EFFECT OF TYPE, DISTANCE BETWEEN EMITTERS AND NITROGEN FERTILIZER ON YIELD AND ITS COMPONENT OF BREAD WHEAT IN NEWLY RECLAIMED LANDS

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ABSTRACT

Two experiments were carried out during the two successive seasons of 2009/2010 and 2010/2011 at the farm of Environmental Studies and Research Institute in Sadat City, under drip irrigation method. The split-split in randomize complete block design was used with three replications to study the effect of type of emitters (Long path GR) and Pressure compensating (Turbo emitters) which were allocated in the main plot, the distance between the emitters (50 and 25 cm, D1 and D2) which were randomly distributed in the sub plots and the nitrogen levels (60, 80 and 100 Kg/feddan) which were occupied the sub-sub plots on the bread wheat cultivar Sakha 94. The results indicated that using long path (GR) emitters significantly increased crop growth rate at the two periods of 45:75 and 75:105 days after sowing. Also it significantly increased plant height, number spike/m^2 number of grains/spike, 1000-kernels weight, grain yield/feddan, harvest index. The distance between the emitters (25 cm) produced the highest values of all studied characters. The nitrogen level of 100 Kg N/feddan, also, significantly increased all studied traits. The interaction effect among the experimental treatments significantly affected the studied traits. Water use efficiency was increased with long path emitters and 25 cm distance between the emitters. The interaction effects of the experimental treatments were discussed.

Keyword: *fertilizer; bread wheat and reclaimed lands*

INTRODUCTION

Maximizing irrigation water use efficiency is a common concept used by irrigation project managers. In recent years, however, growing competition for scarce water resources has led to applying modified techniques for maximizing water use efficiency and improving crop yields, particularly in arid and semi-arid regions as in Egypt. Subsurface drip irrigation system has successfully been used to irrigate wide range of crop patterns, but on the other hand, no studies had been conducted under intensive field crops (Grabow *et al.*, 2004). Overall efficiency of the trickle system, however, was on the average about 28 % and 45 % more than those of the sprinkler and furrow systems, respectively (Dawood and Hamad, 1985). Wheat is one of the key crops in Egypt with a cultivation area of about 1.3 million hectares (Ministry of Agriculture and Land Reclamation, 2014). With increasing human demand for food more efforts had been done to expand wheat cultivation area in new reclaimed and irrigated sandy soils based on new technologies as using bio-fertilizers and developed new varieties (Girgis, 2006). Few technically, economically and environmentally feasible studies had been focused on the application possibility of the alternative drip irrigation systems (surface and subsurface drip); an evaluation and performance consideration exists under intensive field crop conditions, which had been carried out by Suarez-Rey *et al.* (2000). Egypt is one of the countries that facing great challenges due to its limited water resources, and food shortage, especially, in wheat production which is considered as a strategic crop while the population increases greatly. The first challenge is represented mainly by the fixed share of the Nile water and its aridity as a general characteristic. Formulation of Egypt's water resources policy for the 21st century requires a major shift from the classical paradigm used in water resource planning and management to a new innovative. Therefore, increasing demand for water has created a whole new set of problems confronting irrigated agriculture. For many years, the emphasis of sustainable irrigated agriculture has been improving the effectiveness of water management, water conservation and salinity. The second challenge is wheat production which is the most important staple crop produced in Egypt. Abd El-Rahman (1996) emphasized that crops grown under subsurface trickle irrigation system might obtain yield more than those grown under surface one. The aim of this work is to study the possibility of enhancing water use efficiency of bread wheat cultivar Sakha 94 under two kinds of emitters (GR and Turbo), two distances between the emitters (25cm and 50cm) and three fertilization rates (60, 80 and 100 kg N/faddan) in sandy soils under at the farm of the Environmental studies and research Institute, Sadat City, Minufiya University, Egypt.

Materials and Methods

The present investigation was carried out during the two successive growing seasons of 2009/2010 and 2010/2011 at the farm of Minufiya University, Sadat City, under drip irrigation system.

A field experiment was carried out during the two successive seasons of 2009/2010 and 2010/2011. The experimental layout was split-split plot in randomized complete blocks design with three replications by randomly allocating two types of emitters (Long path (GR), and Pressure compensating (Turbo) E2) in main plots, two distance between emitters D1 (25 cm) and D2 (50 cm) in the sub plots and three nitrogen levels (N1= 60, N2= 80 and N3= 100 Kg/faddan) in the sub-sub plots. The area of the experimental plot was 3 X 3.5 m (10.5 m^2 = 1/400 Fadden) .The bread wheat cultivar Sakha 94 was used. The experiment was sown at 15^{th} November 2009 and 16^{th} November 2010, the harvest was done at 8 May 2010 and 10 May 2011, respectively.

Nitrogen fertilizer, in the rate of 100 Kg N/faddan, was added as a form of ammonium nitrate (33.5%N). And applied into four doses, 20% of the total amount was added at sowing, 40% was added at the first irrigation (25 days after sowing), 30% was added at the second irrigation (55days after sowing) and the rest of 10% was added 75 days after sowing.

Other agronomic practices were applied as the recommendations of the region.

Surface soil samples (0-30 cm depth) from the experimental sites were taken before planting in the two seasons and prepared for physical and chemical analysis according to Piper (1950). The physical and chemical properties of the experimental soils are in Tables 1 and 2.

Plant samples of one m^2 were randomly taken from each experimental plot after 45, 75 and 105 days after sowing to determine Crop Growth Rate (CGR) to the two periods of 45:75 (CGR1) and 75:105 (CGR2) days after sowing.

The data of Crop Growth Rata (CGR) in the two periods 45:75 (CGR1) and 75:105 (CGR2) days after sowing. Plant height (PH cm), number of spike/m^2 (NS), number of kernels/spike (KS), 1000-kernels weight (KW g), harvest index (HI %), Grain yield/faddan (GY) and Water Use Efficiency (WUE) were collected in the two seasons.

Table (1): Mechanical analysis, of the experimental sites, in the two seasons.

Season	Organic materials %	$CaCo_3$ %	Particle fraction			Soil texture
			Clay %	Silt %	Sand %	
2009/2010	0.29	5.50	7.80	19.35	72.85	Sandy loam
2010/2011	0.35	5.61	7.70	19.13	73.17	Sandy loam

Table (2): Water Chemical analysis, of the two experimental sites, in the two seasons.

Season	pH	EC	Soluble cations (meq/L)				Soluble Anions (meq/L)			
			Ca^+	Mg^+	Na^+	K^+	Co_3	HCo_3	Cl^-	So_4
2009/2010	7.13	1.78	4.56	2.60	3.07	0.36	---	6.60	12.83	1.16
2010/2011	7.20	1.73	4.60	6.63	3.10	0.47	---	6.68	12.80	1.22

RESULTS AND DISCUSSION

Effect of the types of emitters:

The data in Table (3) revealed that type of emitter had a significant effect on crop growth rate at the periods of 45:75 and 75:105 days after sowing in the two seasons. GR emitter significantly increased CGR1 of wheat plants to 18.56 and 19.17 g/day/m^2, and CGR2 to 12.08 and 16.49 g/day/m^2, in both respective seasons.

The data revealed that type of emitter had a significant effect on wheat traits in the two seasons. GR emitter significantly increased plant height of wheat plants to 85.7 and 87.47 cm, number of spike/m^2 at harvest to 405.39 and 392.04 spikes, number of kernels/spike to 55.88 and 59.13 kernels, harvest index to 61 and 60% and grain yield/faddan to 2760.2 and 2606.6 kg, in the first and second season, respectively, compared to Turbo emitters.

On the other hand, Turbo emitter significantly increased 1000-kernels weight to 29.79 g in the first season, while GR emitter significantly increased it to 34.21 g in the second one.

These results revealed the role of emission uniformity of drip irrigation systems and emitters manufactured by injection molding possessed higher EU values with relatively low reduction rate compared with extruded emitters. Consequently, injected-type emitters gave a higher crop yield than extruded types. These results are in agreement with those observed by El-Yazal *et al.* (2002), Kadale *et al*. (2007) and Kassem and El-Suker (2009).

Table (3): Effect of the type of emitters on wheat traits, in 2009/2010 and 2010/2011 seasons.

Emitter	CGR1	CGR2	PH (cm)	NS	KS	KW	GY	HI%
				2009/2010				
GR	18.56	12.08	85.07	405.39	55.88	29.79	2760.2	61
Turbo	15.39	11.20	82.62	391.17	52.70	29.00	2596.5	59
LSD 0.05	0.85	0.13	1.70	2.47	0.99	0.03	2.4	1.00
				2010/2011				
GR	19.17	16.49	87.47	329.04	59.13	34.21	2606.6	60
Turbo	16.17	14.46	81.79	384.71	56.22	30.05	2473.2	57
LSD 0.05	0.31	0.42	1.44	1.16	0.91	0.18	2.9	3.00

Effect of distance between emitters:

Data in Table (4) showed the effect of distance between emitters in both seasons. Whereas 25 cm distance between emitters recorded the highest values of CGR1 and CGR2 at the two studied periods at the two seasons. The values were 19.98 and 20.69 g/day/m^2 for CGR1 and they were 12.57 and 16.83 g/day/m^2 for CGR2, in the two respective seasons.

Table (4): Effect of distance between the emitters (D) on wheat traits, in 2009/2010 and 2010/2011 seasons.

D	CGR1	CGR2	PH (cm)	NS	KS	KW	GY	HI%
				2009/2010				
D1	13.98	10.71	81.54	386.74	51.88	29.26	2474.29	0.58
D2	19.98	19.98	86.15	409/82	56.70	29.52	2882.38	0.61
LSD 0.05	1.88	0.18	1.7	1/51	1.88	0.21	2.09	0.01
				2010/2011				
D1	14.65	14.12	79.71	384.71	55.31	26.62	2372.80	0.57
D2	20.69	16.83	89.54	392.04	60.04	27.11	2706.94	0.61
LSD 0.05	2.98	0.06	1.44	0.51	2.98	0.05	3.02	0.07

Also, the 25 cm between emitters recorded the significantly highest plant height (86.15 and 89.54 cm), number of spike/m^2 (409.82 and 392.04 spikes), number of kernels/spike (56.70 and 60.04 kernels), 1000-kernels weight (29.52 and 27.11 g), grain yield/faddan (2882.38 and 2706.94 kg) and harvest index (61 and 61%), in the two respective seasons.

These increases might be due to the increasing in the wet surface area with increasing the number of drippers and causing higher evaporation, or due to the increase in plant growth and transpiration in addition to the higher evaporation from the wet top layer rather than from the dry soil surface.

These results are in harmony with the findings of Seidhom (2001), Gaber (2000), Maqsood *et al.* (2002), Nasser and El-Gizawy (2005) and Abd El-Rahman (2009).

Effect of Nitrogen levels:

Table (5) showed that nitrogen levels had a significant effect on crop growth rate during the periods of 45:75 and 75:105 days after sowing in both seasons. Application of 100 kg N/faddan resulted in the highest values of CGR1 (18.08 and 18.38 g/day/m^2) and CGR2 (16.89 and 16.05 g/day/m^2) in both seasons, respectively.

Data, also, showed that 100 kg N/faddan significantly increased plant height to 86.15 and 84.32 cm, number of spikes/m^2 to 402.07 and 391.13 spikes, number of kernels/spike to 55.56 and 58.69 kernels, 1000-kernels weight to 30.17 and 28.25 g, grain yield/faddan to 2833.80 and 2732.84 kg/fed and harvest index to 63 and 60%, in both respective seasons.

These increases may be due to the fact that nitrogen fertilizer is attributing and has an important role in increasing division and cells elongation as well as activating metabolic and photosynthesis processes and translocation from source to sink.

These results are in accordance with those reported by Hassanin (2002), Maqsood *et al.* (2002), Nasser and El-gizawy (2005) and Farboodi *et al.* (2012).

Table (5): Effect of nitrogen fertilizer level (N) on wheat traits, in 2009/2010 and 2010/2011 seasons.

N level	CGR1	CGR2	PH (cm)	NS	KS	KW	GY	HI%
				2009/2010				
N1	15.77	11.42	82.92	395.25	52.89	29.10	2511.10	58
N2	17.08	13.61	84.07	397.49	54.42	28.91	2690.10	60
N3	18.08	16.89	84.51	402.07	55.56	30.17	2833.80	63
LSD 0.05	0.08	0.06	0.05	0.43	0.20	1.10	0.28	5
				2010/2011				
N1	16.56	14.83	81.79	385.87	56.60	24.94	2301.00	55
N2	18.06	15.53	82.79	388.10	57.74	27.40	2585.77	59
N3	18.38	16.05	84.32	391.13	58.69	28.25	2732.84	60
LSD 0.05	0.01	0.60	1.04	0.49	1.75	0.31	0.24	3

The interaction effect between type of emitter and distance between the emitters:

Results in indicated that GR emitter and 25 cm distance between the emitters significantly increased CGR1 to 21.62 and 22.25 g/day/m^2, CGR2 to 13.08 and 18.29 g/day/m^2, plant height to 87.39 and 92.22 cm, number of spike/m^2 to 419.53 and 400.08 spikes, number of kernels/spike to 58.87 and 61.53 kernels, 1000-kernels weight to 30.96 and 27.42 g, grain yield/faddan to 2918.30 and 2774.24 Kg and harvest index to 62 and 61%, in the two seasons respectively, (Tables 6 and 7).

Table (6): Effect of the interaction between type of emitter and distance between the emitters on CGR, PH and NS, in 2009/2010 and 2010/2011 seasons.

D	CGR1		CGR2		PH		NS	
	GR	Turbo	GR	Turbo	GR	Turbo	GR	Turbo
				2009/2010				
D1	15.51	12.45	11.08	10.34	82.75	80.33	391.25	382.23
D2	21.62	18.35	13.08	12.06	87.39	84.90	419.53	400.11
LSD 0.05	0.78		0.31		0.98		2.14	
				2010/2011				
D1	16.08	13.21	14.07	14.07	82.72	76.71	383.99	379.72
D2	22.25	19.13	18.29	15.34	92.22	86.87	400.08	391.25
LSD 0.05	0.36		0.74		2.21		0.72	

These results may be due to the amount of water available to plants by GR emitters and the narrow distance of 25 cm, in addition to the higher evaporation from the wet rather than dry soil surface and to the higher transpiration from plants as well as the amount of water needed for plant growth development and building plant tissues.

Table (7): Effect of the interaction between type of emitter and distance between the emitters on KS, KW, GY and HI, in 2009/2010 and 2010/2011 seasons.

D	KS		KW		GY		HI%	
	GR	Turbo	GR	Turbo	GR	Turbo	GR	Turbo
				2009/2010				
D1	52.9	50.86	29.92	28.61	2602.08	2346.50	59	56
D2	58.87	54.54	30.96	28.61	2853.30	2846.47	62	61
LSD 0.05	0.66		2.74		2.46		0.01	
				2010/2011				
D1	56.73	53.89	26.49	26.81	2438.93	2306.68	58	56
D2	61.53	58.55	27.42	26.74	2774.24	2639.65	61	59
LSD 0.05	0.22		0.22		2.44		0.08	

The interaction effect between nitrogen levels and type emitter:

Results revealed that GR emitter plus 100 kg N/faddan gave the significantly highest CGR1 (20.95 and 20.14 g/day/m^2), CGR2 (12.50 and 17.38 g/day/m^2), plant height (85.67 and 89.97 cm), number of spikes/m^2 (415.04 and 398.99 spikes), 1000-kernel weight (36.55 and 28.14 g), grain yield/faddan (2874.36 and 2760.51 Kg) and harvest index (62 and 61%) in the first and second season, respectively. While number of kernels/spike significantly increased up to 57.30 kernels using GR emitter under 100 Kg N/faddan in the first season, and up to 59.90 kernels by using Turbo emitter under 100 Kg N/faddan in the second season (Tables 8 and 9). These results are in accordance with those reported by AbdEl-Rahman (1996).

Table (8): Effect of the interaction between type of emitter and nitrogen fertilizer level on CGR, PH and NS, in 2009/2010 and 2010/2011 seasons.

N level	CGR1		CGR2		PH		NS	
	GR	Turbo	GR	Turbo	GR	Turbo	GR	Turbo
				2009/2010				
N1	17.09	14.45	11.76	11.09	84.20	81.65	406.05	584.46
N2	18.65	15.52	11.99	11.23	85.34	82.85	408.35	386.64
N3	20.95	16.21	12.50	11.29	85.67	83.35	415.04	389.11
LSD 0.05	0.01		0.04		2.20		2.02	
				2010/2011				
N1	17.91	15.21	15.53	14.13	85.13	80.45	392.64	379.10
N2	19.45	16.67	16.56	14.51	87.31	81.33	395.36	380.85
N3	20.14	16.62	17.38	14.73	89.97	83.58	398.99	383.29
LSD 0.05	0.03		0.04		1.09		0.01	

Table (9): Effect of the interaction between type of emitter and nitrogen fertilizer level on KS, KW, GY and HI, in 2009/2010 and 2010/2011 seasons.

N level	KS		KW		GY		HI%	
	GR	Turbo	GR	Turbo	GR	Turbo	GR	Turbo
				2009/2010				
N1	54.42	51.37	32.72	28.14	2599.00	2423.20	59	57
N2	55.93	52.91	33.78	29.05	2807.20	2573.00	61	59
N3	57.30	53.82	36.55	30.60	2874.36	2793.25	62	61
LSD 0.05	0.05		0.53		1.69		4	
				2010/2011				
N1	54.93	58.37	25.30	24.58	2405.60	2196.40	58	53
N2	65.36	59.12	27.62	27.18	2653.65	2517.90	60	58
N3	57.47	59.90	28.41	28.09	2760.51	2705.18	61	60
LSD 0.05	0.92		0.45		1.44		1	

The interaction effect between the distance between emitters and nitrogen levels:

The interaction effect between the distance between emitters and nitrogen levels had a significant effect on wheat studied traits in the two seasons (Tables 10 and 11).

The interaction significantly increased CGR1 to 21.12 and 21.76 g/day/faddan, CGR2 to 13.11 and 22.40 g/day/faddan, plant height to 86.72 and 91, 99 cm, number of spikes/m^2 to 415.04 and 398, 99 spikes, number of kernels/spike to 58.35 and 61.12 kernels, grain yield/faddan to 3019.45 and 2908.58 Kg and harvest index to 63 and 60%, in the two respective seasons.

Table (10): Effect of the interaction between the distance between emitter and nitrogen fertilizer level on CGR, PH and NS, in 2009/2010 and 2010/2011 seasons.

N level	CGR1		CGR2		PH		NS	
	D1	D2	D1	D2	D1	D2	D1	D2
				2009/2010				
N1	12.80	18.75	10.34	11.60	80.52	85.32	384.46	406.05
N2	14.09	20.08	10.65	12.50	81.80	86.39	386.64	408.35
N3	15.04	21.12	10.91	13.11	82.30	86.72	389.11	415.04
LSD 0.05	0.68		0.03		0.10		0.02	
				2010/2011				
N1	13.86	19.25	15.74	18.64	77.97	87.61	379.10	392.64
N2	15.07	21.05	14.51	20.84	79.61	89.03	380.85	359.36
N3	15.00	21.76	14.73	22.40	81.56	91.99	383.29	398.99
LSD 0.05	0.01		0.75		1.08		0.69	

Table (11): Effect of the interaction between the distance between emitter and nitrogen fertilizer level on KS, KW, GY and HI, in 2009/2010 and 2010/2011 seasons.

N level	KS		KW		GY		HI%	
	D1	D2	D1	D2	D1	D2	D1	D2
				2009/2010				
N1	50.77	55.02	24.58	28.14	2312.50	2709.70	56	60
N2	52.10	56.74	27.18	29.05	2462.20	2918.00	62	62
N3	52.77	58.35	28.09	30.60	2648.16	3019.45	62	63
LSD 0.05	0.12		0.23		1.68		2	
				2010/2011				
N1	54.14	59.05	25.30	28.76	2132.75	2469.25	53	58
N2	55.45	59.95	27.62	29.74	2428.55	2743.00	58	59
N3	56.25	61.12	28.41	30.07	2557.11	2908.58	59	60
LSD 0.05	3.89		0.01		1.43		1	

The interaction effect between type of emitter, distance between the emitters and nitrogen levels:

The second order interaction between the experimental treatments significantly affected all wheat studied traits. The highest values of CGR1 (22.97 and 23.34 g/day/faddan), CGR2 (13.34 and 19.69 g/day/faddan), plant height (88.24 and 95.64 cm), number of spikes/m^2 (426.94 and 403.15 spikes), number of kernels/spike (61.20 and 62.90 kernels), grain yield/faddan (3042.10 and 2932.83 Kg) and harvest index (63 and 63%) were achieved by using GR emitters with 25 cm distances between the emitters under 100 Kg N/faddan in both seasons, respectively. On the other hand, using Turbo emitters with 50 cm in-between under 60 Kg N/faddan resulted in the lowest values of mentioned traits in the two seasons (Tables 12 and 13).

Table (12): Effect of the interaction between type of emitter, distance between the emitters and nitrogen levels on CGR, PH and NS, in 2009/2010 and 2010/2011 seasons.

Emitter	N Kg/f	CGR1		CGR2		PH		NK	
		Distance between emitters							
		D1	D2	D1	D2	D1	D2	D1	D2
		2009/2010							
GR	60	14.07	20.12	10.64	12.88	82.45	85.95	387.93	414.66
	80	15.52	21.78	10.95	13.03	82.70	87.99	390.99	416.98
	100	16.94	22.97	11.66	13.34	83.10	88.24	394.83	426.94
Turbo	60	11.53	17.38	10.30	11.89	78.60	84.70	380.99	397.44
	80	12.67	18.38	10.35	12.11	80.90	84.80	382.30	399.73
	100	13.15	19.28	10.38	12.20	81.50	85.20	383.40	403.15
LSD 0.05		0.97		0.3		3.02		2.85	
		2010/2011							
GR	60	14.99	20.83	14.39	16.68	81.14	89.12	382.98	397.36
	80	16.31	22.59	14.61	18.52	82.71	91.91	383.39	399.73
	100	16.95	23.34	15.07	19.69	84.30	95.64	385.62	403.15
Turbo	60	12.74	17.68	13.15	15.11	74.80	86.10	375.22	387.93
	80	13.83	19.52	13.57	15.45	76.52	86.15	378.32	390.99
	100	13.06	20.18	13.96	15.51	78.82	88.35	380.96	394.83
LSD 0.05		0.37		1.05		2.80		0.99	

Table (13): Effect of the interaction between type of emitter, distance between the emitters and nitrogen levels on KS, KW, GY and HI in 2009/2010 and 2010/2011 seasons.

Emitter	N Kg/f	KS		KW		GY		HI%	
		Distance between emitters							
		D1	D2	D1	D2	D1	D2	D1	D2
		2009/2010							
GR	60	52.20	56.64	28.93	27.72	2457.10	2740.90	58	61
	80	53.10	58.76	30.32	28.76	2642.50	2971.90	60	62
	100	53.40	61.20	30.52	27.78	2706.63	3042.10	61	63
Turbo	60	49.35	53.40	27.35	32.42	167.90	2678.50	55	60
	80	51.10	54.72	27.79	28.76	2281.90	2864.10	56	62
	100	52.14	55.50	27.69	31.71	2589.70	2996.80	59	63
LSD 0.05		4.41		0.05		2.38		1	
		2010/2011							
GR	60	56.34	60.40	24.14	25.83	2202.10	1609.10	56	60
	80	56.95	61.30	27.39	27.09	2526.50	2780.80	59	61
	100	56.90	62.90	27.94	27.50	2588.20	2932.83	60	63
Turbo	60	51.95	57.71	25.02	24.78	2063.40	2329.40	50	57
	80	54.13	58.60	26.97	28.16	2330.60	2705.20	57	60
	100	55.60	59.35	28.24	29.32	2526.03	2884.34	59	62
LSD 0.05		5.51		0.63		2.5		1	

Water use efficiency (WUE):

Data in Table 14 represent the average water use efficiency of bread wheat under the experimental treatments in Kg grains per one m^3 of irrigation water.

It could be noticed that the mean water use efficiency was 1.16 and 1.47 Kg/m^3, with the distances between emitters of 50 and 25 cm, respectively. And it was 1.28 and 1.21 Kg/m^3, when GR and Turbo emitters wear used, respectively. Nitrogen fertilizer levels dramatically increased WUE with increase in nitrogen application. WUE increased from 1.10 with 60 Kg N/faddan to 1.21 with 80 Kg N/faddan and/or to 1.31 Kg/m^3 with 100 Kg N/faddan were applied.

However, the highest value of WUE of 1.43 Kg/m^3 was a Kg/m^3 accrued when GR emitter was used with 25 cm distance between emitters under 100 Kg N/faddan.

These increases in WUE may be due to the decrease in actual evapo-transpiration at low applied water quantities which could correspond with high grain yield.

Similar results were reported by Seidhom (2001) and El-Yazal *et al.* (2002).

Table (14): WUE as affected by type of emitters, distance between emitters and nitrogen fertilizer level in 2009/2010 and 2010/2011 seasons.

N	GR			Turbo			N Mean	D Mean	
	D1	D2	Mean	D1	D2	Mean		D1	D2
N1	1.12	1.28	1.20	1.01	1.19	1.10	1.10	1.06	1.23
N2	1.24	1.38	1.31	1.10	1.33	1.21	1.21	1.17	1.65
N3	1.27	1.43	1.35	1.22	1.41	1.31	1.31	2.31	2.41
Mean	1.21	1.63	1.28	1.11	1.31	1.21	1.21	1.16	1.47

RERERANCES

Abd El-Rahman, G. (2009). Water Use Efficiency of wheat under drip irrigation systems at Al-Maghara area, North Sinai, Egypt. American-Eurasian J. Agric. & Environ. Sci., 5 (5): 664-670.

Dawood, S.A. and S.N. Hamad (1985). A comparison of on-farm irrigation systems performance. In Proceedings of the Third International Drip/Trickle Irrigation Congress. California, 18-21 November 1985.

Farboodi, M.; A.S. Nejad; S. Shahrokhi and A. Faramarzi (2012). Effect of nitrogen levels and cultivation arrangements on yield and yield components of wheat. Journal of Food, Agriculture Environment, 10: 1 part 2, 608-611. 22 ref.

Girgis, M.G.Z. (2006). Response of wheat to inoculation with phosphate and potassium mobilizers and organic amendment. Annals Agric. Sci., Ain Shams Univ., Cairo, 51(1): 85-100.

Grabow, G.L.; R.L. Huffman; R.O. Evans; K. Edmisten and D. Jordan (2004). Subsurface drip irrigation research on commodity crops in North Carolina. Tech. Report, N. C. University, USA.

Gaber, A.M. (2000). Water consumptive use, water use efficiency and production of some wheat varieties. Egyptian Journal of Soil Science, 40(4): 545- 556.

Hassanin, M.S. (2002). Effect of variety and nitrogen levels on growth, yield and yield components of wheat *(Triticum aestivumL.)* in newly cultivated land. Egyptian Journal of Agronomy. 2001, publ. 2002. 23: 111-131. 38 ref, ISSN1110-0486.

Kadale, A.S.; N.M. Shah and M. Mallik (2007) Determination of permissible lateral pressure variation for various types of emitters - a case study Karnataka Journal of Agricultural Sciences, 20(2): 444-445. 2 ref.

Kassem M.A. and A. AL-Suker (2009). Effect of fertigation methods on productivity and nitrogen use efficiency for wheat and barley crops. Misr J. Ag. Eng., 26(2): 866-885.

Maqsood, M.; A. Ali; Z. Aslam; M. Saeed and S. Aslam (2002). Effect of irrigation and nitrogen levels on grain yield and quality of wheat. Int. J. Agric. Biol., 4: 164-165.

Nasser Kh. B. and El-Gizawy (2005). Yield and nitrogen use efficiency as influenced by rates and sources of nitrogen fertilizers of some wheat varieties. The 11th Conference of Aagronomy, Agron. Dept., Fac. Agric., Assiut Univ., November, 15-16, 2005.

Piper, C.S. (1950). Soil and plant analysis. Interscience Publisher, Inc., New York.

Seidhom, S.H. (2001). Water use efficiency and water economy of some crops as affected by soil heat at Sinai. Ph.D. Thesis, Fac. Agric., Zagazig Univ., Egypt.

Suarez-Rey, E.; C.Y. Choi; P.M. Waller and D.M. Kopec (2000). Comparison of subsurface drip irrigation and sprinkler irrigation for Bermuda grass turf in Arizona. Trans. ASAE, 43(3): 631-640.

تأثير نوع النقاطات والمسافة بينها والتسميد النيتروجيني علي المحصول ومكوناته لقمح الخبز في الأراضي حديثة الاستصلاح

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تم إجراء التجربة بمزرعة جامعة المنوفية بمدينة السادات خلال موسمي الزراعة 2010/2009 و 2011/2010 لدراسة تأثير نوعين من النقاطات هما النقاط "تربو" و النقاط "جي ار" ومسافتان بين النقاطات (25 و 50 سم)، وثلاث معدلات من التسميد النيتروجيني (60، 80 و 100 كجم نيتروجين لفدان) علي نمو ومحصول قمح الخبز، في منطقة السادات بهدف الترشيد في استخدام مياه الري، والوصول الى أعلى كفاءة لأستخدام المياه والتوصل للتوليفة المثلي من العوامل لتحقيق أفضل إنتاج. نفذت التجربة في تصميم قطاعات كاملة العشوائية بنظام القطع المنشقة مرتين في ثلاث مكررات، خصصت القطع الرئيسية لنوع النقاطات، بينما خصصت القطع الشقية الأولي للمسافات بين النقاطات، وكان نظام الري المتبع هو الري بالتنقيط السطحي وتم دراسة صفات النمو والمحصول ومكوناته، ومعدل النمو للمحصول فى الفترة من 45 إلى 75 ومن 75 إلى 105 يوم، وكفاءة الاستفادة من مياه الري. وأظهرت النتائج وجود فروق معنوية بين تأثير النقاطات علي جميع الصفات المدروسة، حيث أدي استخدام النقاط جي ار إلي زيادة معنوية في طول السنبلة، معامل الحصاد، الوزن الجاف للنبات، معدل نمو المحصول عند جميع مراحل النمو، محصول الحبوب للفدان وكفاءة الاستفادة من مياه الري بالنسبة لمحصول الحبوب كما كان هناك تأثيرا معنويا للمسافة بين النقاطات، حيث أن المسافة 25 سم بين النقاطات سجلت أعلي القيم لجميع الصفات المدروسة، وكانت أفضل القيم عند أستخدام النقاط جي ار والمسافة 25 سم، بينما زادت كفاءة استخدام مياه الري بنسبة 18% عند استخدام النقاط تربو والمسافة بين النقاطات 25 سم.