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Effect of Planting Date and Fertilizer Application on Yield of Wheat under No till System

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Abstract: A 2-yr field study was carried out in the Research and Experimental Center of Faculty of Agriculture at Moshtohor, Benha University, Egypt, during 2006/2007 and 2007/2008 seasons. The aim of this study was to study the effect of 3 planting dates (PD) (November 1, November 15 and November 30), 2 bio- fertilization treatments (BF) (with and with out) and 4 mineral NP fertilizer levels (N_0P_0, $N_{30}P_{15}$, $N_{60}P_{30}$ and $N_{90}P_{45}$ kg/fed.) on yield, yield components, grain protein content (GPC) and grain NPK uptake of wheat cv. Sakha 93. Results showed that the highest values of number of tillers and spikes/m^2, 1000- kernel weight, grain yield/fed and grain NPK uptake were obtained when wheat was sown on mid-November. Early or delayed planting significantly reduced forenamed traits. Increasing fertilizer level up to $N_{90}P_{45}$ kg/fed significantly increased yield and yield components compared with lower fertilizer levels and the control. Bacteria inoculation significantly increased number of spikes/m^2, plant height, spike length,1000- kernel weight, grain yield/fed, GPC% and grain NPK uptake compared with without inoculation in both seasons. Significant interaction effects PD x BF, PD x NP and BF x NP on grain yield and some of its attributes were detected. Whereas, no significant effect of second order interaction was found on any of the studied traits.

Key words: Wheat % *Triticum aestivum* L. % Bio-fertilizer % NP levels % Grain yield

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the most important cereal crop as the main stable food for the Egyptian people. Improving the productivity of this crop is a main task due to its short supply which mandated importing about 50% of the needed wheat. Since there is a short time between harvesting summer crops i.e. corn, cotton and rice and planting wheat, no-till wheat producers can plant more acreage at reduced cost than those who have to gear up for conventional land preparation. The other important benefit of no-till small grain production is that it allows growers to establish a full no-till cropping system. The best chance of increasing soil organic matter, improving soil structure and increasing water availability over the long term occurs when all crops in the rotation are planted using no-till practices [1]. Planting date is one of the most important agronomic factors involved in producing high yielding small grain cereal crops, which affects the timing and duration of the vegetative and reproductive stages. In Egypt, wheat sowing dates varied among different location. The variation in sowing dates plays an important role in the variation of wheat yield per unit area. There are several studies that documented the effects of planting date on winter cereals [2-5]. Seeding earlier increases chances of disease and insect problems. Seeding later reduces chance of survival, generally delays maturity, increases disease chances and reduces yield potential. A 34% decrease in grain yield occurred when planting was delayed from 22 September to 19 October in Nebraska, USA [6].Mahfouz [7], in Egypt, concluded that the highest value for plant height, number of tillers/m^2, number of spikelets/spike, spike length, number of grains /spike, 1000-grain weight, biological and grain yields were produced when wheat was sown on 15th November. But, the highest number of non effective tillers/m^2 and the highest straw yield were recorded from sowing wheat on 30th November. Wheat yield declined by 30 to 40% when seeding was delayed from early September to late October in SW Saskatchewan [2].Delayed planting of wheat from 1 October to 1 December in Kansas (USA) decreased grain yield by 18% per month [8]. Qasim *et al.* [9] showed that early planted wheat yielded maximum grains per spike (44.14), plant height (79.81 cm), 1000-grain weight (39.17 g) grain yield (4165.7 kg/ha) and straw yield (6814.2 kg/ha).Nitrogen (N) is one of the major plant food nutrients applied in the form of chemical fertilizers, whereas, phosphorus (P) counter

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balances the effect of excessive nitrogen by hastening plant maturity and retarding excessive vegetative growth. Nitrogen and phosphorus are the two most widely recognized nutrient deficiencies in soils of Egypt. Unfortunately, there are very little data available to evaluating NP fertilizer management strategies for wheat under no-till system. Knapp and Knapp [10] using four fertility treatments i.e. 0 N and 0 P, 0 N and 20 kg/ha P, 22 kg/ha N and 0 P and 22 kg/ha N and 20 kg/ha P and reported that nitrogen alone had little effect on yields when compared to unfertilized wheat and when N was applied with P the results were similar to those from P alone. Blue *et al.* [6] found that increasing the P rate from 0 to 34 kg P/ ha resulted in 0.67, 0.53 and 0.79 ton/ ha yield increase in 1986, 1987 and 1988, respectively. Singh *et al.* [11] and Behera [12] reported that application of 100% of the recommended fertilizer (120, 60 and 40 kg N, P and K/ha) recorded higher grain and straw yields than the 50% of the recommended fertilizer and the control. The use of expensive chemical fertilizers is a limiting factor for the low-income farmers and increases the cost of crop production. The increase of fertilizer prices during last years in addition to the hazards of environmental pollution resulting from excessive fertilizers application has increased the interest in improving plant efficiency in using fertilizer. Bio-fertilizers (BF) are eco-friendly and have been proved to be effective and economical alternate of chemical fertilizers with lesser in put of capital and energy. Hussein and Radwan [13] demonstrated that inoculated wheat seeds with bio-fertilizer significantly increased the grain yield/fed, harvest index, 1000-grain weight and spike grain weight by 6.5, 3.4, 2.1 and 8.8%, respectively, rather than non-biofertilized treatments. Mahmoud and Mohamed [14] concluded that bio-fertilizers cerealien and phosphorien stimulated wheat growth and yield. This study was carried out to study the effect of planting date, fertilizer application on yield of wheat under no till system.

MATERIALS AND METHODS

Experimental Site Description and Soil Properties: Field experiments were carried out at the Agricultural Research and Experimental Center, Faculty of Agriculture Benha Univ., during the two growing seasons 2006/07 and 2007/08 on wheat cv. Sakha 93.Soil type of the experimental site was clay textured. The preceding crop in both seasons was maize. Soil samples were taken from the surface 20 cm before treatment applications in both seasons (Table 1).

Table1: Characteristics of the surface 20 cm of soil in experiment fields before treatment applications

Soil properties	1st season	2nd season
Physical analysis		
Sand, %	24.5	24.4
Silt, %	19.5	20.3
Clay, %	56.0	55.3
Texture	Clay	Clay
Chemical analysis		
Organic matter %	1.87	1.88
pH $_{\text{water 1:2 ratio}}$	7.77	8.00
EC, dS m^{-1}	1.54	1.66
$CaCO_3$ %	2.55	2.78
Available nutrients (mg/kg)		
N (Nitrate-N) KCl-extractable	18.32	16.45
P ($NaHCO_3$-extractable)	10.55	10.65
K (neutral NH_4-acetate extractable)	243.00	255.00

Normal mean temperatures and mean temperatures of the experimental site during the two seasons are presented in Table 2.

During the growth duration, mean temperature in both seasons did not differ widely from normal temperature ranges.

Treatments and Experimental Design: Each experiment included 24 treatments which were the combination of three planting dates (November 1, November 15 and November 30), two bio- fertilization (BF) (with and without) and four mineral NP fertilization (N_0P_0, $N_{30}P_{15}$, $N_{60}P_{30}$ and $N_{90}P_{45}$ kg/fed). The treatments were arranged in a split-split plot design with 3 replicates. The main plots were occupied by planting date, the first order sub plots were for bio-fertilizer and the NP fertilizer rates were assigned to the second order sub-sub plots. The sub-sub plot area was 10.5 m^2 (3m long and 3.5 m apart).

Crop Management Practices: The plots were sown on November 1, November 15 and November 30 in the two seasons. Wheat grains, just before planting, were inoculated with a mixture of a non-symbiotic N fixing *Azospirillum lipoferum* and *Bacillus polymxa* under the commercial name Cerialine® and phosphate dissolving bacteria *B. megatherium* under the commercial name phospharine® 500g/fed. Coating of wheat grains was conducted as recommended by the Ministry of Agriculture, Giza, Egypt. Both cerealien and phosphorien are produced by Bio-Fertilizers Unit, General Organization of Agriculture Equalization Fund, Agricultural Research Centre, Ministry of Agriculture, Giza, Egypt. Wheat grains

Table 2: Temperatures during the 2006/07 and 2007/08 seasons

	2006/07 Season		2007/08 Season		Normal temperature	
	T_{max}	T_{min}	T_{max}	T_{min}	T_{max}	T_{min}
Months	°C		°C		°C	
November	23.5	13.6	23.0	13.0	24	14
December	19.8	10.2	20.0	9.5	19	11
January	19.2	9.8	18.5	9.0	18	9
February	21.2	11.1	21.0	11.0	20	10
March	24.4	13.4	23.5	11.5	23	12
April	28.2	16.1	27.2	14.6	28	15
May	31.3	17.7	32.0	17.0	32	18

T_{max} = maximum temperature and T_{min} = minimum temperature

were drilled in maize ridges in 3 rows (in both sides and in top of the ridge), hills were 20 cm apart. Super phosphate at the rate of 0, 15, 30 and 45 kg P_2O_5/fed was applied before seeding. Nitrogen fertilizer in the forms of ammonium nitrate (33.5 % N) was applied at the rate of 0, 30, 60 and 90 kg N/fed in two equal doses before the first and second irrigations in both seasons. Weeds were controlled during the growing seasons by specific herbicide Brominal W 24 % (3,5-dibromo-4-hydroxybenzonitrile) at the rate 1.0 L /fed at the 2- to 4-leaf stage (after 21 days from planting in both seasons). Weeds that germinated subsequently were removed by hand. The normal practices for growing wheat were followed as recommended for the region.

Data Collected: At harvest (ripening stage Zadoks 92) [15], plants in 0.5 m^2 were harvested to determine the number of tillers and spikes/m^2.Then, ten fertile tillers from each sub-plot were chosen randomly to estimate the plant height, spike length, number of spikelets and grains/spike. Weight of 1000 – grain was determined by hand counting three 500 kernel samples from redropped wheat treatments. Grain and straw yields were recorded on the whole plot basis. The harvest index (HI, the ratio at harvest of grain dry wt. to total aboveground dry wt.). Grain protein content (GPC %) was calculated as N% X 5.7 on dry weight basis. Nitrogen (N) % in grain was determined by the Microkjeldahl method according to A.A.C.C. [16]. Potassium (K) % was determined by flame emission spectroscopy, phosphorus (P) % by the molybdenum blue-ascorbic acid methods [17].

Statistical Analysis: Data were statistically analyzed according to Steel and Torrie [18] using the MSTAT-C Statistical Software Package [19]. Where the F- test showed significant differences among means Least Significant Differences (LSD) test was performed at the 0.05 level of probability to compared means.

RESULTS AND DISCUSSION

Effect of Planting Dates: Results presented in Tables 3 and 4 shows a significant effect *($P< 0.05$)* for planting dates on yield, yield components, harvest index (HI), GPC % and grain NPK uptake of wheat cv. Sakha 93 during the two experimental seasons. Results showed that the highest number of tillers (435.8 and 420.0) and spikes (413.5 and 402.6)/m^2, 1000- kernel weight (39.3 and 39.6 g) and grain yield/fed (2300.0 and 2381.2 kg) were obtained when wheat was sown on mid-November in both seasons, respectively. While, seeding wheat on November, 1 gave the lowest numbers of tillers and spikes/m^2, plant height, kernels/spike and grain yield/fed when compared with the other planting dates. The crop sown in mid-November produced 7.76 and 2.22 % more grain yield than that sown in early and late November during first season, being 10.59 and 4.52 % in the second season, respectively. This result may be due to the effect of environmental conditions. Similar results were reported by Mahfouz [7], in Egypt, who concluded that the highest value for plant height, number of tillers/m^2, number of spikelets/spike, spike length, number of grain /spike, 1000-grain weight, biological and grain yields were produced when wheat was sown on 15th November. But, the highest number of non effective tillers/m^2 and the highest straw yield were recorded from sowing wheat on 30th November. These results are in harmony with those obtained by Witt [8].

Table 3: Main effects of planting date and fertilizer levels on number of tillers and spikes/m^2, plant height, spike length, number of spikelets and kernels/spike and 1000- kernel weight in 2006/07 and 2007/2008

	Tillers per square meter		Spikes per square meter		Plant height		Spike length		Spikelets per spike		Kernels per spike		1000-kernel weight	
Treatments	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08
Planting dates (PD)	No.				cm				No.				g	
November,1	415.0	411.6	393.9	395.9	93.0	93.4	10.60	10.2	18.30	18.20	57.00	59.9	36.0	37.0
November,15	435.8	420.0	413.5	402.6	98.2	99.3	10.60	11.2	18.40	19.50	61.00	64.9	39.3	39.6
November,30	423.9	396.3	398.2	387.6	97.4	96.6	9.50	10.5	18.90	19.00	61.20	60.9	36.6	36.7
LSD 0.05	4.3	13.9	10.2	8.8	1.8	4.8	0.57	N.S	0.44	0.71	2.05	N.S	1.9	1.2
Bio-fertilizer(BF)														
Without	416.9	409.2	396.4	392.6	94.3	93.5	9.8	10.3	18.3	18.5	58.7	59.3	35.5	35.8
With	432.9	409.4	407.3	398.1	98.1	99.4	10.6	11.0	18.8	19.3	60.8	64.5	39.1	39.7
F test	**	N.S	**	**	*	**	*	**	N.S	*	N.S	**	**	**
N : P_2O_5 kg/fed (NP)														
N0 P0 (control)	412.5	393.8	390.0	376.4	88.3	88.2	8.80	9.50	16.50	16.40	49.20	49.50	32.50	32.60
N30P15	422.2	405.2	395.4	385.7	93.8	94.4	9.80	10.30	18.30	18.80	59.00	59.90	35.60	36.50
N60P30	429.7	416.9	406.1	401.6	98.5	99.7	11.70	11.20	20.20	19.90	63.00	66.30	39.10	39.00
N90P45	435.2	421.2	416.1	417.7	104.2	103.5	10.70	11.60	19.10	20.60	67.70	72.00	42.00	43.00
LSD 0.05	8.6	15.1	4.5	4.9	1.5	1.6	0.42	0.35	0.51	0.52	1.95	2.41	1.10	1.09
F test Prob.							P>F							
PD	**	*	*	*	**	*	**	N.S	*	*	**	N.S	*	**
BF	**	N.S	**	**	*	**	*	**	N.S	*	N.S	**	**	**
NP	**	**	**	**	**	**	**	**	**	**	**	**	**	**
PD x BF	N.S	N.S	*	*	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S
PD x NP	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
BF x NP	N.S	N.S	N.S	N.S	*	N.S	*	N.S	N.S	N.S	N.S	*	N.S	N.S
PD x BF * NP	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
CV, %	3.00	5.45	1.67	1.85	2.36	2.52	6.1	4.97	4.11	4.07	4.83	5.77	4.39	4.29

*, ** Significantly different at 0.05 and 0.01 probability levels, respectively N.S: not significant.

Table 4: Main effects of planting date and fertilizer levels on grain and straw yields, harvest index, grain protein content (GPC) and grain NPK uptake in 2006/07 and 2007/2008

									Grain NPK uptake					
	Grain yield		Straw yield		Harvest index		GPC		N		P		K	
Treatments	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08
Planting dates (PD)	Kg/fed				%				Kg/fed					
November,1	2134.3	2153.1	3180.3	3392.5	39.9	38.5	7.74	7.79	29.3	29.9	7.89	7.89	8.96	9.77
November,15	2300.0	2381.2	3471.2	3677.9	39.7	39	9.02	8.81	36.9	37.3	8.55	9.12	10.51	11.02
November,30	2250.0	2278.1	3564.2	3550.9	38.4	38.8	8.12	7.98	32.8	32.4	8.34	8.48	10.28	10.48
LSD 0.05	60.4	96.7	67.5	125.8	0.6	N.S	N.S	0.42	4.2	1.1	0.26	0.34	0.27	0.38
Bio-fertilizer (BF)														
Without	2168.7	2216.6	3304.2	3487.9	39.4	38.5	7.82	7.91	30.3	31.2	7.89	8.17	9.55	9.99
With	2287.5	2325.0	3506.5	3592.9	39.3	39.0	8.77	8.47	35.7	35.2	8.63	8.83	10.28	10.86
F test	**	**	**	N.S	N.S	N.S	**	*	**	**	*	**	**	**
N: P_2O_5 kg/fed (NP)														
N0 P0 (control)	1541.6	1533.3	2616.1	2683.8	37	36.3	7.41	7.25	20.2	19.5	5.35	5.4	6.49	6.69
N30P15	2237.5	2312.5	3427.7	3623.8	39.5	38.9	7.79	7.98	30.6	32.5	8.14	8.54	9.79	10.44
N60P30	2466.6	2529.1	3656.7	3847.3	40.3	39.6	8.58	8.67	37.1	38.6	9.27	9.54	11.10	11.68
N90P45	2666.6	2708.3	3920.7	4006.6	40.5	40.3	9.40	8.86	44.1	42.2	10.29	10.52	12.29	12.89
LSD 0.05	58.2	57.1	103.5	75.0	0.7	0.6	0.22	0.64	1.4	3.2	0.22	0.22	0.28	0.25
F test Prob.							P>F							
PD	**	**	**	**	**	N.S	N.S	**	**	**	**	**	**	**
BF	**	**	**	N.S	N.S	N.S	**	*	**	**	**	**	**	**
NP	**	**	**	**	**	**	**	**	**	**	**	**	**	**
PD x BF	*	*	N.S	N.S	N.S	N.S	*	N.S	N.S	N.S	N.S	N.S	N.S	N.S
PD x NP	N.S	N.S	N.S	*	N.S	N.S	*	N.S	*	N.S	N.S	N.S	N.S	N.S
BF x NP	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
PD x BF x NP	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
CV %	3.97	3.81	4.61	3.22	2.91	2.58	4.53	12.38	6.43	14.7	4.44	4.03	4.41	3.81

*, ** significantly different at 0.05 and 0.01 probability levels, respectively N.S: not significant

Table 5: Effect the interaction between planting dates and bio-fertilization

		Spikes/m^2		GPC		Grain yield	
Planting dates	Bio-fertilization	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08
		No.		%		Kg/fed	
November, 1	Without	388.3	396.6	7.45	7.64	2031.2	2075.0
	With	399.5	395.2	8.02	7.93	2237.5	2231.2
November, 15	Without	406.2	395.8	8.41	8.50	2287.5	2287.5
	With	420.9	409.4	9.64	9.12	2312.5	2475.0
November, 30	Without	394.8	385.4	7.60	7.60	2187.5	2287.5
	With	401.6	389.8	8.64	8.36	2312.5	2268.7
LSD		5.8	4.3	0.29	N.S	97.4	112.2

Effect of Bio-Fertilizer: Data presented in Tables 3 and 4 demonstrated that inoculated wheat grains with bio-fertilizer significantly increased *(P<0.05*) numbers of tillers and spikes/m^2, plant height, spike length, spikelets/spike, kernels/spike and 1000-grain weight, grain yield/fed, GPC%, grain NPK uptake compared with non inoculated. The relative positive effect of bio-fertilizer treatment on some yield criteria may be attributed to their N_2-fixing activity and the production of plant growth promoting substances such as IAA, gibberellins and cytokinine-like substances [20] as well as mineralization of certain macro and micronutrients [21]. Similar findings were reported by Hussein and Radwan [13] recorded that inoculated wheat grains with bio-fertilizer significantly increased the grain yield/fed, harvest index, 1000-grain weight and spike grain weight by 6.5, 3.4, 2.1 and 8.8%, respectively, rather than non -biofertilized treatments. Mahmoud and Mohamed [14] concluded that bio-fertilizers cerealien and phosphorien stimulated wheat growth and yield.

Effect of NP Fertilizer Levels: It is evident from the results in Tables 3 and 4 that tillers and spikes/m^2, plant height, spike length, spikelets/spike, kernels/spike, 1000-kernel weight, grain and straw yields/fed, HI%, GPC% and grain NPK uptake increased by increasing N and P fertilizer levels. Application of $N_{90}P_{45}$ kg/fed significantly increased *(P<0.05*) yield and yield components compared with lower fertilizer levels and the control. The highest NP rate ($N_{90}P_{45}$ kg/fed) was more effective in increasing grain yield. This might be due to the well utilization of NP fertilizer in metabolism and meristimic activity which improved growth characters and yield components. The application of $N_{30}P_{15}$, $N_{60}P_{30}$ and $N_{90}P_{45}$ kg/fed increased the grain yield over the control treatment by 695.9, 925.0 and 1125.0 kg/fed in the 1st season and by 779.2, 995.8 and 1175.0 kg/fed in the 2nd season, respectively. These increases correspond to 45.1, 60.0 and 72.9% in the first season and 50.8, 64.9 and 76.6% in the second season. These results indicate that the experimental soil was deficient with regard to available N (Table 1). The marked increase in growth characters and yield components contributed for the significant increase in wheat grain yield. The present results indicated clearly the vital role of N and P in plant life and its contribution in increasing the grain yield. Such results clarified that N and P are essential for cell division and elongation as well as the root growth and dry matter content of wheat plants [22]. Similar result was obtained by Hussein and Radwan [13] who found that the largest grain and straw yields/fed were obtained by the application of full recommended rate of nitrogen and phosphorus fertilizers (70 kg N/fed + 15.5 kg P_20_5 /fed).

Interaction Effect

A- Planting Dates x Bio-Fertilization (PD x BF): Results in Table 5 show that plots planted on November,15 with bio-fertilization gave the highest number of spikes/m^2, GPC % and grain yield/fed compared with the other two dates and without bio-fertilization.

B- Planting Dates x NP Fertilizer Levels (PD x NP): Data listed in Table 6 shows that when wheat was sown on November, 15 and received $N_{90}P_{45}$ kg/fed gave the highest number of spikes/m^2, GPC%, N uptake and straw yield/fed compared with the other two dates and lower fertilizer levels.

C- Bio -fertilization x NP levels (BFx NP): Plant height and spike length in the 1st season as well as number of kernels/spike in the 2nd season were significantly affected (*P<0.05*) by the interaction between bio-fertilization and

Table 6: Effect the interaction between planting dates and NP fertilizer levels

Planting dates	N:P fertilizer levels	Spikes/m2		GPC		Grain N uptake		Straw yield	
		2006/07	2007/08	2006/07	2007/08	2006/07	2007/08	2006/07	2007/08
		No.		%		Kg/fed			
November, 1	N0P0	377.5	380.0	7.12	6.84	18.4	17.3	2489.1	2553.3
	N30P15	390.8	386.3	7.41	7.41	27.8	27.9	3123.3	3403.3
	N60P30	400.0	401.6	8.07	8.26	33.4	34.9	3448.3	3766.6
	N90P45	407.5	415.8	8.36	8.64	37.6	39.4	3661.6	3846.6
November, 15	N0P0	407.5	378.8	8.17	7.98	23.7	22.0	2680.0	2736.6
	N30P15	405.0	388.3	8.45	8.74	34.4	38.4	3515.0	3863.3
	N60P30	415.0	411.6	9.21	9.40	40.1	43.5	3715.8	3941.6
	N90P45	426.8	431.6	10.26	9.12	49.3	45.2	3974.0	4170.0
November, 30	N0P0	385.0	370.5	6.93	6.93	18.3	19.1	2679.0	2761.6
	N30P15	390.5	382.5	7.50	7.79	29.7	31.2	2645.6	3605.0
	N60P30	403.3	391.6	8.45	8.36	37.8	37.3	3806.1	3833.6
	N90P45	414.1	405.8	9.59	8.83	45.5	41.9	4126.6	4003.3
LSD		N.S	8.3	0.49	N.S	2.4	N.S	N.S	130.2

Table 7: Effect the interaction between bio-fertilization and NP levels

Bio-fertilization	N:P fertilizer levels	Plant height		Spike length		Kernels per spike	
		2006/07	2007/08	2006/07	2007/08	2006/07	2007/08
		cm				No.	
Without	N0 P0	87.2	85.5	8.6	9.1	47.2	48.7
	N30P15	92.7	91.1	9.5	9.8	58.7	56.1
	N60P30	97.0	96.4	10.2	11.0	62.5	62.4
	N90P45	100.3	100.8	11.0	11.3	66.3	70.0
With	N0 P0	89.5	90.8	9.0	9.8	51.2	50.2
	N30P15	95.0	97.7	10.1	10.8	59.3	63.7
	N60P30	100.1	103.1	11.2	11.5	63.5	70.2
	N90P45	107.7	106.1	12.4	11.8	69.2	74.1
LSD		2.1	N.S	0.6	N.S	N.S	3.3

NP levels (Table 7). Tallest plant height and spike length and largest number of kernels/spike were obtained by bio-fertilization combined with $N_{90}P_{45}$ kg/fed. Similar result was obtained by Hussein and Radwan [13].

CONCLUSION

It can be concluded that wheat grain yield and its components were affected by sowing date and fertilizer application under no till system. The highest values of number of tillers and spikes/m^2, 1000- kernel weight, grain yield/fed and grain NPK uptake were obtained when wheat was sown on mid-November. Increasing fertilizer level up to $N_{90}P_{45}$ kg/fed significantly increased yield and yield components compared with lower fertilizer levels and the control. Bio-fertilizers cerealien and phosphorien stimulated wheat growth and grain yield.

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