Effect of Drought Stress and Nitrogen Fertilizer on Yield and Its Components of Two Wheat Cultivars (*Triticum aestivum* L.)

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Abstract: Two field experiments were carried out at the Agricultural Experimental Farm of Faculty of Agriculture; Suez Canal University; Ismailia Governorate, Egypt during the two winter seasons (2012/13 and 2013/14). To study effect of three irrigation regimes (full irrigation; skipping irrigation at tillering stage or heading stage), three rates of nitrogen fertilization (50, 75 and 100 kg N/fed) and two wheat cultivars (Sakha 94 and Sids12) and their interactions on yield and yield attributes. The experimental farm is located at Longitude 30^{o}58$^{\backslash\backslash}$ and Latitude at 32^{o}23$^{\backslash\backslash}$ at height of 13 meters above sea level. The texture of experimental site was sandy soil. Split–split plot design with three replications was followed. The results showed that skipping irrigation at tillering or heading stage significantly reduction for studied traits: plant height, no. of grains/spike, grain weight/plant, 1000 grain weight, grain yield, straw yield, and biological yield during seasons with comparison to full irrigation regime. Crude protein content in wheat grains was significantly increased by skipping irrigation than of full irrigation treatment. Increasing nitrogen level up to 100 kg significantly increased all parameters except harvest index. Sakha 94 cultivar surpassed significantly Sids 12 cultivar in all studied parameters. Calculations of water stress susceptibility index (S) shown that both wheat cultivars are sensitive to drought stress conditions.

Keywords*:* Drought – wheat – *Triticum aestivum* – nitrogen fertilizer- grain yield

INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the most important cereal crops for feeding a great number of peoples around world because it provides with energy and protein especially at developing countries. Nowadays, in Egypt wheat production is insufficient to face local consumption as a result of rapidly increases in Egyptian population although it is occupied 38.75% from the cultivated area during winter season in Egypt. Some of cultivated areas cultivated by wheat crop are suffer from shortage irrigation shortage be exposed to drought stress conditions. Agricultural land of Ismailia is characterized by low fertility therefore it is necessary to use mineral nitrogen to increase productivity per unit area. Wheat varieties are differ in their genetic characterizes so it will be differed in their response to environmental conditions.

Recently, there is a trend to use new wheat varieties has higher response to nitrogen fertilization rate and the ability to resist drought conditions. Therefore, great efforts have been made to achieve suitable agronomic practices to obtain higher yield. Drought stress conditions were created by skipping irrigation at various growth stages. Skipping irrigation at various growth stages of wheat plant markedly reduced grain, straw and biological yields in addition to yield components (Kandil *et al.*, 2001; Haikl and El Melegy, 2005; El Hawary and Yagoub, 2011; Moharram and Habib, 2011; Galavi and Moghaddam, 2012; Mekkei and El Haggan, 2014).

Nitrogen fertilization has a positive effect on grain, straw and biological yields in addition to yield components where these traits were increased as nitrogen level increased (Abd El-Razik, 2002; Tamman and Tawfils, 2004; Allam, 2005; Amin *et al.,* 2011; Amjed, 2011; Shahzad *et al.,* 2013). Wheat varieties are differ in their genetic characterizes so it differed in their response to environmental conditions. This variations among wheat cultivars may be due to different genetic make – up (Abd El-Razik, 2002; Allam, 2005; Salem, 2005; Galavi and Moghdamm, 2012; Shahzad *et al.,* 2013).

The present work aims to study effect of skipping irrigation at various growth stages of wheat crop and fertilization with different nitrogen fertilizer levels on two wheat cultivars (*Triticum aestivum* L.).

MATERIALS AND METHODS

Two field experiments were conducted during the winter seasons of 2012/13 and 2013/14 at Experimental Farm of Faculty of Agriculture; Suez Canal University; Ismailia Governorate, Egypt (30^{o}58$^{\backslash\backslash}$E Longitude and 32^{o}23$^{\backslash\backslash}$N Latitude and 13 m above sea level). The climate conditions of Ismailia city are presented in Table (1) from these data it could be concluded that averages of air temperature during growing season were ranged from 13.4 – 19.6°C at first season and 14.5 – 21.4°C at second season. Ismailia city is characterized by low rain fall during growing season and it was 25 mm/year. The textures of experimental sites were sandy soil as shown from mechanical and chemical properties in Table (2).

Irrigation treatments included: full irrigation (I_1); skipping irrigation at tillering stage (I_2) and skipping irrigation at heading stage (I_3). Three nitrogen rates (50, 75,100 kg/fed) were applied. Nitrogen fertilizer was in form of ammonium nitrate (33.5% N) and divided into three doses 20% at sowing, 40% after 35 days and 40% after 29 days from sowing. Two wheat cultivars were tested; Sids 12 and Sakha 94. The two varieties of this study were obtained from Ministry of agriculture - Egypt.

Sowing date was December 7, 2012 in first season and December 2, 2013 in second season. Sub-subplot area was 3.5 m in length and 3 m in width. Other agronomic practices were applied as recommended in

Ismailia area. Wheat plants were harvested at April 20, 2013 and April 16, 2014 for first and second season, respectively. Ten plants were selected randomly from inner rows threshed manually for the studied measurements: plant height (cm), number of grains per spike, grain weight per plant (g), 1000 grain weight (g). Crude protein percentage (%) was determined according to method of Lowery *et al.* (1951).

The following measurements were recorded
1-Grain yield (ardab/fad)
2-Straw yield (t/fad)
3-Biological yield (t/fad)
4-Harvest index (grain yield/ biological yield)
6- Drought susceptibility index (S).

Table (1): Monthly climatic data at Ismailia Governorate during two wheat growth periods in 2012/2013 and 2013/2014 seasons.

	Solar radiation Dgt [MJ/m2]	Precipitation [mm]	HC Air temperature [°C]	
Date	**aver**	**sum**	**minimum**	**maximum**
		2012/2013 season		
December 2012	348.58	1.0	6.3	29.2
January 2013	369.51	10.2	5.4	25.9
February 2013	494.94	2.0	7.1	28.2
March 2013	656.73	0	6	34.7
April 2013	746.74	17.6	2.5	37.2
		2013/2014 season		
December 2013	438.045	0.5	9	33.4
January 2014	377.37	7.0	6.45	25.95
February 2014	417.36	1.1	5.95	26.35
March 2014	506.03	4.8	3.8	28.85
April 2014	777.72	0.6	11.2	35.6

Source: Central Laboratory for Agricultural Climate

Table (2): Mechanical and chemical analysis of experimental soil site in the two growing seasons (2012/13 and 2013/14).

Soil analysis	**2012/13**	**2013/14**
Mechanical analysis		
Sand %	80.70	91.36
Silt %	2.32	1.73
Clay %	16.98	91.36
Texture grade	Sandy	Sandy
Chemical analysis		
pH	7.83	7.80
ECs(ds m^{-1})	0.76	0.54
Ca (meq/L)	2.8	3.0
Mg (meq/L)	2.0	1.0
K (meq/L)	0.3	0.2
Na(meq/L)	2.9	1.8
Cl(meq/L)	3.6	1.8
HCo_3(meq/L)	4.0	3.6
SO_4(meq/L)	0.4	0.6
CO_3(meq/L)	0.0	0.0

Drought susceptibility index (S) provides a measure of stress resistance based on minimization of yield loss under stress as compared to yield under optimum conditions. A drought susceptibility index (S) was used to characterize relative stress tolerance of all genotypes according to Fischer and Maurer (1978). The index was calculated independently for each environment from genotype mean, using a generalized formula in which

$$S = \frac{1 - Y_d / Y_p}{D}$$

Where: Y_d= mean grain yield in stress environment.
Y_p= mean grain yield of a genotype without stress
D= Environment stress intensity= 1- mean X/Xp
X= mean yield of all genotypes under stress.
Xp = mean yield of all genotypes without stress.

The "S" was used to characterize the relative water stress tolerance of various cultivars (S < 1.00 highly stress tolerant, S > 0.50 < 1.00 moderately stress tolerant and S > 1.00 susceptible).

Statistical analysis was done using the COSTAT system for Windows, version 6.311 (cohort software, Berkeley, CA, USA). Duncan’s multiple tests (1955) was used to differentiate between the averages of each factor in this study. In Duncan’s multiple tests significance difference between averages was judged by using alphabets at level of 0.05.

RESULTS AND DISCUSSION

1- Effect of skipping irrigation at wheat growth stages of wheat plant on grain yield and its attributes:

The data presented in Table (3) show that plant growth characteristics at harvesting were significantly affected by skipping irrigation at tillering or heading stage in comparison to full irrigation treatment during the two growing seasons. Skipping irrigation at tillering stage led to reduce plant height by 11.04 and 10.74 %, number of grains per spike by 28.58 and 28.74 %, grain weight per plant by 17.97 and 39.60 % and 1000 grain weight by 36.97 and 7.95 % at first and second season, respectively. The same trend was recorded by skipping irrigation at heading stage. Reductions were 4.47 and 6.74%, 9.49% and 23.20% and 5.69% and 3.41% for plant height, grain weight per plant and 1000 grain weight, during first and second seasons, respectively. Grain, straw and biological yields per feddan were significantly decreased by skipping irrigation at each tillering or heading stage comparing to full irrigation treatment during the two growing seasons. At first season, the reduction percent of these traits *i.e.* grain; straw and biological yields at tillering stage were 35.56%, 33.55% and 33.73%, respectively meanwhile reduction percent for these traits at heading stage were 19.17, 24.84 and 23.23%, respectively. In second season, the reduction percentage for grain, straw and biological yields at tillering stage was 39.39, 36.49 and 37.16%, respectively meanwhile, this percent of reduction as a result of skipping irrigation at heading stage was 21.00, 24.71 and 23..59%, respectively.

It could be notice that reduction for grain, straw and biological yields was so higher by skipping irrigation at tillering stage than skipping irrigation at heading stage. From it could be concluded that skipping irrigation at tillering stage has higher negative impact on grain, straw and biological yields than with skipping irrigation at heading stage.

The results may be attributed to the effect of irrigation water which in encourage of cell elongation, cell division and consequently increase meristematic growth in different organs of plant (Haikl and El Melegy, 2005). Westage (1994) reported that water stress induced accelerated desiccation of the endosperm and limiting embryo volume. These results are in harmony with those obtained by Kandil (2001), Awad *et al.* (2002), Moharram and Habib (2011) and Galavi and Moghaddam (2012). Results had unsignificant differences among harvest index of irrigation treatments. These results are in agreement with finding of Sarwar *et al.* (2010), and Mekkei and El Haggan (2014).

The data in Table (3) revealed the effect of skipping irrigation treatments on crude protein content in wheat grains comparing to that of full irrigation during the two growing seasons. Wheat grain resulted from skipping irrigation at heading stage has highest percentage of protein *i.e.* 13.39 and 13.14% for first and second seasons, respectively. Meanwhile, wheat grain of skipping irrigation at tillering stage has less protein content. It could be notice that wheat grain of control treatment and skipping irrigation at tillering stage were not differ significantly in protein content at first season but at second season it were differed. Wheat grain of full irrigation treatment (control treatment) significantly has less protein content than that of skipping irrigation at both stages. The increments in crude protein content of skipping irrigation treatments may be due to reduction in carbohydrates compounds in wheat grains. These findings are in harmony with results obtained by Mehasen *et al.* (2014) who reported that skipping irrigation decreased moisture, fat and carbohydrate content and gave highest values of protein.

The combined data in Table (4) revealed results of calculations water stress susceptibility index "S". The values of "S" are 1.038 and 1.143 for two cultivars Sakha 94 and Sids 12, respectively at tillering stage. Meanwhile the values of "S" were 1.053 and 1.182 for the same cultivars, respectively at heading stage. Then it could be concluded that both cultivars are sensitive to drought stress at tillering or heading stages according to Fischer and Maurer (1978).

2- Effect of nitrogen fertilization on grain yield and its attributes:

The data in Table (5) show that plant height at harvesting was increased significantly as nitrogen fertilizer increase up to 100 kg N/fad during the two growing seasons. Plant fertilized by of 100 kg N/fad surpassed that of 50 kg N/fad by 9.90% and 19.40 % for first and second seasons, respectively. Show that both nitrogen rates *i.e.* 75 and 100 kg N/fad has similar effects on plant height where no significant difference between them. Increases in plant height due to nitrogen fertilization can be attributed to role of nitrogen in some physiological operations such as cell division cell elongation auxin production which plants to expose its potential to grow vigorously. These finding are in agreement and with those of Abd El-Razik (2002), Allam (2005), and Amjed (2011).

Number of grains per spike was significantly as increased nitrogen fertilization rate increased up to 100 kg N (Table 5). Applying 100 kg N/fad significantly increased number of grains per spike by 22.58% and 83.12% in comparison to adding 50 kg N at first and second seasons, respectively. The same trend was realized in case of using 100 kg N comparatively to use 75 k where number of grains resulted from 100 kg N surpassed significantly than that of 75 kg N by 9.21 and 18.89% at first and second season, respectively. Similar findings were reported by Tamman and Tawfils (2004), Amin *et al.* (2011), and Amjed (2011).

The data in Table (5) demonstrate effect of three nitrogen rates under study on grain yield/plant at the two growing seasons. Grain yield/plant were significantly increased as nitrogen fertilizer increased from 50 up to 100 kg N/fad during the growing seasons. Grain yield/plant fertilized by100 kg N/fad surpassed that of 50 and 75 kg N/fed by 19.18 and 9.77%, respectively at first season, meanwhile these increments were 68.71 and 18.36%, respectively in second season.

These increases in grain yield might be attributed to role of nitrogen in formation of more chlorophyll pigments which enhance photosynthetic activity and resulted in more accumulation of carbohydrate which stored in wheat grains.

Data in Table (5) revealed the significant effect of three nitrogen levels 1000 grain weight at two growing seasons. This trait was significantly increased as nitrogen fertilizer increased during two growing seasons. Application of 100 kg N/fad increased 1000 grain weight than that of applying 75 kg N/fad by 6.34 and 4.18% at first and second season, respectively and also, than that of application 50 kg N/fad by 13.41 and 9.80% at first and second seasons, respectively. These findings are in harmony with those obtained Allam (2005), Tamman and Tawfils (2004), Salem (2005), Amjed (2011), Amin *et al.* (2011), and Shahzad *et al.* (2013).

The application of three nitrogen levels had significant influence on grain yield/fad at two growing seasons (Table 5). Grain yield was significantly increased positively and by with increasing nitrogen level up to 100 kg N/fad where grain yield of this level surpassed that of 50 kg N level by 31.48 and 59.15% at first and second seasons, respectively. The same trend was founded when comparing grain yield of 100 kg N to that of 75 kg N where grain yield of 100 kg N surpassed that of 75 kg N by 9.41 and 23.35% for first and second seasons, respectively. Increasing grain yield with adequate nitrogen supply may be a result of delaying leaf senescence, sustained leaf photosynthesis during grain filling period and extended duration of grain fill. In addition to role of nitrogen supply in enhancing of increasing meristematic activity, cell elongation thus increases yielding capacity (Abd El-Razik, 2002). The results of this study are in agreements with findings of Abd El-Razik (2002), Tammam and Tawfils (2004), Allam (2005), Salem (2005), Amin *et al.* (2011), Amjed (2011), Wang *et al.* (2012), and Shahzad *et al.* (2013).

The data in Table (5) revealed that straw yield/fed was significantly increased as nitrogen level increased at the two growing seasons. Under experimental conditions data show that straw yield per feddan resulted from application 100 kg N/fad surpassed that of 50 and 75 kg N/fad by 34.81 and 16.08% at first season.

In the same trend at second season where percentage of increments were 30.65 and 14.13%, respectively. These findings are in harmony with results obtained by Allam (2005).

The data in Table (5) show that application of three nitrogen levels on biological yield trait (total biomass above ground) at two growing seasons. These results revealed that this trait was significantly increased as nitrogen fertilizer increased. Application of 100 kg N/fad led to increase biological yield by 29.60% and 48.20% in comparison to that of 50 kg N/fed at first and second season, respectively. On the other hand, application of 100 kg N/fad produced higher biological yield over than that of 75 kg/N fad by 9.60 and 16.49% at first and second seasons, respectively. The obtained results are in harmony with findings of Shahzad *et al.* (2013).

Harvest index was not affected significantly by application of three nitrogen levels during the two growing seasons (Table 5). This result could be explained from through that nitrogen element enhanced the growth of plant organs. These results are in accordance with findings of Gaballah (2005).

Table (5) shows the effect of nitrogen application on crude protein content of wheat grains in the two growing seasons. Crude protein content was significantly increased as nitrogen fertilizer increased at two growing seasons. At first season highest crude protein (%) was resulted from application 100 kg N level meanwhile the lowest one was produced from application of 50 kg N level. But at second season the highest percent of crude protein in wheat grains was produced from application of 75 kg or 100 kg N/fad.

These increases in protein content of wheat grain may be attributed to role of nitrogen element in of amino acids formation which are essential components in the construction of proteins. The obtained results are in harmony with that founded by Abd El-Razik (2002), and Allam (2005).

3- Varietal differences on wheat grain yield and its components

Data in Table (6) show results of statistical analysis for grain yield and its components of two wheat cultivars Sakha 93 and Sids 12 during two growing seasons. Plant height of Sakha 93 was taller than Sids 12 in two growing seasons by 13.38 and 10.48% at first and second season, respectively. Concerning to number of grain per spike Sakha 94 cultivar has significantly higher number than Sids 12 cultivar by 17.19 and 35.97% at first and second season, respectively. Sakha 93 cultivar has great grain weight than that of Sids 12 cultivar in two growing seasons. The superiority of Sakha in grain weight was 30.04 and 17.03% at first and second season, respectively. Sakha 93 and Sids 12 were differed significantly in 1000 grain weight at the two growing seasons. 1000 grain weight of Sakha 93 cultivar surpassed that of Sids 12 by 10.10 and 8.24% at first and second season, respectively. Concerning to productivity, Table (6) show that grain yield in ardab/fed of Sakha surpassed significantly that of other cultivar Sids 12 during the two growing seasons. This superiority was 24.50 and 31.02% in first and second seasons, respectively. Straw yield in ton/ fed of Sakha 93 was higher than that of Sids 12 in two growing seasons. The increment was 27.38 and 27.57% in first and second two growing seasons. The biological yield (t/feddan) of the two studied cultivars Sakha 93 and Sids 13 were differed significantly in two growing seasons where Sakha 93 cultivar produced biological yield by 26.99 and 28.44% in first and second seasons, respectively. Harvest index of the two studied cultivars was not differed significantly in the two growing seasons. On the hand, grain of Sakha 93 higher percent of crude protein content than that of Sids 12 in the two growing season. This variation among cultivars may be due to genetic make – up of tested cultivars (Shahzad *et al.,* 2013). The obtained results are in agreement with findings of Abd El-Razik (2002), Allam (2005), Salem (2005), and Galavi and Moghdamm (2012).

4- Interactions among three factors of study:

Interactions among the three factors of study did not reach to significant level except between irrigation regime and wheat cultivars second season. Data in

Table (7) show that heaviest 1000 grain weight was produced from Sakha 94 under full irrigation regime by (49.02 g/1000 grain) and was significantly differed than other treatments.

Table (3): Effect of irrigation regimes on wheat yield and its components in the two growing seasons 2013/2014.

Irrigation regimes	2013	2014
Plant height (cm)		
Full irrigation	103.66 a	90.92 a
Skipping irrigation at tillering stage	92.22 c	81.16 b
Skipping irrigation at heading stage	99.03 b	84.79 b
Number of grains/spike		
Full irrigation	51.11a	47.56a
Skipping irrigation at tillering stage	36.50c	33.89c
Skipping irrigation at heading stage	42.22b	42.05b
Grains weight/plant (g)		
Full irrigation	2.95a	2.50 a
Skipping irrigation at tillering stage	2.42c	1.51c
Skipping irrigation at heading stage	2.67b	1.92b
1000 grain weight (g)		
Full irrigation	42.17a	47.54 a
Skipping irrigation at tillering stage	36.97c	43.76 c
Skipping irrigation at heading stage	39.77b	45.92 b
Grain yield (ardab/fad)		
Full irrigation	8.24a	8.76 a
Skipping irrigation at tillering stage	5.31b	5.31 b
Skipping irrigation at heading stage	6.66b	6.92 b
Straw yield (ton/fad)		
Full irrigation	4.59a	3.48a
Skipping irrigation at tillering stage	3.05b	2.21b
Skipping irrigation at heading stage	3.45b	2.62b
Biological yield (ton/fad)		
Full irrigation	5.81a	4.79a
Skipping irrigation at tillering stage	3.85b	3.01b
Skipping irrigation at heading stage	4.46b	3.66b
Crude protein percentage		
Full irrigation	10.32b	11.95 c
Skipping irrigation at tillering stage	11.16b	12.66 b
Skipping irrigation at heading stage	13.39a	13.14 a
Harvest index		
Full irrigation	21.04 a	27.43a
Skipping irrigation at tillering stage	22.38 a	26.46a
Skipping irrigation at heading stage	22.65 a	28.36a

Table (4): Drought stress susceptibility (S) of wheat cultivars in 2012/2013 and 2013/2014.

Cultivars	Drought stress susceptibility values (S)			Susceptibility degree
	2013	2014	Combined	
at tillering stage				
Sakha 94	0.946	1.130	1.038	susceptible
Sids12	1.105	1.180	1.143	susceptible
at Heading stage				
Sakha 94	1.328	0.777	1.053	susceptible
Sids12	1.102	1.262	1.182	susceptible

Table (5): Effect of N fertilization on wheat yield and its components in the two growing seasons 2013/2014.

Fertilization levels	2013	2014
Plant height (cm)		
50 Kg N/fed	93.46 b	76.53 b
75 Kg N/fed	98.74 a	88.96a
100 K N/fed	102.72 a	91.38a
Number of grains/spike		
50 Kg N/fed	38.89c	28.61c
75 Kg N/fed	43.28b	42.50 b
100 K N/fed	47.67a	52.39a
Grains weight/plant (g)		
50 Kg N/fed	2.45c	1.41c
75 Kg N/fed	2.66b	2.07b
100 K N/fed	2.92a	2.45a
1000 grain weight (g)		
50 Kg N/fed	37.15c	40.63c
75 Kg N/fed	39.62b	42.82b
100 K N/fed	42.13a	44.61a
Grain yield (ardab/fad)		
50 Kg N/fed	5.75c	5.41 c
75 Kg N/fed	6.91b	6.98 b
100 K N/fed	7.56a	8.61a
Straw yield (ton/fad)		
50 Kg N/fed	3.16c	2.24c
75 Kg N/fed	3.67b	2.83b
100 K N/fed	4.26a	3.23a
Biological yield (ton/fad)		
50 Kg N/fed	4.02c	3.05c
75 Kg N/fed	4.71b	3.88b
100 K N/fed	5.21a	4.52a
Crude protein percentage		
50 Kg N/fed	10.47c	11.22b
75 Kg N/fed	11.54b	12.90a
100 K N/fed	12.86a	13.64a
Harvest index		
50 Kg N/fed	21.45a	26.60a
75 Kg N/fed	22.01a	26.98a
100 K N/fed	21.76a	28.57a

Table (6): Effect of irrigation regimes on wheat yield and its components in the two growing seasons 2013/2014.

Cultivars	2013	2014
	Plant height (cm)	
Sakha 94	104.47 a	89.89 a
Sids 12	92.14 b	81.36 b
	Number of grains/spike	
Sakha 94	46.70a	47.44a
Sids 12	39.85b	34.89b
	Grains weight/plant (g)	
Sakha 94	3.03 a	2.13a
Sids 12	2.33 b	1.82b
	1000 grain weight (g)	
Sakha 94	41.54 a	47.55 a
Sids 12	37.73 b	43.93 b
	Grain yield (ard/fad)	
Sakha 94	7.47 a	7.94 a
Sids 12	6.00 b	6.06 b
	Straw yield (ton/fad)	
Sakha 94	4.14a	3.10a
Sids 12	3.25b	2.43b
	Biological yield (ton/fad)	
Sakha 94	5.27a	4.29a
Sids 12	4.15b	3.34b
	Crude protein percentage	
Sakha 94	12.49 a	13.19 a
Sids 12	10.76 b	11.98 b
	Harvest index	
Sakha 94	21.26a	27.76a
Sids 12	21.68a	27.22a

Table (7): Interactions among three factors on 1000 grain weight at 2013/2014 season

Irrigation regimes	Sakha 94	Sids 12
Full irrigation regime	49.02	46.06
Skipping irrigation at tillering stage	46.60	40.91
Skipping irrigation at heading stage	47.02	44.81

L.S.D. (p = 0.05) = 1.71

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تأثير الإجهاد الرطوبي والتسميد الأزوتي علي محصول الحبوب ومكوناته في صنفين من قمح الخبز

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أقيمت تجربة حقليه في محطة البحوث الزراعية التابعة لكلية الزراعة جامعة قناة السويس بمدينة الاسماعيليه خلال موسمي الزراعة ٢٠١٣/٢٠١٢ و ٢٠١٤/٢٠١٣. لدراسة تأثير كل من نظم الري ومعدلات التسميد الأزوتي والتفاعل بينهم علي صفات النمو لصنفين من أصناف قمح الخبز. وكانت معاملات الري هي: ري كامل– منع الري خلال مرحلة التفريع – منع الري خلال مرحلة طرد السنابل . أما مستويات التسميد الأزوتي فكانت هي ٥٠ – ٧٥ – ١٠٠ كجم ازوت/فدان. واختير صنفان من أصناف قمح الخبز هما سخا ٩٤ وسدس ١٢. اتبع تصميم القطع المنشقة مرتين في ثلاث مكررات وتتلخص أهم النتائج فيما يلي

١- أدى منع الري في مرحلة تفريع النبات أو مرحلة الأزهار إلي حدوث نقص معنوي في كل من الصفات التالية خلال موسمي الزراعة: ارتفاع النبات، عدد الحبوب بالسنبلة، وزن حبوب النبات، وزن ١٠٠٠ حبة، محصول الحبوب /فدان، محصول القش للفدان، والمحصول البيولوجي للفدان وذلك بالمقارنة مع معاملة الري الكامل (المقارنة). بينما لم تتأثر معنويا صفة دليل المحصول.بينما ازدادت نسبة البروتين بالحبوب معنويا نتيجة لمنع الري في مرحلتي الدراسة مقارنة بمعاملة الري الكامل.

٢- أدت زيادة مستوي النيتروجين من ٥٠ الي ١٠٠ كجم / فدان إلي زيادة معنوية في الصفات تحت الدراسة ما عدا صفة دليل المحصول فإنها لم تتأثر معنويا خلال موسمي الزراعة. كما أن التسميد بمعدل ١٠٠ كجم / فدان أدى إلي تفوق قيم الصفات تحت الدراسة مقارنة بالمعدل ٥٠ كجم خلال موسمي الزراعة.

٣- تفوق الصنف سخا ٩٤ على سدس ١٢ في جميع الصفات المدروسة فيما عدا صفة دليل المحصول والتي لم تتأثر معنويا باختلاف الصنف.