adversely effect on reproductive growth stage.

The results showed significant effect of sowing dates on all studied characteristics. It was clear that the significant between numbers of spikes/ m^2 (NSPM2) (338, 334 and 336) in the first and second season and combined data, respectively in the optimum date, and the late sowing date was (249, 252 and 251) in first and second season and overall data. In this context, grain growth was reported to be reduced due to the high temperatures during grain filling and consequently abnormal grain development and shortened the period for normal grain development **(Seleem, & Abd El –Dayem, 2013 and El-Areed *et al.*, 2017)**. These results are in agreement with those obtained by **Talukder *et al.*, (2014)**. Number of kernels/spike (NKS) were (83.09, 78.48 and 80.79), respectively in first and second season and overall data, in the optimum date. But these values in the late sowing date were (62.58, 56.84 and 59.71) respectively, in first and second season and overall seasons, for 1000 kernel weight (1000KW)(g) (41.13, 38.72 and 39.93g) in first and second season and overall data in the optimum date, and the late sowing date was (31.16, 29.15 and 30.15 g) in first and second season and overall data, for grain yield ard/fad (GY ard/fad) (15.16, 14.95 and 15.05 ard/fad) in the optimum sowing date and in the late sowing date was (7.16, 7.06 and 7.11 ard/ fad, respectively, in first and second season and overall data. These results are in good agreement with those reported by **Tawfelis *et al*., (2006) ; Talukder (2014) ; Menshawy *et al*., (2015) and Yadav *et al*., (2018). Menshawy *et al*., (2007)** recorded that timing of initiation of vegetative and reproductive organs depends upon temperature and photoperiod, but the survival and subsequent size of such organs is dependent upon the supply of assimilates. The choice of sowing date is, therefore, vital to ensure both sufficient grain sitting initiated and sufficient assimilates. **Ali *et al*., (2016)**, reported that late sowing of wheat subjected the grains to low soil temperatures causing poor emergence, and high temperature at the end of season, which might adversely affect reproductive growth stage.

Table (3): Mean performance of three sowing dates in both seasons and combined for days to heading (DH), days to maturity (DM) and grain filling period (GFP).

Dates (D)	DH			DM			GFP		
	21/22	22/23	Overall	21/22	22/23	Overall	21/22	22/23	Overall
D1	97	93	95	142	140	141	45	47	46
D2	95	89	92	133	129	131	38	40	39
D3	84	81	83	119	115	117	35	34	34
Mean	92.0	87	90.0	131.3	128.0	129.7	39.3	40.3	39.7
LSD 0.05	0.6	0.67	0.7	0.71	2	0.8	0.7	0.78	0.8
Genotypes (G)	21/22	22/23	Overall	21/22	22/23	Overall	21/22	22/23	Overall
Line 1	91	85	88	129	126	128	39	41	40
Line 2	90	82	86	129	122	125	39	40	40
Line 3	90	88	89	130	127	129	40	39	39
Line 4	91	86	88	131	127	129	40	41	40
Line 5	87	81	84	127	126	126	41	44	43
Line 6	92	87	89	130	128	129	38	42	40
Line 7	92	87	90	133	130	132	42	43	42
Line 8	94	89	92	135	132	133	41	42	42
Line 9	93	91	92	135	128	132	42	38	40
Line 10	89	84	86	129	127	128	40	43	42
Line 11	88	86	87	129	125	127	40	39	39
Line 12	93	91	92	134	130	132	41	40	40
Line 13	94	88	91	133	128	131	40	40	40
Line 14	97	94	95	130	130	130	34	36	35
Misr 3	94	93	94	133	130	131	39	37	38
Sakha 95	96	94	95	133	130	131	37	36	36
Mean	91.9	87.9	89.9	131.3	127.9	129.6	39.6	40.1	39.8
LSD 0.05	2.1	2.33	1.2	2.9	0.7	1.2	2.2	2.92	1.4
Interaction D*G	2.9	3.15	2.1	3	3.1	2.1	3.3	3.83	2.50

Table (4): Mean performance of three sowing dates in both seasons and combined for grain filling rate (GFR), plant height (PH) and number of spikes/m^2 (NSM2).

Dates (D)	GFR (g/day)			PH (cm)			NSM2		
	21/22	22/23	Overall	21/22	22/23	Overall	21/22	22/23	Overall
D1	50.92	48.2	49.56	101.03	98.38	99.7	338	334	336
D2	45.38	39.94	42.66	91.06	90.2	90.63	329	320	325
D3	30.9	31.66	31.28	81.86	85.17	83.52	249	252	251
Mean	42.4	39.9	41.2	91.3	91.3	91.3	305.3	302.0	304.0
LSD 0.05	1.57	1.83	1.83	1.91	1.47	2.13	3.09	2.91	4.2
Genotypes (G)	21/22	22/23	Overall	21/22	22/23	Overall	21/22	22/23	Overall
Line 1	43.59	40.81	42.20	87.33	86.08	86.71	292	288	290
Line 2	44.51	42.33	43.42	93.08	90.58	91.83	323	314	318
Line 3	41.79	40.54	41.17	94	94.33	94.17	318	310	314
Line 4	38.95	38.18	38.57	90.25	89.42	89.83	322	317	320
Line 5	40.33	36.08	38.20	90.67	90.58	90.62	298	293	295
Line 6	40.36	36.27	38.31	91.42	93.33	92.38	285	286	286
Line 7	40.95	37.45	39.20	88.08	88.08	88.08	338	333	336
Line 8	41.74	34.27	38.01	88	89.42	88.71	335	329	332
Line 9	37.11	41.16	39.14	94.08	97.25	95.67	300	294	297
Line 10	34.89	36.67	35.78	88	87.17	87.58	287	287	287
Line 11	50.32	47.43	48.88	95.33	96.08	95.71	310	298	304
Line 12	41.78	41.42	41.60	91.17	90.17	90.67	289	285	287
Line 13	45.85	41.44	43.64	90.42	88.83	89.62	315	327	321
Line 14	50.57	44.17	47.37	97.42	97.25	97.33	285	287	286
Misr 3	40.47	39.97	40.22	86.75	86.5	86.62	300	298	299
Sakha 95	45.19	40.72	42.95	95.08	94.92	95	291	286	289
Mean	42.40	39.90	41.20	91.30	91.20	91.30	305.50	302.00	303.80
LSD 0.05	4.54	5.72	2.99	4.28	6.37	3.04	15.1	9.56	6.70
Interaction D*G	6.72	8.19	5.28	7.91	NS	5.45	19.6	13.34	11.8

Table (5): Mean performance of three sowing dates in both seasons and combined for number of kernels/spike (NKS), 1000 kernel weight (1000 KW) and grain yield (GY).

Dates (D)	NKS			1000 KW (g)			GY ard/fad		
	21/22	22/23	Overall	21/22	22/23	Overall	21/22	22/23	Overall
D1	83.09	78.48	80.79	41.13	38.72	39.93	15.16	14.95	15.05
D2	74.55	73.66	74.1	37.5	36.79	37.15	11.5	10.52	11.01
D3	62.58	56.84	59.71	31.16	29.15	30.15	7.16	7.06	7.11
Mean	73.4	69.7	71.5	36.6	34.9	35.7	11.3	10.8	11.1
LSD 0.05	2.18	1.01	1.87	0.77	0.39	0.63	0.32	0.44	0.38
Genotypes (G)	21/22	22/23	Overall	21/22	22/23	Overall	21/22	22/23	Overall
Line 1	73.42	68.58	71	35.06	33.63	34.35	11.42	11.23	11.33
Line 2	76.25	71	73.62	38.66	37.57	38.12	11.71	11.52	11.62
Line 3	75.08	73	74.04	34.83	32.42	33.62	11.14	10.79	10.96
Line 4	72.92	67.25	70.08	35.42	33.82	34.62	10.53	10.52	10.53
Line 5	76	68.08	72.04	34.24	32.13	33.18	11.05	10.85	10.95
Line 6	68.92	66.08	67.5	37.42	34.45	35.93	10.42	10.3	10.36
Line 7	73.33	73.83	73.58	37.15	34.93	36.04	11.49	10.94	11.22
Line 8	71.25	65.42	68.33	38.29	36.72	37.5	11.57	9.85	10.71
Line 9	76.92	72.92	74.92	36.05	34.96	35.5	10.44	10.61	10.53
Line 10	73.08	73.5	73.29	34.78	35.03	34.9	9.55	10.84	10.2
Line 11	74.25	68.5	71.38	38.49	35.31	36.9	13.6	12.44	13.02
Line 12	79.08	74.25	76.67	33.86	34.16	34.01	11.61	11.2	11.41
Line 13	71.75	66.25	69	40.15	37.25	38.7	12.4	11.35	11.88
Line 14	70.42	68.33	69.38	37.37	35.51	36.44	11.5	10.95	11.22
Misr 3	72.42	70.67	71.54	35.66	34.24	34.95	10.57	10.07	10.32
Sakha 95	69.42	66.92	68.17	38.17	36.05	37.11	11.35	9.99	10.67
Mean	73.4	69.7	71.5	36.6	34.9	35.7	11.3	10.8	11.1
LSD 0.05	5.01	4.83	2.93	1.49	2.18	1.08	1.25	1.30	0.71
Interaction D*G	NS	5.79	5.19	NS	2.5	1.90	1.61	1.92	1.24

Response of wheat genotypes

Results from Tables (3, 4 and 5) show that the wheat genotypes significantly differed in all studied traits in the two growing seasons and in the combined analysis. For days to heading (DH), L5 was the earliest genotype and L14 and Sakha 95 were the latest one in the two seasons and in overall data. For days to maturity (DM) also L5 was the earliest variety in the first seasons and L2 in the second season and in overall data and L8 was the latest one in the two seasons and in overall data. For the grain filling period (GFP) the wheat line L7 was having the longest grain filling period in the two seasons and overall data, while L14 had the shortest grain filling period under the two growing seasons and across seasons (Table 3).

For the grain filling rate (GFR) the wheat genotype L14 and L11 had the longest grain filling rate in the first season and L11 in the second season and overall data, while L10 had the shortest grain filling period in the first growing seasons and overall data while L8 was in second season (Table 4).

For plant height (PH), data in Table (4) revealed that **L14**, in the both and overall data the tallest plants with (97.42, 97.25 and 97.33 cm), while, **L1** had the shortest one with (87.33, 86.08 and 86.71 cm) in the first and the second season and overall data.

For the number of spikes/ m^2 (SPM2), the wheat genotype L6 showed the lowest number of spikes/ m^2 (285, 286 and 286) in the two seasons and across seasons, while L7 showed the highest number of spikes/ m^2 in the first and second seasons and overall data (338, 333 and 336) (Table 4).

For the number of kernels/spike (KSP), **L6** showed the lowest number of kernels/spike among the tested wheat genotypes (68.92, 66.08 and 67.50) and L12 showed the highest number of kernels / spike (79.08, 74.25 and 76.76) in the two seasons and overall data (Table 5).

For 1000 kernel weight (1000-KW), the genotype L13 showed the highest value of 1000 kernel weight (40.15, 37.25 and 38.7 g) in the two consecutive seasons and overall data, while, L5 had the lowest value of 1000 kernel weight (34.24, 32.13 and 33.18 g) in two seasons and overall data (Table5) .

For the grain yield (GY), in the both seasons and overall data L11 showed the highest grain yield (13.6, 12.44 and 13.02 ard/fad) and L10 showed the highest grain yield (9.55 and 10.2 ard/fad) in the first season and overall data. On the other hand, L8 produced the lowest grain yield (9.85 ard/fad) in the second season (Table 5).

A highly significant differences were obtained among the bread wheat genotypes for grain yield and yield component. This result indicates the presence of a clear degree of genetic variation that may contribute the most to adaptation and flexibility to diverse environmental conditions. Variations among wheat cultivars might be attributed to the genetic constitution of the cultivar. These results are in harmony with **(Hasina *et al.*, 2012; Hassanein *et al.*, 2012; Lak *et al.*, 2013; Upadhyay *et al.*, 2015 and Ali *et al.*, 2016)**.

Effect of sowing date on wheat genotypes

The presented data in Tables (6, 7 and 8), show that highly significant differences were obtained due to different sowing dates, for days to heading (DH), **L5** was the earliest genotype in three times of sowing date and followed by L2 , **L14** was the latest one in three times of date. For days to maturity (DM) also L2 then **L5** were the earliest genotypes in three times of sowing date, and L8 was the latest one in three times of sowing date. For the grain filling period (GFP) the wheat line L7 was having the longest grain filling period in first and third sowing date while L5 and L8 in the second sowing date, and Sakha 95 had the shortest grain filling period under the first and the third date and L14 under the second date (Table 6).

For the grain filling rate (GFR) the wheat genotype L11 was having the longest grain filling rate in the three times of sowing date, while L10 had the shortest grain filling period under first and second date and L9 under the last date (Table 7).

For plant height (PH), data in Table (7) revealed that, **L14** in the first and last date the tallest plants with (111.5 and 88.5 cm) and Sakha 95 (92.38 cm) in the second date, while, **L1** had the shortest one with (86.13 and 78.5 cm) in the second and the last date, and Misr 3 (92 cm) under the optimum date.

For the number of spikes/ m^2 (NSM2), the wheat genotype L8 showed the highest number of spikes/ m^2 (369 and 361) in the first and second sowing date, while L7 showed the highest number of spikes/ m^2 (296) in the last sowing date, and L14 gave the lowest number of spike/m^2 under optimum date, L6 under second date and L10 under the latest date (Table 7). The reason for the decrease in the number of grains in the late dates is due to high temperature during that period, which negatively affected the number of grains in the spike (Table 2). These results agree with **Al-Jiashi (2020) and Jassim *et al.*, (2016)** who found a significant difference in the different sowing dates for the number of grains traits during the period of its formation and this result agree also with **Farooq *et al.*, (2018)**.

Table (6): Overall mean performance of three sowing dates in two growing seasons for days to heading (DH), days to maturity (DM) and grain filling period (GFP).

Genotypes (G)	DH (d)			DM (d)			GFP (d)		
	D1	D2	D3	D1	D2	D3	D1	D2	D3
Line 1	92	90	81	138	129	116	46	39	34
Line 2	90	88	78	135	127	114	45	39	35
Line 3	96	91	80	141	129	115	45	38	35
Line 4	94	91	80	139	131	117	44	40	37
Line 5	89	85	78	138	128	114	49	42	36
Line 6	93	91	84	140	130	117	47	38	34
Line 7	94	92	83	143	132	121	49	40	38
Line 8	97	93	85	145	135	121	47	42	36
Line 9	98	94	83	143	133	119	44	39	36
Line 10	91	89	78	140	130	114	49	41	35
Line 11	92	89	81	137	129	114	46	40	33
Line 12	99	94	84	145	135	117	46	40	33
Line 13	95	92	84	141	132	119	46	40	34
Line 14	100	97	88	144	131	116	44	34	27
Misr 3	99	96	86	143	132	120	44	36	34
Sakha 95	100	97	87	142	133	119	41	36	31
mean	95	92	83	141	131	117	46	39	34
LSD 0.05	2.1			2.1			2.5		

Table (7): Overall mean performance of three sowing dates in two growing seasons for grain filling rate (GFR), plant height (PH) and number of spikes/m^2 (NSM2).

Genotypes (G)	GFR (g/d)			PH (cm)			NSM2		
	D1	D2	D3	D1	D2	D3	D1	D2	D3
Line 1	47.27	41.52	37.82	95.5	86.13	78.5	325	315	230
Line 2	54.79	39.68	35.79	97.63	93.25	84.63	347	332	275
Line 3	47.62	45.22	30.65	101.25	94.63	86.63	352	339	251
Line 4	46.04	38.21	31.45	97.88	89.13	82.5	354	340	266
Line 5	45.67	36.58	32.35	100.25	87.88	83.75	327	313	247
Line 6	47.32	39.01	28.61	102.5	87.25	87.38	316	304	237
Line 7	45.9	44.48	27.23	94.13	90.13	80	359	352	296
Line 8	43.9	42.6	27.52	97.5	88.38	80.25	369	361	266
Line 9	49.92	41	26.48	105.25	97.5	84.25	327	315	247
Line 10	43.76	36.8	26.79	93.5	90.13	79.13	329	314	218
Line 11	55.18	47.76	43.7	107	92.75	87.38	341	326	245
Line 12	50.13	47.93	26.75	97.75	92	82.25	317	310	235
Line 13	55.43	44.84	30.66	96.25	88.75	83.88	346	334	282
Line 14	54.1	49.14	38.88	111.5	92	88.5	315	306	237
Misr 3	47.66	41.67	31.34	92	87.88	80	332	320	245
Sakha 95	58.3	46.09	24.48	105.38	92.38	87.25	320	312	234
Mean	49.56	42.66	31.28	99.7	90.63	83.52	336	325	251
LSD 0.05	5.28			5.45			11.80		

Table (8): Overall mean performance of combined of three sowing date at two growing seasons of number of kernels/spike (NKS), 1000 kernel weight (1000 KW) and grain yield (GY).

Genotypes (G)	NKS			1000 KW (g)			GY ard/fad		
	D1	D2	D3	D1	D2	D3	D1	D2	D3
Line 1	77.75	74.88	60.38	38.59	37.09	27.35	14.5	10.82	8.66
Line 2	82.75	74.5	63.63	42.2	39.55	32.6	16.33	10.16	8.35
Line 3	86.25	75.25	60.63	38.52	34.52	27.83	14.26	11.38	7.25
Line 4	78.38	75.25	56.63	38.3	34.68	30.88	13.67	10.18	7.73
Line 5	83.38	73.25	59.5	37.72	35.04	26.79	14.87	10.2	7.77
Line 6	76.5	68.38	57.63	38.73	37.63	31.44	14.67	10.03	6.38
Line 7	85.25	78.5	57	38.77	37.75	31.59	14.95	11.79	6.9
Line 8	82.38	67.63	55	40.88	38.65	32.98	13.8	11.73	6.6
Line 9	84.25	78.88	61.63	38.36	37.54	30.61	14.65	10.61	6.33
Line 10	83.88	75.75	60.25	39.28	36.84	28.59	14.24	10.04	6.31
Line 11	79.38	75.63	59.13	42.59	37.31	30.79	16.86	12.63	9.56
Line 12	86.62	82.75	60.63	40.8	34.54	26.68	15.44	12.93	5.85
Line 13	73	68.88	65.13	42.71	40.52	32.87	16.85	11.77	7.01
Line 14	76.38	71.5	60.25	41.11	37.49	30.73	15.72	10.94	7.01
Misr 3	82.25	74.13	58.25	39	36.6	29.26	14.01	9.99	6.97
Sakha 95	74.25	70.5	59.75	41.23	38.61	31.49	16.01	10.96	5.05
Mean	80.79	74.1	59.71	39.93	37.15	30.15	15.05	11.01	7.11
LSD 0.05	5.19			1.90			1.24		

For the number of kernels/spike (KSP), L13 (73) showed the lowest number of kernels/spike among the tested wheat genotypes in the optimum date while, L8 (67.63 and 55) in the second and third sowing date . L12 showed the highest number of kernels / spike (86.62 and 82.75) in the first and second season, and L13 (65.13) under the late season (Table 8).

For 1000 kernel weight (1000-KW), the genotype L13 showed the highest value of 1000 kernel weight (42.71and 40.52 g) in the optimum and second date and L8 under the third sowing date, while, L5 (37.72 g) in the first date, L4 in the second sowing date (34.68 g) and L12 (26.68 g) in the late season had the lowest value of 1000 kernel weight (Table 8).

For the grain yield (GY), in the both seasons and combined L13 (16.85 ard/fad), L12 (12.93 ard/fad) and **L11** (9.56 ard/fad) showed the highest grain yield in the first, the second and the late sowing date, respectively. On the other hand, L4 (13.67 ard/fad), L2 (10.16 ard/fad) and Sakha 95 (5.05 ard/fad) produced the lowest grain yield in the first, the second and the late sowing date, respectively. (Table 8).

These results may be due to the appropriate temperature at different developmental stages and consequently increased net assimilation rate. These results are in harmony with the findings of **Riaz- Ud-Din *et al* (2010) and Talukder *et al* (2014)**. Under the late sowing date, there were high heat stress, especially during grain filling period, and resulted in the reduction in grain yield, which could be due to the reduction in grain weight and shortened period to maturity **(Riaz- Ud-Din *et al.*, 2010)**.

The discrepancy between the genotypes in this trait may be due to the difference in the number of grains in the spike, which led to a greater opportunity for the accumulation of nutrients in the grain due to the lack of competition, agree with **Al-Amiri *et al.*, (2016) and Al-Hamdawi (2017)**.

In this respect, **ShenYunze (2014)** reported that the growth period of wheat was largely extended by shorter photoperiod before flowering, particularly the number of days from tillering to jointing and from jointing to heading. Also the period from flowering to maturity was extended by shorter photoperiod after flowering.

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تأثير مواعيد الزراعة على محصول الحبوب ومكوناته لبعض التراكيب الوراثية لقمح الخبز

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بعض المزارعين فى مصر الوسطى يلجاون لزراعة القمح (قمح الخبز) فى مواعيد متاخرة بسبب أن حقولهم تكون منزرعة بم

حاصيل لم تصل لمرحلة النضج مثل البصل و البطاطس و الكرنب وبالتالى يتاخر حصاد هذه المحاصيل بالاضافة الى التغيرات المناخية والتى قد تؤثر على مواعيد زراعة المحاصيل، ولهذه الاسباب اقيمت هذه التجربة فى محطة البحوث الزراعية بأسيوط خلال موسمى الزراعة المتاليين 2022/2021 و 2023/2022 ، لذلك كان الهدف من الدراسة التعرف على أفضل ميعاد للزراعة لستة عشرة تركيبا وراثيا من قمح الخبز للحصول على أفضل محصول من الحبوب وذلك فى ثلاث مواعيد زراعة وهى العاشر من نوفمبر، الخامس من ديسمبر والثلاثين من ديسمبر . كان التصميم الاحصائى المستخدم هو القطاعات المنشقة مرة واحدة فى تصميم الكامل العشوائية فى اربع مكررات حيث تم وضع مواعيد الزراعة فى القطع الرئيسية ووضعت التراكيب الوراثية فى القطع المنشقة (14 سلالة وصنفين من قمح الخبز مصر 3 وسخا 95) . وأوضحت النتائج أن مواعيد الزراعة كانت لها تأثير معنوى على جميع الصفات المدروسة على جميع التراكيب الوراثية خلال موسمى الزراعة والنتائج التجميعية.كانت أعلى النتائج لصفة عدد السنابل/م^2 للسلالة 8 (369و 361) فى الميعاد الأول والثانى و فى الميعاد المتأخر السلالة 7 (266) وكان أعلى عدد حبوب السنبلة للسلالة 12 (86.62 و 82.75) خلال الميعادين الأول والثانى والسلالة 3 (86,25) فى الميعاد الأول و اعطت السلالة 11 (42.59 و 30,79 جم) أعلى متوسط لوزن الألف حبة خلال الميعادين الأول والمتأخر ، وكان أعلى محصول الحبوب /فدان فى ميعاد الزراعة الأمثل و المتأخر للسلالة 11 (16.86 و 9.56 أردب/فدان).