Evaluation of Four New Bread Wheat (*Triticum aestivum* L.) Cultivars in Sandy Soils under Different Irrigation Regimes and Nitrogen Fertilizer Rates for Yield and Its Components

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ABSTRACT

The present study was carried out (sandy soil under sprinkler irrigation) at El-Bustan area, ARC, in Egypt during the two seasons, 2009/2010 and 2010/2011. Four new bread wheat cultivars (Sids12, Sids13, Gemmeiza11 and Shandaweel 1) were evaluated under three irrigation regimes under sprinkler irrigation system (I_1=2380 m^3/ha, I_2=3094 m^3/ha and I_3=3808 m^3/ha) and two nitrogen levels (N_1=119 and N_2=238 kg/ha for grain yield and its components. This study was performed as split-split plot in using three replications. The results showed that the studied characters were significantly affected by irrigation treatments in both growing seasons. All characters showed highly significantly differences among applied N rates except for 1000-kernel weight in the second season and number of kernels per spike in the first season. Cultivars were significantly in number of spikes/m² and number of kernels/spike in the first growing season, while highly significantly differences in 1000- kernel weight, grain yield and biological yield in the second season. Sids 13 recorded the highest number of spikes/m², number of kernels per spike and grain yield in the first season. Meanwhile, Gemmeiza 11 recorded the highest 1000-kernel weight, grain yield and biological yield in the second season. The interactions of irrigation regimes × N nitrogen levels were highly significant for number of spikes/m² in the first season and for biological yield in both growing seasons.

The interactions of irrigation treatment by cultivars were highly significant for number of spikes/m² in the first season, for number of kernels per spike in the both seasons and grain yield in the second season. The highest number of spikes/m² was obtained from Sids 13 under I_3 irrigation treatments but the lowest number of spikes/m² was obtained by Gemmeiza 11 under I_1 irrigation treatment in the first season. The highest value of number of kernels/spike was obtained from Sids 13 under I_3 irrigation in the first season. While, Gemmeiza 11 gave the highest number of kernels/spike and grain yield under I_3 irrigation treatment meanwhile, Sids 12 gave the lowest number of kernels/spike and grain yield under I_1 irrigation treatment in the second season. The interaction between nitrogen rate and wheat cultivar was highly significant for 1000-kernels weight in the first season. The results show that Gemmeiza 11 gave the highest 1000-kernel weight under the highest nitrogen level while Sids 12 recorded the lowest 1000-kernel weight under the lowest nitrogen level. The interaction between irrigation treatments, nitrogen rate and wheat cultivar was significant for 1000-kernels weight, number of kernels/spike and biological yield in the first season. Cultivars were significantly in water use efficiency in the both growing season. Sids 13 had the highest water use efficiency among the four cultivars in the first season, while Gemmiza 11 had the highest value in the second season. Sids 13 and Gemmeiza 11 had average of 2.4 kg/m³/ha in both growing season. This finding implied that Gemmeiza 11 and Sids 13 could be recommended growing in sandy soils and both can use irrigation water efficiently.

Key words: Wheat cultivars, irrigation regime, N fertilizer rates, water use efficiency, sprinkler irrigation.

INTRODUCTION

Bread wheat (*Triticum aestivum* L.) is the most important grain crop in the world and covers more of the earth's surface, as well than any other food crops. Wheat is the most important cereal crop in Egypt. Increasing wheat production to reduce the gap between production and consumption is the main target of wheat breeders. Despite many efforts of wheat breeders, yield losses due to a biotic stresses such as water stress, salinity or high temperature and/or biotic stresses (diseases, insects etc.) still considered the main constants to high grain yield of importance. In newly reclaimed areas, water is a limiting factor for producing food. Growing wheat in newly reclaimed sandy soils needs different cultural practices instead of those used in old lands, especially irrigation and fertilization. Increasing grain yield with increasing regime of water was attributed to the increase in yield components values such as number of spikes/m², kernel weight and number of kernels/spike. Number of kernels/spike is the most affected yield component and it has been proposed as an important selection criterion for drought tolerance (Shipler and Blum, 1991). Menshawy *et al.,* (2006) found that number of kernels/spike is more drought sensitive compared with number of spikes per square meter. Moreover Zafarnaderi *et al.,* (2013) reported that path analysis using stepwise regression based on average of irrigation factors indicated that number of grains/spike, thousand grain weight, number of fertile tiller and peduncle length were the most effective components on grain yield. Therefore, these traits could be used as important indices for selecting high yielding bread wheat genotypes. Awad *et al.,* (2000) found that increasing irrigation water amounts from 60 to 100%, significantly increased grain yield and its components. El-Sayed (2003) reported that irrigation level had a significant effect on the plant height, grain weight/spike, and 1000-grain weight. Singh *et al.,* (2009) found that, grain yield and yield components of wheat were decreased with decreasing irrigation water amounts as well as its quality.

Nitrogen fertilizer is also, one of out resources, which we have to use properly because the abuse of this resource will contaminate under groundwater and increase the variable coasts for wheat production. Bustan sandy soils are poor in N as well as its low cation exchange capacity (Sayed *et al.,* 2003). Nitrogen management is a key to successful wheat production. Numerous studies indicated that N fertilization can increase both wheat grain yield and grain protein concentration (Awad *et al.,* 2000, and Selles and Zentner 2001) moreover Ejaz et *al.,* (2007) found that N application increased grain filling rate (GFR) and duration at all irrigation levels. Reduction in grain yield under less irrigation treatment is the result of a significant reduction in number of effective tillers and nitrogen supply improved effective tillers per unit area at all irrigation levels.

Several studies reported that water use efficiency (WUE) values were higher under water deficit than high irrigation condition, especially when irrigation is applied in the critical growth stages of plant, Mandal *et al.,* (2005). Haikel and El-Melegy (2005) concluded that maximum grain yield and minimum water use efficiency of wheat was recorded by irrigation with recommended requirements under sandy soils conditions and sprinkler irrigation system. Ouda *et al.,* (2007) reported that the highest water use efficiency was obtained for Sakha 93 and skipping the third irrigation (at grain maturity stage).Water use efficiency (WUE) generally decreased linearly with increasing seasonal irrigation rates in tow years (Wang *et al.,* 2012).

Therefore, the main objectives of this study were to identify superior cultivars under nitrogen rates as well as different irrigation regimes and to determine water use efficiency in sandy soils.

MATERIALS AND METHODS

The present work was carried out at the Experimental Farm of Abd El-Moneim Riyad Research Station, at El-Bustan area, ARC, Egypt during the two successive seasons of 2009/2010 and 2010/2011, under sprinkler irrigation. Name and pedigree of the used wheat cultivars were presented in Table 1.

The materials used in the study included four wheat cultivars namely, Sids 12, Sids 13, Gemmeiza 11 and Shandaweel 1. Names and pedigree of wheat cultivars used in the study are presented in Table 1.Three irrigation water regimes, i.e. I_1=2380 m³/ha, I_2=3094 m³/ha and I_3=3808 m³/ha and two nitrogen levels N_1=119 and N_2 =238 Kg/ha represented the studied treatments. A solid set rotary sprinkler irrigation system was used to irrigate the experiment. Spacings between sprinkler lines and sprinklers were 15 × 15 meters. The discharge for each sprinkler is 1.3 m³/ ha. A split-split plot design with three replicates was used, where irrigation regimes had assigned to the main plots, nitrogen level had assigned to the sub plots and wheat cultivars had allocated to the sub- sub plots. Each sub-sub plot consisted of eight rows, 4 meters long and 20 cm apart (plot size=6.4m²). Soil mechanical and chemical analysis of the experimental site are illustrated in Table (2).

Planting dates were the 25th of November in both seasons. Grains were drilled in rows at the rate 166 kg/ha. Calcium super phosphate (15.5% P2O5) and potassium sulfate (48.5% K2O) were broadcasted before sowing at the rate of 114 and 71 kg/ha, respectively. After planting, nitrogen fertilizer treatments were applied at eight equal doses and added before irrigation for each at 10 days intervals. Other cultural practices were performed as recommended for wheat production. Sprinkling was used every three days from planting until maturity stage. Irrigation stopped after 140 days from sowing in both seasons. Harvesting was after 150 and155 days from sowing in the first and second seasons, respectively.

During the tow seasons of study the following data were recorded:

At harvest time, the central six rows of each plot, with four meters long, were harvested and the data were recorded for grain yield and its components, as follow:

1- Number of spikes/m² was estimated as number of fertile spikes in a guarded square meter within each plot before harvesting.
2- 1000-kernel weight (g) was recorded as the average of two random samples of 1000 kernels from clean grains of each plot.
3- Number of kernels/spike was estimated as the average of ten spikes taken randomly from each plot.
4- Grain yield/ha was estimated as the weight of grains of each plot, which was converted to tons/ha.
5- Biological yield/ha was estimated as the total of above ground plants of each plot and converted to tons /ha.

Table 1: Name and pedigree of four bread wheat cultivar used in the study.

No	Cultivars	Pedigree
1	Sids12	BUS//7C//ALD/5/MAYA74/ON//1160.147/3/BB/GLL/4/CHAT"S"/ 6/MAYA/VUL//CMH74A.630/4*SX. SD720096-4SD-1SD-1SD-0SD.
2	Sids 13	ALMAZ-19=KAUZ"S"//TSI/SNB"S". ICW94-0375-4AP-2AP-030AP-0APS-3AP-0APS-050AP-0AP-0SD.
3	Gemmeiza 11	BOW"S"/KVZ"S"//7C/SER182/3/GIZA 168/SAKHA61. GM7892-2GM-1GM-2GM-1GM-0GM.
4	Shandaweel 1	CAZO/KAUZ//KAUZ. CMBW90 Y3279-OTOPM-02010M-02010Y-3M-OSH

Table 2: Chemical and physical characteristis analysis of the soil in the experimental site.

Soil texture and its fractions.				
Soil depth (cm)	Sand %	Silt %	Clay%	Texture class
0-30	90.9	2.6	6.5	Sandy
30-60	91.0	1.8	7.2	Sandy

Some chemical soil properties										
Soil depth	EC	PH	Soluble cations and anions (meq/l)							
(cm)	(ds/m)		CaCO3	Ca++	Mg++	Na+	K+	HCO3	Cl-	SO4-
0-30	0.35	9.13	5.2	1.23	0.54	1.56	0.17	1.1	1.73	0.67
30-60	0.30	9.38	5.6	1.25	0.49	1.61	0.15	1.07	1.74	0.69

Water use efficiency:

Water use efficiency (WUE) was calculated according to the equation of Vietes (1965) as follows:

Water use efficiency (kg/m³/ha)= grain yield (kg/ha)/ total applied water to the field (m³/ha).

Statistical analysis:

All data were analyzed using SAS computer software package for the data for each season and differences among treatment means were compared using the least significant differences test (LSD 0.05) according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Yield and its components:

The results presented in Table 3 showed significantly differences in most the studied characters due to irrigation treatments, cultivars, nitrogen treatments, the interaction between irrigation and nitrogen applied and the interaction between irrigation and cultivars in both growing seasons. Moreover significantly differences in some the studied characters due to the interaction between nitrogen applied and cultivars and the interaction between irrigation, nitrogen and cultivars in the first seasons.

There are significant differences among irrigation treatments for all studied characters in both seasons (Table 3). The results in Table 4 showed that irrigation treatment I_3 recorded the highest values of all studied characters in the first season, meanwhile gave the highest number of kernels/spike and biological yield in the second season. Moreover, irrigation treatment I_3 recorded the highest number of spikes/m², 1000-kernel weight and grain yield without significant differences compared to I_2 in the second season. On the other hand, I_1 recorded the lowest number of spikes/m² and 1000-kernel weight without significant differences with I_2 but I_1 recorded the lowest number of kernels/ spike, grain yield and biological yield in the first season. These results agree with the findings of Zhong-hu and Rajaram (1994), where they found that kernels / spike are more drought sensitivity compared with number of spikes per square meter. Data in table (4), also showed that in the second season, I_1 treatment recorded the lowest values of all studied characters. These results are in agreement with those obtained by Mesbah (2009) who found that the differences between 1600 m³/fed and 1850 m³/fed were insignificant for yield and its components. These results are in agreement with those obtained by Gardner *et al.,* (1985), Awad *et al.,* (2000) and El-Hadi and Khadr (2003).

The results in Table 3 show that highly significant differences were revealed between the two N fertilizer rates in all studied characters except 1000-kernel weight in the second season and number of kernels per spike in the first growing season. Table 4 show that N_2 fertilizer rate gave the highest significant value in all studied characters in both seasons because sandy soils are poor in organic matter and nitrogen content as shown in soil analysis (Table 2).These results are in harmony with those reported by El-Haris (2004).

Table 3: Analysis of variance for, Number of spikes/m², 1000-kernel weight (g), Number of kernels/spike, Grain yield and Biological yield of the bread wheat cultivars under three water regimes and two nitrogen levels.

Source of variations	Season 2009/2010 Mean square (MS)						Season 2010/2011 Mean square (MS)					
	d.f	Number of spikes/m²	1000-kernel weight (g)	Number of kernels /spike	Grain yield (ton/ha)	Biological yield (ton/ha)	d.f	Number ofspikes /m²	1000-kernel weight (g)	Number of kernels /spike	Grain yield (ton/ha)	Biological yield (ton/ha)
Replication	2	86.72	2.68	8.93	0.19	0.25	2	536.54	2.39	54.76	0.1	0.06
Irrigation (I)	2	3146.7*	98.1*	531.6**	1.65*	12.02**	2	30424*	198.72**	495.4**	1.313**	13.74**
Error a	4	183.26	9.20	10.51	0.12	0.51	4	2021	8.87	26.43	0.04	0.06
Nitrogen (N)	1	4496.9**	33.35**	15.13ns	0.91**	6.13**	1	14000**	18ns	224**	0.41**	1.84**
I x N	2	1938.9**	3.6ns	1.54ns	0.17ns	2.00ns	2	1766ns	5.17ns	16.22ns	0.02ns	1.41**
Error b	6	152.78	1.97	3.54	0.04	0.43	6	790	4.65	12.65	0.02	0.07
Cultivar (C)	3	6246**	3.98ns	22.9**	0.12ns	0.37ns	3	1353ns	44.20**	10.27ns	0.34**	2.33**
I x C	6	1228**	1.84	19.26**	0.08ns	0.41ns	6	834ns	4.87ns	68.43**	0.12**	0.21ns
N x C	3	152.72ns	17.64**	5.94ns	0.013 ns	0.24ns	3	543ns	6.67ns	35.16ns	0.03ns	0.25ns
I x N x C	6	119.6ns	11.45**	23.36*	0.018 ns	0.80 *	6	481ns	15.0ns	28.26ns	0.02ns	0.13ns
Error c	36	135.67	3.07	5.43	0.06	0.20	36	1547	6.65	15.8	0.03	0.2

* Significant difference at $P < 0.05$ ** Significant difference at $P < 0.01$ *ns*: no significant

Table 4: Means of number of spikes/m^2, kernel weight, number of kernels/spike, grain yield and biological yield of wheat cultivars as affected by irrigation treatments, nitrogen fertilizer rates and their interactions in 2009/2010 and 2010/2011 seasons.

SOV	No of Spikes/m²		1000 Kernel weight (g)		No of Kernels/Spike		Grain yield (ton/ha)		Biological yield (ton/ha)	
	2009/2010	2010/2011	2009/2010	2010/2011	2009/2010	2010/2011	2009/2010	2010/2011	2009/2010	2010/2011
Irrigation treatments (I)										
I_1	227.7b	280b	31.88b	35.33b	28.1c	33.96c	2.87c	4.34b	7.46c	8.80c
I_2	235.7b	329.4a	32.33b	39.33a	33.5b	38.29b	3.68b	5.77a	10.92b	10.67b
I_3	250.2a	349.1a	35.58a	40.92a	37.5a	43.04a	4.49a	5.90a	11.61a	13.51a
LSD 0.05	10.85	36	2.43	2.39	2.6	4.12	0.28	0.15	0.51	0.2
Nitrogen rates (Kg N/ha) (N)										
N_1	230b	306b	32.6b	38	32.6	36.7b	3.43b	4.90b	9.05b	10.48b
N_2	245a	333a	33.9a	39	33.5	40.2a	4.06a	5.37a	10.92a	11.54a
LSD 0.05	7.13	16.2	0.81	NS	NS	2.1	0.11	0.1	0.4	0.2
Cultivars (C)										
Sids 12	227.4b	315	33.80	38.94a	34.10a	39.50	3.62	4.52d	10.60	10.10c
Sids 13	265.7a	313	32.60	36.50c	33.10a	38.05	4.05	4.99c	9.98	10.26c
Gemmeiza 11	226.9b	318	33.40	40.28a	31.44b	37.78	3.49	5.61a	9.67	12.54a
Shandaweel 1	231.6b	320	33.20	38.39b	33.39a	38.39	3.58	5.30b	9.50	10.98b
LSD 0.05	7.87	NS	NS	1.69	1.50	NS	NS	0.11	NS	0.29

I_1=2380 m³/ha I_2=3094 m³/ha I_3=3808 m³/ha N_1=119 Kg/ha N_2=238 Kg/ha
* Significant difference at $P < 0.05$ ** significant difference at $P < 0.01$ *ns*: no significant

The results in Table 3 show that all the studied cultivars were highly significantly different in number of spikes/m² and number of kernels/spike in the first season and differences were highly significant in 1000- kernel weight, grain yield and biological yield in the second season. Table 4 show that Sids 13 recorded the highest number of spikes/m² (265.7) in the first season while, Sids 12, Sids 13 and Shandaweel 1 recorded the highest number of kernels/spike (34.1, 33.39 and 33.1) in the first season, respectively. On the other hand, Gemmeiza 11 and Sids 12 had the highest 1000-kernel weight (40.28 and 38.94 gm). Gemmeiza 11 gave the highest value for grain yield and biological yield (5.61 and 12.54 ton/ha) in the second season. In contrast, Sids 12 gave the lowest value in grain yield and biological yield (4.52 and 10.1 ton/ha) in the same season, respectively. These results are in agreement with Ejaz *et al.,* (2007). These differences between cultivars could be referred to their genetic constitutions and their interaction with the prevailing environmental conditions Shehab El-Din (1993b), Moustafa *et al.,* (1997) and Sadek (2000).

Effect of interaction between irrigation treatments and nitrogen levels:

The interactions between irrigation regimes and nitrogen rates were highly significant in second season for biological yield and highly significant for number of spikes/m² in the first season only (Table 3). However, interactions between irrigation treatments and nitrogen levels were insignificant for the other characters under study. Data in Table 5 showed that, the highest number of spikes/m² (252.7) was obtained under I_3 irrigation treatment and N_2 nitrogen level in the first season where the lowest value (213.4) was obtained under the lowest irrigation regime and the lowest nitrogen rate. Biological yield recorded the highest value (14.88 ton/ha) under I_3 irrigation treatment and N_2 nitrogen level in the second season, where the lowest value (8.80 ton/ha) was obtained under the lowest irrigation regime and nitrogen rate in the second season.

Effect of the interaction between irrigation and cultivars:

The interactions between irrigation treatments and cultivars were highly significant for number of spikes/m² in the first season, number of kernels / spike in both seasons and grain yield in the second season (Table 3). The results in Table 6 showed that the highest number of spikes per m² (283) was obtained by Sids 13 under I_3 irrigation treatment while the lowest number of spikes/m² (216) was obtained by Gemmeiza 11 under I_1 irrigation treatment in the first season. The highest value of number of kernels / spike was obtained for Sids 13 under I_3 irrigation (39.3) while the lowest value (26.5) was obtained by Sids 12 under I_1 irrigation in the first season. On the other hand, Gemmeiza 11 recorded the highest number of kernels/spike (48.1) and grain yield (6.55 ton/ha) with I_3 irrigation treatment in the second season, while Sids 12 gave the lowest number of kernels /spike (29.5) and grain yield (3.08 ton/ha) with I_1 irrigation treatment. These results agree with the finding of Shipler and Blum (1991) where they found the number of kernels/spike is the most effective component on grain yield under drought conditions. These variations among cultivars might reflect, partially their different genetic backgrounds. Moreover, Ouda *et al.,* (2007) in their study reported that, the amount of wheat yield reductions as a result of water stress were affected by genotypes and the stage of grain development.

Table 5: Effect of the interaction between irrigation and nitrogen treatments on some wheat cultivars means traits in two seasons.

Nitrogen fertilizer rate (Kg N/ha)	No of Spikes/m²			Biological yield (ton/ha)		
	2009/2010			2010/2011		
	I_1	I_2	I_3	I_1	I_2	I_3
N_1	213.4	223.9	247.9	8.80	10.51	12.14
N_2	242	247.5	252.7	8.83	10.80	14.88
LS D 0.05	6.77			0.26		

I_1=2380 m³/ha I_2=3094 m³/ha I_3=3808 m³/ha N_1=119 Kg/ha N_2 =238 Kg/ha

Table 6: Effect of the interaction between cultivar and irrigation treatments on four wheat cultivars means traits in two seasons.

Cultivar	No of Spikes / m²			No of kernels/spike						Grain yield (ton/ha)		
	2009/2010			2009/2010			2010/2011			2010/2011		
	I_1	I_2	I_3	I_1	I_2	I_3	I_1	I_2	I_3	I_1	I_2	I_3
Sids 12	221	222	239	26.5	36.5	37.2	29.5	35.80	40.3	3.08	4.92	5.58
Sids 13	247	267	283	29.2	33.0	39.3	36.7	38.70	43.2	4.58	4.49	5.39
Gemmeiza 11	216	229	246	28.3	31.3	38.1	36.5	38.17	48.1	4.77	5.36	6.55
Shandaweel 1	220	224	251	28.3	33.2	38.7	33.2	40.50	39.0	4.89	5.30	5.91
L S D 0.05	9.581			1.916			3.26			0.135		

I_1=2380 m³/ha I_2=3094 m³/ha I_3=3808 m³/ha

Effect of interaction between nitrogen rates and cultivars:

The interaction between nitrogen rate and wheat cultivar was highly significant for 1000-kernel weight the first season (Table 3). Data presented in Table 7 indicated that Gemmeiza 11 gave the highest 1000-kernel weight (36.1) with the N_2 (238 Kg N/ha), while Sids 12 recorded the lowest kernel weight (31.33) with N_1 (119 Kg N/ha). These results are agreement with that obtained by Allam (2003) and El-Borhamy and Gadallah (2009).

Effect of interaction between irrigation, nitrogen rates and cultivars:

The interactions between irrigation treatments, nitrogen rate and wheat cultivar were significant for 1000- kernels weight, number of kernels/spike and biological yield in the first season (Table 3). Data presented in Table 8 indicated that Sids 13 and Shandaweel 1 gave the highest 1000-kernel weight (39 and 38) with the N_2 and I_3 treatment. Sids 12 gave the highest number of kernels (40.7) without significant difference with Sids 13 under N_2 and I_3 treatment and Shandaweel 1 under N_1 and I_3 treatment. Sids 12 cultivar gave the highest biological yield (5.2 ton/ha) without significant difference with Sids 13 and Gemmeiza 11 under N_2 and I_3 treatment, Shandaweel 1 with N_1 and I_3 treatment both Sids 12 and Sids 13 with N_2 and I_2 treatment while, Sids 12 cultivar gave the lowest number of kernels/spike (23.3) under N_1 and I_1 treatment. Shandaweel 1 gave the lowest biological yield (2.1ton / ha) with N_1 and I_1 treatment.

Water use efficiency:

The results in Table 9 clearly indicated that the water use efficiency decreased with increasing irrigation treatments. The low irrigation treatment had higher water use efficiency (2.46 and 3.41 kg/m³/ha in the first and second seasons, respectively) than that of high irrigation treatment (1.538 and 2.12 kg/m³/ha in the first and second seasons, respectively). The medium irrigation treatment had a medium water use efficiency (1.893 and 2.62 kg/m³/ha in the first and second seasons, respectively) these results agreement with Mesbah *et al.,* (2009) and Wang *et al.,* (2012).

The results in Table 9 show that revealed that the genotypes responded differently to water use efficiency Sids 13 had the highest water use efficiency among the four cultivars in the first season. Meanwhile, Gemmeiza 11 had the highest value in the second season. Sids 13 and Gemmeiza 11 had average of 2.4 kg / m³/ ha in both growing season. This finding implied that Gemmeiza11and Sids 13 could be recommended to be grow in sandy soils and both can use irrigation water efficiently.

Table 7: kernel weight as affected by the interaction between cultivar and nitrogen treatments in 2009/2010 season.

Cultivars	1000 Kernel weight (g) 2009/2010	
	N_1	N_2
Sids 12	31.33	34.33
Sids 13	33.11	33.12
Gemmeiza 11	31.55	36.10
Shandaweel 1	34.32	33.21
L S D 0.05	0.41	

N_1=119 Kg/ha N_2 =238 Kg/ha

Table 8: 1000-kernel weight, number of kernels/spike and biological yield as affected by the interaction between cultivars, irrigation and nitrogen treatments in 2009/2010 season.

Nitrogen rates	Cultivars	1000 kernel weight (g)			No of kernels/spike			Biological yield (ton/ha)		
		I_1	I_2	I_3	I_1	I_2	I_3	I_1	I_2	I_3
N_1	Sids 12	32.67	33.00	34.0	23.3	37.3	37.8	2.90	5.00	4.10
	Sids 13	30.30	32.00	31.7	28.7	34.3	35.3	3.10	4.90	4.70
	Gemmeiza 11	31.70	32.00	35.3	28.0	31.0	34.0	3.00	3.90	4.40
	Shandaweel 1	29.80	31.00	34.0	30.0	30.7	40.0	2.10	3.98	5.00
N_2	Sids 12	32.80	33.33	36.7	29.7	35.7	40.7	3.60	4.80	5.20
	Sids 13	32.00	31.00	39.0	29.7	31.7	39.0	3.90	4.89	5.00
	Gemmeiza 11	32.00	33.70	35.7	28.7	31.7	35.3	4.10	4.68	4.75
	Shandaweel 1	34.00	32.30	38.0	29.7	35.7	37.3	4.50	4.40	4.60
LSD 0.05			2.02			2.70			0.51	

I_1=2380 m³/ha I_2=3094 m³/ha I_3=3808 m³/ha N_1=119 Kg/ha N_2 =238 Kg/ha

Table 9: Water use efficiency for wheat cultivars in sandy soil.

Cultivars	Irrigation treatments 2009/2010			Irrigation treatments 2010/2011		
	I_1	I_2	I_3	I_1	I_2	I_3
Sids12	2.42	1.86	1.51	3.02	2.32	1.88
Sids13	2.70	2.08	1.69	3.33	2.56	2.08
Gemmeiza.11	2.33	1.79	1.46	3.74	2.88	2.34
Shandaweel.1	2.39	1.84	1.49	3.54	2.72	2.21
Mean	2.46	1.893	1.538	3.41	2.62	2.12
LSD 0.05		0.02			0.42	

I_1=2380 m³/ha I_2=3094 m³/ha I_3=3808 m³/ha

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الملخص العربى

تقييم أربعة أصناف جديدة من قمح الخبز تحت مستويات مختلفة من الرى بالرش و التسميد النتروجينى تحت ظروف الأراضى الرملية

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أجريت هذة الدراسة فى منطقة البستان- مركز البحوث الزراعية خلال موسمى ٢٠١٠/٢٠٠٩ و٢٠١١/٢٠١٠ حيث تم تقييم أربعة أصناف جديدة وهى (سدس ١٢، سدس ١٣، جميزة ١١ وشندويل ١) تحت ثلاث كميات من مياة الرى المضافة (٢٣٨٠،٣٠٩٤ و٣٨٠٨ متر مكعب للهكتار) ومستوين من النتروجين (١١٩ و٢٣٨كجم نيتروجين للهكتار) وصممت التجربة بنظام القطع المنشقة مرتين فى ثلاث مكررات وتم جمع البيانات على المحصول ومكوناتة وقياس كفاءة الأصناف لاستخدام المياة.

وقد أوضحت النتائج أن تأثيركميات المياة المضافة فى الرى كان معنويا لكل الصفات المدروسة فى الموسمين. اختلف تأثير النتروجين معنويا فى كل الصفات موضع الدراسة فيما عدا عدد الحبوب للسـنبلة فـى الموسـم الأول ووزن ١٠٠٠ حبة فى الموسم الثانى. أظهرت الأصناف اختلافا معنويا فى صفة عدد السنابل فى المتر مربع، عـدد حبوب السنبلة فى الموسم الأول وعالى المعنوية لصفة وزن ال١٠٠٠حبة، محصول الحبوب والمحصول البيولوجى فى الموسم الثانى. تفوق الصنف سدس١٣ فى صفة عدد السنابل فى المتر مربع وعدد حبوب السنبلة فـى الموسـم الاول، بينما تفوق الصنف جميزة ١١ فى صفة وزن ١٠٠٠حبة، محصول الحبوب والمحصـول البيولـوجى فـى الموسم الثانى. كان التفاعل بين معاملات الرى والنتروجين عالي المعنوية لعدد السنابل فى المتر مربع للموسم الاول وللمحصول البيولوجى للموسمين.وتم الحصول على أعلى قيمة لها تحت المعدل الأعلى من المياة والنتروجين.

التفاعل بين معاملات الرى والأصناف كان عالى المعنوية لعدد السنابل فى المتر مربع فى الموسم الأول، عـدد حبوب السنبلة فى الموسمين ومحصول الحبوب فى الموسم الثانى، سجل الصنف سدس ١٣ أعلى قيمة لعدد السـنابل فى المتر مربع وعدد حبوب السنبلة تحت أعلى كمية رى (المعاملة الثالثة) بينما سجل جميزة ١١ أقـل عـدد مـن

السنابل فى المتر مربع تحت أقل كمية رى(المعاملة الأولى) فى الموسم الأول بينما تفوق جميزة ١١ فى عدد حبوب السنبلة ومحصول الحبوب تحت أعلى معدل للرى للموسم الثانى بينما اعطى سدس ١٢ اقل عـدد حبـوب للسـنبلة ومحصول الحبوب مع أقل كمية رى (المعاملة الأولى) فى الموسم الثانى. التفاعل بين معدلى النتروجين والأصـناف كان عالى المعنوية لوزن ١٠٠٠ حبة فى الموسم الاول فقط وسجل جميزة ١١ أعلى قيمة تحت المعدل الأعلى مـن النتروجين وسجل سدس ١٢ اقل قيمة تحت المعدل الأقل.

التفاعل بين معاملات الرى والنتروجين والأصناف كان معنوي لكل من وزن ١٠٠٠ حبة وعدد حبوب السـنبلة والمحصول البيولوجى فى الموسم الأول فقط.

اختلفت الأصناف معنوياً لكفاءة إستخدام المياة فى كلا الموسمين وسجل كلا من الصنفين سدس ١٣ وجميزة ١١ أعلى متوسط لكفاءة إستخدام المياة فى الموسمين على الترتيب مما يدل على إمكانية زراعتهما فى الأراضى الرملية.