Menoufia J. Plant Prod., Vol. 7 December (2022): 235 – 247

MENOUFIA JOURNAL OF PLANT PRODUCTION

https://mjppf.journals.ekb.eg/

EFFECT OF NITROGEN FERTILIZER LEVELS AND IRRIGATION REGIMES ON YIELD AND YIELD COMPONENTS OF SOME WHEAT CULTIVARS

El-Refaey, R.A.[1] ; El-Seidy E.H[1]; Atta, M.B.[2]; Zahran, G.[3] and El-Hadidy, Nehal, Kh.[1]

[1] Dept. of Agronomy, Fac. of Agric., Tanta Univ., Egypt

[2] Food Science and Technology Department, Faculty of Agriculture, Tanta University, Egypt.

[3] Bread and Pastar Research, Dept. of Food Technology, Agriculture Research Centre, Giza, Egypt

Received: Dec. 4, 2022 Accepted: Dec. 31, 2022

ABSTRACT: A Field experiment was carried out at private farm, El-Gharbeia Governorate, Egypt. This investigation was performed during the two successive growing seasons 2018/19 and 2019/20 to study the effect of three irrigations and three nitrogen levels on yield and yield components of four common wheat cultivars. The highest number of spikes/m^2, grains/spike, straw yield, biological yield, grains/spike and 1000–grain weight recorded by increasing number of irrigations from one to four irrigations. Grain yield/fad were significant only in the second growing season. Plants that received two or four irrigations produced the highest significant values of grain yield/fad. Concerning fertilization, the highest significant values of yield and yield components were obtained from fertilized wheat plants with 100 kg N/fad in both seasons, while the lowest one was obtained from 50 kg N/fad in both seasons. Banei Sweif 6 cultivar recorded the highest number of spikes/m^2 in both seasons, while Gemmeiza 11 recorded the highest number of grains/spike, straw yield and biological yield. The highest means of 1000-grain weight, and grain yields were detected in Banei Sweif 1 in both seasons. The interactions of irrigations regimes x N fertilization levels were significant for biological yield, straw yield in the second season. The interactions of irrigations regimes x genotypes were significant for biological yield, straw yield in both season and for harvest index in one season. On the other hand, interaction among the three study factors did not reach the level of significance for all studied traits. We conclude from the results that irrigation four times and twice gave the highest yield values compared to irrigation once, and it is recommended to add nitrogen fertilizer at a rate of 100 kg nitrogen per feddan to maximize the productivity of the wheat crop, under the environmental conditions of this experiment.

Key words: Wheat, Nitrogen rate, Irrigations, Cultivars, Yield.

INTRODUCTION

Wheat is one of the most important cereal crops in Egypt and in the world, It is being the most important sources of stable food urban and rural societies used in human nutrition. Bread wheat (*Triticum aestivum* L.) has been considered the first strategic food crop for more than 7000 years in Egypt. It is used for making bread, some industrial purposes and as major source of straw fodder for animal feeding. However, durum wheat (*Triticum turgidum* L. var. durum) is the second most important wheat species grown in the world, it is the best wheat for producing semolina to make macaroni due to its strong gluten, excellent amber color and superior cooking quality Gerba *et al* (2013). The cultivated area in 2018/19 season was nearly 3.135 million feddans produced 8.6 million tons of grains, with an average of 2.73 ton per feddan, while in 2019/20 season was nearly 3.171 million feddans produced 9.1 million tons of grains, with an average of 2.678 ton per feddan (according to data recorded by Agriculture Statistics, Economic Affairs sector ministry of agriculture and land reclamation 2019/20). The annual consumption of wheat grains is about 15 million tons. Consumption has increased drastically due to overall population growth of about 2.5% per year. Egypt strategy is to

*Corresponding author: nehal_khayry@agr.tanta.edu.eg

minimize the food gap of this crop particular throughout vertical improvement (increment of productivity per unit area) and horizontal expansion (increase of the area cultivated to wheat). Recently, a great attention of several investigations has been directed to increase the productivity of wheat to minimize the gap between the Egyptian production and consumption by increasing the cultivated area and wheat yield per unit area (Zaki., *et al* 2012). Increasing wheat production per unit land area could be improved through usage of high yielding varieties and the application of agro-management practices, especially added nitrogen fertilization. Many researchers have found that nitrogen application is an important input for wheat production. Irrigation could be considered the limiting factor affecting crop production and agricultural expansion. In Egypt, especially in Nile Valley and Delta region, farmers use extra water to irrigate their farms which negatively affected on wheat yield. So, irrigation management, applying the irrigation water timely and quantitatively will improve wheat yield and save considerable amount of water. Many researches proved the importance of irrigation treatment in wheat productivity. Menshawy *et al* (2006) evaluated some agronomic of some wheat cultivars under different irrigation treatments and concluded that, plant height, grains/spike, 1000-grain weight, grain and straw yields for all tested cultivars were decreased with decreasing the number of irrigations from four to two to one.

The aim of this investigation was to study the effects of irrigation regimes and nitrogen levels on yield and its components of some common wheat cultivars.

MATERIALS AND METHODS

A field experiment was carried out at the experimental private farm, El-Gharbeia Governorate, Egypt. The first season was sown on 16th November, and the second one was sown on 13nd November 2018. The soil properties of experiment site are depicted in Table 1. Split split-plot design with three replications was used. The three irrigation regimes were allocated in main-plots, i.e. **I_1:** four irrigations applied at tillering, stem elongation, flowering and grain failing stages, **I_2:** two irrigations applied at tillering and flowering and **I_3:** one irrigation applied at tillering stage. However, the three nitrogen levels (50, 75 and 100 kg N/fad) were plotted in sub-plots and the four wheat cultivars (Giza 171, Gemmeiza 11, Banei Sweif 1 and Banei Sweif 6) were arranged in sub- sub-plots. The pedigree of the tested common wheat cultivars was presented in Table 2. The experimental sub sub-plot consisted of 15 rows, 3.5 meters long with 20 cm between rows and 10 cm between plants within rows. Each experimental sub sub-plot size was 10.5 m^2. In order to minimize border effects, the 13 middle rows were harvested with the area of 9.1 m^2 for determine the yield. Experiment field area was prepared. Phosphorus was added at the rate of 100 kg /fad in the form of calcium superphosphate (15.5% P_2O_5) before sowing. Nitrogen was added in the form of ammonia nitrate fertilizer (33.5%N) in two doses, the first one before sowing irrigation and the second dose before the first irrigation. Other agricultural practices were implemented in accordance with the recommendations of wheat farming.

Characters studied

The characters studied were determined at physiological maturity as follows: number of spikes /m^2, number of grains/spike, 1000- grains weight, grain yield, straw yield, biological yield and harvest index

Statistical analysis

Data were subjected to the proper statistical analysis as the technique of analysis of variance (ANOVA) as mentioned by Gomez and Gomez (1984). Treatment means were compared using the Least Significant Difference (LSD) test as outlined by Waller and Duncan (1969). All statistical analysis performed using analysis of variance technique by "MSTAT-C" computer software package 1990.

Table (1): Mechanical and chemical analysis of experimental soil in 2018/19 and 2019/20 seasons.

Soil properties	Season	
	2018/19	2019/20
Mechanical analysis		
Clay%	33	33.31
Silt%	35.5	35.2
Fine Sand%	16.3	16.3
coarse Sand%	9.2	9.1
Textural class	silt clay	
Chemical analysis		
pH	7.89	7.86
Organic matter	1.9	2.25
Available N (ppm)	84.6	101.232
Available p (ppm)	27.54	28.97
Available k (ppm)	340	365

Table (2): Names and pedigree of the tested common wheat cultivars.

No.	Cultivars	Species	Pedigree
1	Giza 171	Hexaploid *T. aestivum* L	SAKHA 93/GEMMEIZA 9S.6-1GZ-4GZ-1GZ-2GZ-0S
2	Gemmeiza 11		BOW"S"/KVZ"S"//7C/SER182/3/GIZA168/SAKHA61 CGM7892-2GM-1GM-2GM-OGM.
3	Banei Sweif 1	Tetraploid *T. turgidum* L *var durum*	JO"S"/AA"S"//FG"S".
4	Banei Sweif 6		BOOMER-21/BUSCA-3. CDSS9Y00185-8Y-0M-0Y-0B-1Y-0BOSD.

RESULTS AND DISCUSSIONS

Yield and yield components

1-Analysis of variance

Mean squares from the analysis of variance for number of spikes/m^2, number of grains /spike,1000- grain weight, straw yield(ton)/fad, biological yield, grain yield/fad and harvest index are presented in Table (3).

It is clear from the data collected that, mean squares of irrigations were highly significant for number of spikes/m^{2}and biological yield in both seasons. However, 1000–grain weight was highly significant in the first season and number of grains/spike and straw yield (ton)/fad in the second season. Number of grains/spike, straw yield/fad were significant only in the first season and, grain yield /fed in the second season only. This could indicate that, the effect of different number of irrigations on the significant traits above was differ from irrigation number to another. On the other side, harvest index was not significant in both seasons,1000 –grain weight in the second season and grain yields per feddan in the first season, which may indicate that these traits were performed in the same way with different irrigation numbers.

Table (3): Analysis of variance for yield and yield components.

S.O.V	*d.f*	Number of spikes/m^2		Number of grains/spike		1000-grain weight (g)		Grain yield/fad (ton)		Straw yield /fad (ton)		Biological yield/ fad (ton)		Harvest index (%)	
		2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020
Rep	2	1409.33	2241.77	0.41	128.74	244.46**	0.11	14.81	11.88	8.19	1.63	6.17	2.06	225.25	59.56
Irrigations(A)	2	84669.77**	76088.44**	253.48*	7171.03**	362.26**	555.56	165.87	162.28*	56.56*	48.87**	88.33**	72.67**	900.41	586.84
Error(a)	4	1273.77	8808.88	34.61	113.74	8.91	112.87	32.64	15.19	5.12	1.40	2.89	1.35	316.52	132.65
Fertilization (B)	2	22019.11*	19863.11**	197.64**	386.91*	299.34*	460.10**	108.61**	127.08**	9.77	12.65**	22.01**	27.33**	58.76	20.87
A×B	4	74.88	348.22	28.24	67.57	17.08	39.25	2.76	2.70	0.48	6.78**	.78	7.14**	33.39	171.40
Error(b)	12	4855.62	4095.62	21.90	79.77	71.58	66.09	8.15	5.07	2.99	0.77	2.59	1.067	135.43	55.83
Genotypes (C)	3	36670.82**	19799.06*	1695.77**	966.35**	1294.52**	531.99**	32.19	33.57	37.48**	7.94*	28.003**	9.59*	1412.14**	111.29
A×C	6	362.22	7192.24	26.36	53.25	22.30	38.40	20.90	2.53	6.99**	6.70*	5.85**	6.16*	208.58*	145.85
B×C	6	576.74	457.87	57.49	24.32	37.83	8.90	3.15	3.30	0.96	4.16	.81	3.34	74.51	151.86
A×B×C	12	207.93	397.51	11.80	28.01	12.23	3.23	2.68	0.92	0.84	3.69	.74	3.67	36.09	104.17
Error(c)	54	2618.56	5402.81	66.12	94.70	70.39	85.36	13.28	13.18	1.54	2.60	1.63	2.45	91.52	174.14

NS, * and ** indicated not significant, significant at 0.05 and significant at 0.01 levels of probability, respectively.

From the data listed in Table (3), it could be concluded that the effect of different fertilization levels was significant in the first season and highly significant in the second one for No. of spikes/m^2 and1000 –grain weight and highly significant for biological yield, grain yield /feddan in both seasons. The effect of different fertilization levels was highly significant for No. of grains /spike in the first season and only significant in the second one. The same effect was highly significant for straw yield/feddan in the second season. These results indicated that the performance of the significant traits in view was differ from nitrogen level to another. On the other hand, the effect of fertilization levels was not significant for harvest index in both seasons and straw yield in the first season, indicating that, the traits were performed in the same way with different nitrogen fertilization levels.

These results may be due to the fact that, nitrogen is a necessary element for cell structure and function since protoplasm in the seat of cell division and plant growth, which lead to increasing dry matter accumulation. In addition, increasing nitrogen rates encouraged the vegetative growth, meristematic activity, improve the biotic process in plant and increasing the filling process in wheat grains and consider the main element in protein content.

The interactions of irrigation x nitrogen fertilization levels mean squares were highly significant for biological yield and straw yield/fed in the second season only. This might indicate that, the effect of nitrogen levels differed from irrigation treatment to another. On the other side, all above rest traits showed insignificant interactions, indicating that the effect of N levels on these traits do not differ from irrigation regime to another (Table 3).

Genotypes mean squares were highly significant for No. of grains/spike and1000 –grain weight in both seasons, No. of spikes/m^2, biological yield, straw yield/fad were highly significant in the first season and only significant in the second one. This might indicate that the presence of variation in the genotypes, genetic make-up and the unsteady environmental conditions as well as to the differences in most yield components characters. On the other side, it was observed that, for grain yield per feddan in both seasons and harvest index in the second season, the genotype mean squares were not significant.

The interaction of irrigations x genotypes mean squares were highly significant for biological yield and straw yield/fad in the first season and only significant in the second season and the interaction mean square was highly significant for harvest index in the first season . This would indicate that, the tested varieties behaved in different way by changing irrigation treatment for the significant traits. While, for the other traits the same interaction was not significant, indicating that the genotypes not affected by changes of irrigation for these traits.

The interactions of genotypes x nitrogen levels mean square were not significant for all studied traits. This might indicate that, the effect of nitrogen fertilization levels on these traits do not differ from the variety to another.

The second order interaction; irrigation x genotypes x nitrogen levels mean squares were not significant for all above mentioned studied traits., indicating that the performance of cultivars for these traits performed as stable with the changing of irrigation as well as N levels.

2- Mean performance

Data presented in Table (4) indicated that, irrigation numbers were highly significant effected on number of spikes/m^2 in the first season and only significant in the second season, respectively. The results indicated that, plants which received four followed by two irrigations had a significant increase in this trait compared to those received one irrigation in both seasons. The reduction in number of spikes/m^2 under drought condition at late stage might be due to subjection the growing plants to a water stress that negatively affected wheat plants. Moayedi *et al*., (2010) studied the performance of durum and bread wheat genotypes in relation to yield and yield component under different water deficit conditions. They found that, number of spikes /m^2 was highly significant ($P<0.01$) affected by water deficit conditions. Abu-Grab and El-Shaarawy (2013), Parvaneh *et al.*, (2014) showed that, water stress gradually decreased number of spikes/m^2.

Data presented in Table (4) indicated that irrigation treatments were highly significant effected number of grains/spike and 1000–grain weight in the first season only and not significant in the second one. The highest number of grains/spike and 1000–grain weight were recorded by increasing number of irrigations up to four irrigations, while one irrigation recorded the lowest values in this respect. Similar trend of results was obtained by Omar *et al*., (2011) where they found that, irrigation regimes had highly significant effects on yield components (No. of spikes/m^2, 1000 -grain weight and No. of grains/spike). Aghanejad *et al*., (2015) found that, drought stress (no irrigation at 50% pollination stage) decreased 1000-grain weight. Moreover, El-Nahas and Ali (2021) reported that exposing wheat genotypes to mid or severe drought stresses restricted the production of wheat grain yield and contributing traits.

In both seasons, the irrigation treatments had highly significant differences for biological yield. Where plants received either four or two irrigation regimes had the significantly highest values in this concern, while one irrigation recognized the lowest values of the trait in view in both seasons. For straw yield per feddan the effect of irrigation regimes had significant in the first season and highly significant in the second one. However, the wheat plants received four irrigations gave the significantly highest values of the trait in question in both seasons. One irrigation gave the significantly lowest straw yield either per feddan in both seasons. The highest biological and straw yields as the amount of irrigation increased might be due to the increase of yield components such as number of productive tillers and growth attributes. These results are in agreement with those obtained by Parvaneh *et al*., (2014) where they showed that, drought stress, drought stress at stem elongation had a significant effect on biological yield.

The results listed in Table (4) showed that, grain yield per feddan were significant only in the second growing season. Treated plants with two or four irrigations produced the highest significant values of grain yield, where there are no significant differences between both. However, the plants received one irrigation at tillering recorded the lowest values in both seasons.

The data listed in Table (4) revealed that number of spikes/m^2 was only significant affected by nitrogen rates in both seasons. The fertilized plants by either 100 or 75 kg N/feddan gave the highest significant values in both seasons, where there are no significant differences between both nitrogen rates in this respect. The lowest number of spikes/m^2 was obtained by the rate of 50 kg N/feddan in both seasons Number of grains/spikes was highly significant affected by N rates in the first season and only significant in the second season. However, the fertilized plants by 100 kg N/feddan gave the highest significant values for the traits under s in study both seasons, while the N rate of 50 kg N/feddan gave the significantly lowest values for the traits in view.1000-grain weight was only significant affected by nitrogen rates in the first season and highly significant in the second one. The nitrogen rates of 100 or 75 kg N/feddan had the significantly highest values of 1000-grains weight in both seasons, where there are no significant differences between both N rates in this concern. Biological yield was highly significant affected by nitrogen fertilizer rates in both seasons. In this respect, 100kgN/feddan surpassed the other nitrogen rates in both seasons. Straw yield per feddan were highly significant affected by nitrogen fertilizer rates in the second season, while in the first season the differences between means of N rates were not significant. However, 100 or 75 kg N/feddan had the same effect. The effect of nitrogen fertilizer rates on grain yield per feddan was highly significant in both seasons. The rates of nitrogen (100 or 75 kg N/fed) had the same effect both seasons. Concerning harvest index, these is no significant effect of nitrogen rates in both seasons for the trait in consideration.

Table (4). Mean performance of irrigation, fertilization and genotypes in both season for yield and yield components of wheat.

Treatments	Number of spikes/m^2		Number of grains/spike		1000-grain weight (g)		Grain yield (ton/fad)		Straw yield (ton/fad)		Biological yield (ton/fad)		Harvest index (%)	
	Season 2018/2019	Season 2019/2020	Season 2018/2019	Season 2019/2020	Season 2018/2019	Season 2019/2020	Season 2018/2019	Season 2019/2020	Season 2018/2019	Season 2019/2020	Season 2018/2019	Season 2019/2020	Season 2018/2019	Season 2019/2020
Irrigation (A)														
I_1	331.33	314.33	57.98	65.02	56.22	54.29	3.07	2.93	5.19	5.19	8.26	8.12	37.17	36.08
I_2	320.77	309.11	56.58	61.62	58.72	54.57	2.93	3.00	4.01	3.86	6.94	6.86	42.22	43.73
I_3	242.55	232.22	52.85	56.18	52.42	47.64	2.46	2.42	2.69	2.86	5.15	5.28	47.77	45.83
F-test	**	*	**	n.s	**	n.s	n.s	*	*	**	**	**	n.s	n.s
LSD0.05	23.35	61.41	3.85	-	1.95	-	-	2.55	1.48	0.78	1.11	0.76	-	-
LSD0.01	38.73	-	4.38	-	3.24	-	-	-	-	1.29	1.84	1.26	-	-
Fertilization levels (B)														
50 Kg N/fad	271.22	258.77	53.71	58.1	52.99	48.51	2.56	2.48	3.43	3.39	5.99	5.87	42.74	42.25
75 Kg N/fad	303.66	293.22	55.37	60.19	55.61	52.34	2.81	2.83	3.99	3.95	6.8	6.78	41.32	41.74
100 Kg N/fad	319.77	303.66	58.33	64.53	58.75	55.66	3.08	3.04	4.47	4.58	7.55	7.62	40.79	39.90
F-test	*	*	**	*	*	**	**	**	n.s	**	**	**	n.s	n.s
LSD0.05	35.79	32.87	2.40	4.59	4.35	4.18	1.47	1.16	-	0.45	0.83	0.53	-	-
LSD0.01	-	-	3.37	-	-	5.85	2.06	1.62	-	0.64	1.16	0.75	-	-
Genotypes (c)														
Gemmeiza 11	257.93	265.63	62.85	67.12	45.74	45.87	2.58	2.72	5.73	4.56	8.31	7.28	31.05	37.36
Giza 171	276.15	281.93	62.13	64.12	58.59	56.254	2.91	3.03	3.26	4.11	6.17	7.14	47.16	42.44
Banei Sweif 6	332.44	324.44	46.93	54.01	57.32	52.94	2.86	2.67	3.42	3.98	6.28	6.65	45.54	40.15
Banei Sweif 1	326.37	268.44	51.31	58.09	61.498	53.62	2.93	2.71	3.46	3.25	6.39	5.96	45.85	45.47
F-test	**	*	**	**	**	**	n.s	n.s	n.s	*	**	*	**	n.s
LSD0.05	-	60.02	-	-	-	-	-	-	-	1.32	-	0.85	-	-
LSD0.01	45.57	-	8.83	10.57	9.11	10.03	-	-	-	-	0.92	-	10.39	-
Interactions														
A×B	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	**	n.s	**	n.s	n.s
A×C	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	*	**	*	*	n.s
B×C	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s
A×B×C	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s

NS, * and ** indicated not significant, significant at 0.05 and significant at 0.01 levels of probability, respectively.

The successive increase in nitrogen rate from 50 to 100 kg/fed resulted in a progressive increase for all the studied traits above mentioned, the highest means of yield and yield components were obtained from fertilized by 100 unit/fad in both seasons, while the lowest one was obtained from 50 unit of nitrogen /fad in both seasons. Also, due to changes in chemical and mechanical analysis of experimental soil from season to another as pointed out in Table (1). When increasing consumption of more nitrogen fertilization rates, this would lead to the highest number of grains/spike, because the lack of N in the soil causes a great loss in a number of grains as a result of failure spikelets fertilization and/or an increase in abortions advanced grain due to insufficient supply of N and lack of soil fertility. These results agreed with those reported by Ali (2007) who stated that, when No. of spikes/m^2 exhibited highly positive response with increasing nitrogen levels in both seasons, it means that N/application promoted spike initiation and also seemed to be important in regulating survival and eventual grain production. Through providing the individual tiller, with sufficient amounts of various metabolites to ensure development and activation of the essential enzyme system, which necessary for survival and growth of tiller and its spikes. Salem (2005) reported that increasing N levels lead to increase number of spikes /m^2, number of grains per spike, straw, grain and biological yields and harvest index. Also, Abad *et al.*, (2005) indicated that, increasing nitrogen levels up to 100 kg N/fad significantly increased all the studied characters. El-Sayed (2015) stated that, tillering is the most important one of the yield components factors, especially for biological yield and thus the number of spikes, the weight of a thousand grains and the number of grains/spike. In addition to, the plant height and leaf area, as well as the straw yield which affected by the number of plants and plant height during the growing season. Hossain *et al* (2006), El-Sayed and Hammad (2007) and El-Hag (2008) reported that, increasing nitrogen fertilizer led to increase number of spikes /m^2, number of grains/spike and grain yield. Salem (2005), Alam *et al* (2007), Gul *et al (*2012), Iqbal *et al* (2012), Gomaa *et al* (2015) Ullah *et al* (2018) and Araya *et al* (2019) found that increasing nitrogen rates resulted in a progressive increase for all the studied traits. This may be attributed to imply higher photosynthetic efficiencies, which leading to more assimilates production and translocation to the sinks, and also cause increases the success of pollination and fertilization of higher number of spikelets in spike. The favorable effect of nitrogen could be mainly due to its simulative effect on the number of grains /spike, number of spikes /m ^{2}and 1000-grain weight. Nitrogen effects on spike characters of wheat plant might be through its influence on the dry matter production, increasing endogenous photohormone concentration and photoassimilate partitioning to the grain and prolong the period of grain filling. Ali (2007) stated that heaviest mean of 1000 grains may be due to its grains number /spike which decreased the competition of grains for assimilates compared to higher number of the other treatments.

Data presented in Table (4) revealed that, number of spikes/m^2 was highly significant in the first season and only significant in the second one with respect to the tested wheat genotypes. Wheat Banei Sweif 6 recorded the highest number of spikes/m^2 in both seasons with no significant differences between Banei Sweif 6 and Banei Sweif 1 in the first season, followed by Banei Sweif 1 in the second season. Giza 171 came in the second grade, while Gemmeiza 11 recorded the lowest one in both seasons. The variation among wheat genotypes in number of spikes/m^2 could be attributing to genetic variation (Table 2). These results are in harmony with those reported by Salem, (2005) found significant differences among eight bread wheat varieties in number of spikes/m^2, Khalil *et al.*, (2006), Gab Alla (2007), Abd El-Rahman (2008) and Abdel-Nour and Fatheh (2011) confirmed similar obtained results.

Data presented in Table (4) indicated that, the genotype; Gemmeiza 11 recorded the highest values for number of grains/spike, biological yield, and straw yield. On the other hand, Banei Sweif 6 recorded the lowest values for number of grains/spike and 1000–grains weight in both seasons, while Giza 171 recorded the lowest values for biological yield in the first season and Banei Sweif 1 in the second one.

The highest means of 1000-grains weight, and grain yield were detected in Banei Sweif 1 in both seasons, Giza 171 in both seasons. However, Gemmeiza 11 recorded the lowest values for 1000-grain weight in both seasons. These results confirmed with those reported by Moussa and Abdel-Maksoud, (2004) where they found that, eight wheat cultivars differed significantly for number of spikes/m^2, number of grains/spike, 1000-grain weight, straw and grain yields. El-Gizawy, (2005) found that Gemmeiza 9 surpassed the other two cultivars in number of spikes/m^2, number of grains/spike, 1000-grain weight and grain yield. Gab Alla (2007) showed that, highly significant differences among 10 wheat genotypes in number of spikes/m^2, number of grains/spike, 1000-grain weight, grain and straw yields and harvest index. Semun-Tayyar, (2008) Abdel-Nour and Fatheh (2011) and Hafez *et al.*, (2012) confirmed the obtained results and they found that the wheat cultivars significantly differed in yield and yield components.

Harvest index was highly significant differed among wheat genotypes in the first season and not significant in the second one. It is clear from the data listed in Table (4) that, Giza 171 gave the highest harvest index in the first season, with no significant differences between Banei Sweif 6 and Banei Sweif 1in this concern, while Gemmeiza 11 recorded the lowest values. In this concern, Salem (2005) and El-Afandy (2006) showed marked differences in harvest index among wheat cultivars.

Data given in Table (5) show the interactions between irrigations and nitrogen fertilizations which had highly significant effect on biological yield and straw yield in the second season only. Four irrigations when fertilized with100 kg N/fad. recorded the highest values for biological yield and straw yield with no significant differences between the interaction referred and the plants received four irrigations and fertilized with 75 kg N/fad for straw yield, while one irrigation recorded the lowest values for these traits at 50 kg N/fad. On the other hand, all the other interactions for yield and yield components were not significant in both seasons.

Table (5): Effect of the interaction between nitrogen fertilization and irrigation.

Factors		**Straw yield /fad (ton)**	**Biological yield /fad (ton)**
irrigation	**Nitrogen fertilization (kg/fad)**	**Season 2019/2020**	**Season 2019/2020**
I_1	50	3.67	6.25
	75	5.38	8.41
	100	6.53	9.70
I_2	50	3.74	6.41
	75	3.63	6.71
	100	4.24	7.49
I_3	50	2.78	4.96
	75	2.85	5.22
	100	2.98	5.67
F-test		**	**
LSD 0.05		-	-
LSD 0.01		1.10	2.25

The data listed in Table (6) revealed that, Gemmeiza 11 cultivar when interacted with two or four irrigations gave the highest value for straw yield/plot in the first season, where the two interactions did not significantly differ. However, in the second season Giza 171 when irrigated four times gave the highest value for the trait in view. However, the same trend of results was occurred for straw yield without no exception. For biological yield, the results in Table (6) pointed out that Giza 171 when irrigated two times gave the significantly highest value for the trait under test, with no significant differ with the interaction of Gemmeiza 11 irrigated four times in the first season. In the second season, Giza 171 when irrigated four times gave the significantly highest value in this concern.

Table (6): Effect of the interaction between irrigation and wheat genotypes.

Factors		**Straw yield /fad (ton)**		**Biological yield /fad (ton)**		**Harvest index (%)**
Irrigation	**Genotypes**	**Season 2018/2019**	**Season 2019/2020**	**Season 2018/2019**	**Season 2019/2020**	**Season 2018/2019**
I_1	Gemmeiza 11	6.50	5.26	9.15	8.32	28.96
	Giza 171	4.81	7.06	7.98	9.90	39.72
	Banei Sweif 6	4.72	4.01	8.00	6.92	41.00
	Banei Sweif 1	4.76	4.44	7.94	7.33	40.18
I_2	Gemmeiza 11	7.25	4.33	9.84	7.62	26.32
	Giza 171	2.71	3.34	5.97	6.33	54.61
	Banei Sweif 6	2.92	3.24	5.85	6.13	50.09
	Banei Sweif 1	3.17	4.55	6.12	7.40	48.20
I_3	Gemmeiza 11	3.44	2.75	5.94	5.48	42.09
	Giza 171	2.26	3.27	4.56	5.61	50.44
	Banei Sweif 6	2.62	2.50	4.98	4.82	47.39
	Banei Sweif 1	2.45	2.95	5.12	5.22	52.15
F-test		**	*	**	*	*
LSD 0.05		-	1.52	-	1.47	9.02
LSD 0.01		1.56	-	1.60	-	-

REFERENCES

Abad, A.; Michelena, A. and Lloveras, J. (2005). Effects of nitrogen supply on wheat and on soil nitrate. Agro. Sustainable. Dev, Spri. Verlag/EDP Sci/INRA, 25 (4): 439-446.

Abdel-Nour, N.A.R. and Fatheh, H. *S*. A. (2011). Influence of sowing date and nitrogen fertilization on yield and its components in some bread wheat genotypes. Egypt. J. Agric. Res., 89 (4): 1413-1433.

Abd El-Rahman, M.E. (2008). Genetic analysis of yield, yield components and earliness in some bread wheat crosses. Egypt. J. Agric. Res., 86(3): 575-583.

Abu-Grab, O.S. and EL-Shaarawy, G.A. (2013). Physiological evaluation of some wheat genotypes to water stress. Egypt J of Apple Sci. 28(7):398-412.

Aghanejad, M.; Mahfoozi, S. and Sharghi, Y. (2015) Effects of Late-Season Drought Stress on some Physiological Traits, Yield and Yield Components of Wheat Genotypes Biological Forum –An International Journal 7(1): 1426-1431.

Alam, M.S.; Nesa, M. N.; Khan, S. K.; Hossain, M. B. and Hoque, A. (2007). Varietal differences on yield and yield contributing characters of wheat under different levels of nitrogen and planting methods. J.Appl. Sci. Res., 3(11):1388-1392

Ali, E. E.R. (2007). Performance of some wheat genotypes under different levels of irrigation and nitrogen fertilization. M.Sc. Agric. (Agronomy) –Minufiya Univ.

Araya, A.; Prasad, P.V.V.; Gowda, P.H.; Kisekka, I. and Foster, A.J. (2019). Yield and water productivity of winter wheat under various irrigation capacities. J. The American Water Resources Association. 55(1): 24-37.

El-Afandy, K.H.T. (2006). Effect of sowing methods and irrigation intervals on some wheat varieties grown under saline conditions at South Sinai. J. Agric. Sci. Mansoura Univ., 31: 573-586.

El-Gizawy, N. K. B. (2005). Yield and nitrogen efficiency as influenced by rates and sources of nitrogen fertilizers of some wheat varieties. The 11th Conference of Agronomy, Agron. Dept., Fac. Agric., Assuit Univ. Nov. 15-16.

EL-Hag, Dalia, A. A. (2008). Effect of nitrogen fertilizer rate on productivity and quality of some wheat cultivars under different plant densities M. Sc. Thesis, Kaferelshikh Univ., Egypt.

El-Nahas, Marwa M. and O.A.M. Ali (2021). Estimation of combining ability and heterosis for wheat yield and its components under water stress conditions. Egyptian J. of Agronomy, 43(2): 277-293.

El-Sayed, M.O.A.M. (2015). Performance of some new wheat cultivars under different irrigation regimes and sowing methods. M. Sc. Agric, Tanta Univ.

El-Sayed, Soad, A. and S. M. Hammad (2007). Effect of nitrogen, potassium levels on agronomic and quality traits in three bread wheat cultivars J. Agric Sci, Mansoura Univ, 32(2): 5139-5153.

Gab Alla, M.M.M. (2007). Effect of irrigation numbers on some varieties and strains of wheat. M.Sci. Thesis, Kafr El Sheikh University., Egypt.

Gerba, L; Getachew, B. and Walelign, W. (2013). Nitrogen fertilization effects on grain quality of durum wheat (Triticum turgidum L. var. durum) varieties in central Ethiopia. Agri. Sci, 4(3):123-130.

Gomaa, M.A.; Radwan, F. I.; Rehab, I. F. and Mabrouk, W. S. (2015). Response of bread wheat to organic and nitrogen fertilization. Middle East J. Agric. Res., 4(4): 712-716.

Gomez, K.A. and Gomez, A.A. (1984). Statistical Procedures for Agricultural Research (2ed.). John wiley and sons, New York, p 680.

Gul, H.; Saeed, B.; Khan, A.Z.; Latif, U.; Ali, Kh.; Ur-Rehman, J. and Ur-Rehman, S. (2012). Yield and yield contributing traits of wheat cultivars in relation with planting dates and nitrogen fertilization. Aron J. of Agric. and Bio. Sci., 7(6):386-395.

Hafez, E.M.; Aboukhadrah, S.H.; Sorour S.Gh.R. and Yousef, A.R. (2012). Comparison of agronomical and physiological nitrogen use efficiency in three cultivars of wheat as affected by different levels of N-sources. Proc. 13th International Conf. Agron., Fac. of Agic., Benha Univ., Egypt, 9-10 September.

Hossain, L.; Islam, Kh.; Meisner, C. and Islam, S. (2006). Effect of planting method and nitrogen levels on the yield and yield attributes of wheat. J. Bio-Sci. 14: 127-130.

Iqbal, J.; Hayat, KH. and Hussain, S. (2012). Effect of seeding rates and nitrogen levels on yield and yield components of wheat (*Triticum aestivum* L.). Pak. J. Nutr., 11 (7): 531-536.

Khalil, F.A.F.; Tammam, A.M.; Amin, I.A. and Mohamed, K.A. (2006). Scheduling irrigation for some wheat cultivars under Upper Egypt conditions. J. Agric. Sci. Mansoura Univ., 31(1): 561-572.

Menshawy, A.M.M.; El-Hag, A.A. and , A. S El-Sayed (2006). Evaluation of some agronomic and quality traits for some wheat cultivars under different irrigation treatments. The First Field Crop Res. Ins. Conference, Giza, Egypt, 294-310.

Moayedi, A.A.; Boyce, A. N. and Barakbah, S. S. (2010). The Performance of durum and bread wheat genotypes associated with yield and yield component under different water deficit conditions. Aust. J. Basic & Appl. Sci., 4(1): 106-113.

Moussa, A.M. and Abdel-Maksoud, H.H. (2004). Effect of soil moisture regime on yield and its components and water use efficiency for some wheat cultivars. Annals Agric. Sci., Ain Shams Univ. Cairo, 49(2): 515-530.

Omar, A.M.; El-Sayed, A.A.; Abd El- Rahman, M.E. and El-Hag, W.A. (2011). Evaluation of some cultivars and lines of bread wheat under low input conditions. J. Plant Production. Mansoura Univ., 2(12): 1761-1771.

Parvaneh, V.; Naseri, R. and Moradi, M. (2014). The Effect of drought stress on grain yield, yield components and protein content of durum wheat cultivars in liam Province, Iran. International Scholarly and Scientific Research & Innovation 8(6): 619-624.

Salem, M.A. (2005). Effect of nitrogen and irrigation regimes on yield and yield components of bread wheat (*Triticum aestivum* L.) genotypes under newly reclaimed land condition. J. Agric. Sci. Mansoura Univ. 30(11): 6481-6490.

Semun-Tayyar (2008). Grain yield and agronomic characteristics of Romanian bread wheat varieties under the conditions of Northwestern Turkey. African Journal of Biotechnology., 7 (10): 1479-1486.

Ullah, I.; Ali, N.; Durrani, S.; Shabaz, M. A.; Hafeez, A.; Ameer, H.; Ishfaq, M.; Fayyaz, M. R.; Rehman, A. and Waheed, A. (2018). Effect of different nitrogen levels on growth, yield and yield contributing attributes of wheat. International Journal of Scientific & Engineering Research. 9: 595-602.

Waller, R.A. and Duncan, D.B. (1969). Abays rule for the symmetric multiple comparison problem. Am. Stat. Assoc. J., 1485-1504.

Zaki, N.M.; Gomaa, M. A.; Radwan, F. I.; Hassanein, M. S. and Wali, A. M. (2012). Effect of mineral organic and bio-fertilizer on yield, yield components and chemical composition of some wheat cultivars J. of applied Sci., Res. 8(1): 174-191.

تأثير مستويات مختلفة من السماد النيتروجيني ومعاملات الري على المحصول ومكوناته لبعض أصناف القمح

رمضان علي الرفاعي[١]، السيد حامد الصعيدى[١]، محمد بسيم عطا[٢]،

جمال عبدالحميد زهران[٣]، نهال خيرى الحديدى[١]

[١] قسم المحاصيل - كلية الزراعة - جامعة طنطا

[٢] قسم تكنولوجيا الاغذية - كلية الزراعة - جامعة طنطا

[٣] قسم الخبز والعجائن بمركز البحوث الزراعية بالجيزة

الملخص العربى

أجريت تجربة حقلية بمزرعة خاصة – بمحافظة الغربية وذلك خلال موسمي الزراعة الشتوي ٢٠١٨/١٩ ، ٢٠١٩/٢٠ بهدف دراسة ثلاث معاملات للري السطحي بالغمر ، ثلاث مستويات من التسميد النيتروجيني (٥٠، ٧٥، ١٠٠ كجم أزوت / للفدان) على إنتاجية أربعة أصناف من القمح وقد أوضحت النتائج أن تأثير الري أظهر فروق عالية المعنوية لصفة عدد السنابل/م٢ ,وزن الألف حبة و المحصول البيولوجي و محصول القش. وسجلت معاملتي الري بأربع ريات وريتان أعلى القيم لهذه الصفات. وتشير نتائج مستويات التسميد أن استخدام مستوى النيتروجيني ١٠٠ كجم / فدان أدى إلى زيادة معنوية في كل من عدد السنابل بالمتر المربع، عدد الحبوب بالسنبلة، وزن الألف حبة ، محصول الحبوب ، محصول القش والمحصول البيولوجي. هذا وقد سجل الصنف بنى سويف ٦ أعلى عدد من السنابل فى المتر المربع و سجل الصنف جميزة ١١ اعلى عدد لحبوب السنبلة وكلا محصول البيولوجي والقش في حين سجل الصنف بنى سويف ١ أعلى قيمة لوزن الالف حبة ومحصول الحبوب في الموسم الاول وجيزة ١٧١ فى الموسم الثاني , والصنف جميزة ١١ سجل أقل قيمة لوزن الالف حبة في كلا الموسمين. وقد أظهر التفاعل بين الريات ومستويات السماد النيتروجيني معنوية لصفات المحصول البيولوجي ومحصول القش في الموسم الثاني، بينما كان التفاعل بين الريات والتراكيب الوراثية معنويا لصفات المحصول البيولوجي ومحصول القش في الموسمين ولصفة دليل الحصاد فى الموسم الاول. هذا ولم يسجل التفاعل بين عوامل الدراسة الثلاثة أي معنوية لكل الصفات المدروسة. ونستخلص من نتائج الدراسة أن الري أربع مرات ومرتان قد أعطوا أعلى قيم المحصول مقارنة بالرى لمرة واحدة، كما ينصح بإضافة السماد النتروجيني بمعدل ١٠٠ كجم أزوت للفدان لتعظيم إنتاجية محصول القمح وذلك تحت الظروف البيئية لهذه التجربة.