Response of Some Wheat Varieties to Agrispon Foliar Application and Nitrogen Rates .

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Abstract

Two field experiments were conducted at the Experiment and Research Center, Fac. Agric., Moshtohor, Zagazig Univ., during 1995/96 and 1996/97 seasons. The aim of this study was to investigate the response of three wheat varieties (Sids 1, Sids3 and Giza167)to Agrispon treatments (foliar application with Agrispon vs. check treatment) and four N rates (zero,30,60 and 90 kg /fed).

The results of the combined analysis showed that:

Sids 3 variety gave the highest values of plant height, number of spikelets and kernels/spike, weight of kernels/spike, 1000- grain weight and biological, grain, and straw yields/fed campared with the other varieties. Sids1and Giza 167 recorded higher values of NUE compared with Sids 3.

Plant height, number of spikelts and kernels/spike and biological, grain and straw yields/fed increased significantly by foliar application with Agrispon, whereas 1000–grain weight and NUE decreased by foliar application with Agrispon.

The increase in N rate up to 90 kg N/ fed increased significantly plant height, spike length, number of spikelets and kernels/spike, weight of kernels/spike and biological, grain and straw yields/fed, whereas the increase in N rate reduced significantly NUE. Raising N rate from zero to 30, 60 and 90 Kg N/ fed increased grain yield/ fed by 11.44, 19.74 and 29.25%, respectively.

Number of spikelets and kernels/spike, 1000-grain weight, biological and grain yields/fed and NUE were affected by the interaction between varieties and Agrispon treatments. Biological, grain and straw yields/fed and NUE were affected by the interaction between varieties and N rates. Also biological and straw yields/fed responded to the interaction between the three involved factors (varieties x Agrispon treatments x N rates). It could be concluded that under the conditions of the experiment, growing Sids 3 and application of Agrispon + 90 kg/fed is recommended.

Introduction

Wheat is considered the main source of food in the world and in Egypt. Raising wheat production through increasing productivity and increasing the cultivated area is an important national target to minimize the gap between the Egyptian production and consumption. The total production of wheat was 6,093,151 tons in 1998 produced from 2,421,131 faddans with an average yield of 2517 kg/ faddan (Nassar , 1998). Increasing wheat yield per unit area can be achieved by breeding high yielding varieties or improving the cultural treatments of the crop. Maintaining the nutritive requirements for wheat is an important tool for raising wheat productivity. Wheat cultivars differed in yield and its components (Hagras, 1985; EL-Kalla et al., 1992; Fayed, 1992; Abd-Alla and Bassiouny, 1994; EL-Kalla et al., 1994; Hassanein, et al., 1997 and Metwally et al., 1998).

Badr et al., (1997) found slight increases in some yield components by spraying Agrispon at 400 cm^3 / fed as compared with control treatment in cron. Khalil et al., (1997) reported that Bio-2 (products + a collection) was the most effective as biological yield/ fed of wheat produced (106%), followed by Bio-3 (Azotobacter + Azospirillum) (67%) then Bio-1 (Agrispon) (65%) referring to the control. Maximum

development was associated with the Bio-2 biofertilizer followed by Bio-3 and then the Bio-1. Mehasen (1999) found that weight of kernels/ spike, 1000- grain weight and biological yield/fed of wheat increased significantly by Agrispon treatment .

All cereal crops grown on many Egyptian soils have shown a significant increase in yield as a result of soil application of nitrogen. Several investigators found the positive effect of nitrogen application on plant characters, yield and yield components of wheat (Shams EL- Din and EL-Habbak, 1992; EL-Bially and Abd EL-Samie, 1995; Hamed, 1998 and Mehasen, 1999).

The present investigation was designed to study the effect of foliar Agrispon application and nitrogen fertilizer rates on yield and its components of some wheat varieties grown on a clay soil in Kalubia Governorate.

Materials and Methods

Two field experiments were carried out in the Experimental Field of the Faculty of Agriculture at Mashtohor, Zagazig Univ., during 1995/96 and 1996/97 seasons to study the effect of Agrisporn foliar application and N fertilizer rates on yield and its components of some wheat varieties. The soil was clay in texture with a pH value of 7.81, 7.79 and an organic matter content of 1.75,1.68% and available N of 55,50 ppm during the two growing seasons, respectively.

The experimental design was a split- plot with four replications. Every experiment included twenty four treatments which were the combination of three wheat varieties, two Agrispon treatments and four N levels as follows :

A-Wheat varieties: Sids1, Sids 3 and Giza 167.

B-Agrispon foliar application: zero (spray with tap water) and 400 cm^3 Agrispon/ fed. Spraying Agrispon was carried out once, 45 days from planting. Spray solution was 400L/fed. Agrispon is a registered trade name for a soil supplement which is applied to the soil, plant or seeds. It is composed of inorganic elements (0.39%), organic compounds (0.17%) and water (99.44%) (Anonymous, 1992). Inorganic elements are derived from naturally occurring conglomerate rock formation. Type of organic compounds with the organic matter fraction are pureen and Adenosine (a.i. zeatin), 100- 250 mg 1^{-1}. The material is provided in an aqucous solation of an (E.C) about 5 ds/m.

C- Nitrogen levels: were zero, 30 ,60 and 90 kg N/ fed Ammonium nitrate (33.5% N) were applied in two equal doses (before the first and second irrigations).

The three wheat varieties were arranged at random in the main plots, the sub-plots were assigned also at randon, to the combination of Agrispon treatments and nitrogen levels. The sub-plot area was 10.5m^2 (3 ×3.5m). Wheat was cultivated on November 28th and 30th in the first and second seasons, respectively. In the two seasons, the preceding crop was cotton. The normal cultural practices for growing wheat were followed as recommended for the region.

At harvest, the guraded plants of one inner square meter from each sub-plot were harvested and the following criteria were estimated : plant height (cm), spike length (cm), number of tillers and spikes/m^2, number of spikelets and kernels/spike, weight of kernels /spike (g),1000-grain weight (g) and biological, grain and straw

yields (ton/fed).Moreover,N use efficiency (NUE)or kg grains/kg N applied was calculated according to Craswell and Godwin (1984)as follows:

$$NUE = \frac{\text{Grain yield of fertilized plots} - \text{Grain yield of unfertilized plots}}{\text{Fertilizer N applied}}$$

The collected data from each season were subjected to the proper statistical analysis of variance as outlined by Snedecor and Cochran (1980). The combined analysis of variance for the two seasons was conducted after testing the homogeneity , and L.S.D test at 0,05 level of probability was used to compare the treatments means.

Results and Discussion

A-Effect of varieties.

The results reported in Table(1) indicate clearly that, there were significant differences between the different wheat cultivars in all studied traits in the first and second seasons as well as in the combined analysis except with plant height and spike length in the second season and number of tillers and spikes/m^2 in the first and second seasons as well as the combined analysis. Moreover; it is clear from Table(1) that sids 3 cultivar gave the highest values of plant height ,number of spikelets and kernels/spike, biological yield/fed and straw yield /fed in the first and second seasons as well as combined analysis, number of tillers and spikes/m^2,1000-grain weight and grain yield /fed in the first season and combined analysis, compared with other cultivars .

Table (1). Yield and its components of three wheat varieties in 1995/96 and 1996/97 seasons and their combined average

Characters	1995/96season			L.S.D 5%	1996/97 season			L.S.D 5%	Combined			L.S.D 5%
	Sids1	Sids3	G.167		Sids1	Sids3	G.167		Sids1	Sids3	G.167	
Plant height (cm)	116.3	116.4	114..1	1.29	106.5	107.4	106.7	n.s	111.4	111.9	110.7	0.68
Spike Length(cm)	6.71	9.67	9.36	0.22	9.30	9.14	8.96	n.s	9.50	9.41	9.16	0.14
No.of tillers/m^2	341.2	365.5	343.1	n.s	306.7	297.6	284.7	n.s	323.9	331.5	313.9	n.s
No.of spikes/m^2	328.7	354.5	330.9	n.s	295.0	292.5	275.6	n.s	311.9	323.3	303.2	n.s
No.of spikelets/spike	20.68	20.82	19.45	0.55	20.24	20.52	19.14	0.63	20.46	20.67	19.29	0.35
No.of kernels/spike	48.07	48.57	44.69	1.30	46.98	47.58	43.68	1.42	47.53	48.08	44.18	0.80
Wt.of kernels/spike(g)	2.19	2.26	1.74	0.01	2.00	2.01	1.62	0.10	2.10	2.14	1.68	0.04
1000-grain weigth(g)	45.67	46.67	38.93	1.00	42.73	42.33	37.13	1.74	44.20	44.50	38.03	0.83
Biolegical yield(ton/fed)	6.838	6.883	6.311	0.08	5.699	5.910	5.285	0.04	6.269	6.396	5.798	0.04
Grain yield (ton/fed)	2.092	2.119	2.021	0.02	1.755	1.742	1.673	0.02	1.923	1.930	1.847	0.01
Straw yield (ton/fed)	4.746	4.764	4.290	0.07	3.944	4.168	3.612	0.03	4.346	4.466	3.951	0.03
NUE	5.06	4.45	3.78	0.84	4.17	3.51	4.65	0.67	4.62	3.98	4.21	0.45

Sids 1 cultivar gave the highest values of spike length in the first and second seasons as well as the combined analysis, NUE in the first season and the combined analysis and number of tillers and spikes/m2,1000-grain weight and grain yield /fed in the second season compared with the other cultivars .

It could be concluded that varietal differences among wheat caltivars may be due to genetical make up. The superiority of Sids 3 and Sids 1 in grain yield (ton/fed) over G. 167 might be due to the increase in yield components, namely, number of spikelets and kernels/spike, weight of kernels/spike and 1000-grain weight. The results obtained by Hagras (1985); EL-kalla et al., (1992); Abd-Alla and Bassiouny (1994); EL-kalla et al., (1994); Hassanein et al., (1997) and Metwally et al., (1998) indicated marked differences among wheat varieties in yield and yield components .

B-Effect of Agrispon .

Results in Table (2) indicate that grain yield and its components were affected by Agrispon. Number of spikelets and kernels /spike and biological, grain and straw yields/fed increased significantly by foliar application with Agrispon in the first and second seasons as well as the combined analysis, while, plant height was significantly affected by Agrispon in the second season and the combined analysis. Spike length and NUE significantly increased by foliar application with Agrispon in the second season only. The increases in biological, grain and straw yields/fed were 2.93, 2.82 and 2.98% by Agrispon application as compared with the check treatment in the combined analysis, respectively. On the other hand, spike length and NUE in the first season, 1000-grain weight in the second season and 1000-grain weight and NUE significantly decreased by Agrispon application in the combined analysis as compared with the control as shown in Table (2).

Table (2) Effect of Agrispon treatments on yield and yield components of wheat in 1995/96 and 1996/97 seasons as well as the combined analysis of both seasons

Characters	1995/96 season		Signi-ficance	1995/96 season		Signi-ficance	combined		Signi-ficance
	Without Agrispon	Agrispon		Without Agrispon	Agrispon		Without Agrispon	Agrispon	
Plant height (cm)	115.2	116.0	n.s	106.2	107.51	**	110.7	111.7	**
Spike length (cm)	9.63	9.53	*	9.06	9.20	**	9.35	9.37	n.s
No. of tillers/cm^2	347.3	352.5	n.s	302.4	290.3	n.s	324.8	321.4	n.s
No. of spkes/m^2	334.6	341.1	n.s	295.2	280.2	**	314.9	310.7	n.s
No. of spikelets/ spike	19.96	20.67	**	19.61	20.32	**	19.79	20.49	**
No. of kernels/spike	46.25	47.97	**	45.21	46.95	**	45.73	47.46	**
Wt. of kernel/spike(g)	2.04	2.09	**	1.88	1.87	n.s	1.96	0.98	n.s
1000-grain weight (g)	43.93	43.58	n.s	41.56	39.89	**	42.75	41.74	**
Biological yield (ton /fed)	6.585	6.769	**	5.546	5.717	**	6.065	6.243	**
Grain yield (ton/fed)	2.040	2.114	**	1.708	1.740	**	1.874	1.927	**
Straw yield (ton /fed)	4.545	4.655	**	3.838	3.977	**	4.191	4.316	**
NUE	4.97	3.89	**	3.95	4.27	**	4.46	4.08	**

The increases in biological, grain and straw yields/fed by Agrispon application may be due to the production of growth hormones, which increase the uptake of plant nutrients. As a result an encouraging effect was induced which increased yield components i.e. number of spikelets/spike, number of kernels/ spike and weight of kernels/spike, over the control treatment (Table 2).

Similar results were obtained by Badr et al., (1997), Khalil et al., (1997) and Mehasen (1999).

C- Effect of nitrogen rates.

Results in Table (3) show in general that nearly all wheat characters were significantly affected by N fertilizer rates in both seasons and the combined analysis except number of tillers and spikes/m^2 in both seasons and the combined analysis, and 1000- grain weight in the second season only. Plant height and spike length significantly increased in the two seasons and the combined analysis by increasing N rate up to 90 kg N/ fed. The increase in plant height over the control is attributable to the beneficial effect of N on cell division and elongation. The increase in the rate of N fertilizer caused a significant increase in number of spikelets and kernels/spike, weight of kernels/spike and biological, grain and straw yields/fed of wheat in both seasons and the combined analysis, the highest N rate (90 kg N/fed) recorded the

Table (3) Effect of nitrogen rates on yield and yield components of wheat in 1995/96 and 1996/97 seasons as well as combined analysis

Characters	1995/ 96 season				L.S.D 5%	1996/97 season				L.S.D 5%	combined				L.S.D 5%
	Zero	30	60	90		Zero	30	60	90		Zero	30	60	90	
Plant height (cm)	108.7	114.4	118.5	120.8	1.25	101.4	105.1	108.1	112.8	0.61	105.0	109.7	113.33	116.8	0.68
Spike length (cm)	8.95	9.50	9.81	10.06	0.13	8.46	8.92	9.40	9.76	0.11	8.70	9.21	9.60	9.91	0.08
No. of tillers/ m^2	338.2	352.8	342.7	365.9	n.s	302.1	294.9	290.2	298.1	n.s	320.1	323.9	316.5	332.0	n.s
No. of spikes / m^2	325.6	340.6	331.4	354.0	n.s	291.0	284.8	287.1	288.0	n.s	308.3	312.7	309.3	321.0	n.s
No. of spikelets/spike	18.92	20.04	20.76	21.55	0.23	18.61	19.62	20.40	21.25	0.25	18.76	19.83	20.58	21.40	0.17
No. of kernels/spike	43.86	46.42	48.18	49.97	0.47	42.75	45.35	47.21	49.02	0.57	43.31	45.88	47.70	49.50	0.37
Wt. of kernel/spike(g)	1.85	2.00	2.14	2.46	0.02	1.68	1.85	1.94	2.03	0.08	1.77	1.93	2.04	2.15	0.04
1000-grain weight (g)	.42.22	43.09	44.44	45.27	0.73	39.40	40.90	41.13	41.49	n.s	40.81	42.00	42.78	43.38	0.93
Biological yield (ton /fed)	5.811	6.460	6.938	7.499	0.07	4.762	5.487	5.925	6.352	0.04	5.286	5.974	6.432	6.926	0.04
Grain yield (ton/fed)	1.814	1.997	2.13	2.324	0.03	1.488	1.682	1.781	1.944	0.01	1.651	1.840	1.977	2.134	0.02
Straw yield (ton /fed)	.997	4.463	4.765	5.175	0.05	3.274	3.805	4.144	4.408	0.04	3.635	4.134	4.455	4.792	0.03
NUE	0.00	6.09	5.97	5.66	0.62	0.00	6.49	4.89	4.71	0.31	0.00	6.29	5.43	5.36	0.34

highest values of these traits in the two seasons and the combined analysis. The increase in biological yield/fed due to adding 30, 60 and 90 kg N/ fed was 13.01,.21.67 and 31.02%, being 11.44, 19.74 and 29.25% for grain yield / fed , and being 13.72, 22.55 and 31. 82% for straw yield/ fed, respectively compared with the control in the combined analysis. The increases in biological, grain and straw yields are mainly due to the beneficial effects of N on all yield component characters namely, plant height, spike length , number of spikelst and kernels /spike, 1000- grain weight and weight of kernels/ spike. Also, a good supply of N increased the vegetative growth and grain filling period, and consequently, the role of N as the most essential nutritive element for cereals is clearly demonstrated .

The results showed also that NUE decreased greatly with the increase in N rate in both seasons and the combined analysis. Applying 30,60 and 90 kg N/ fed produced NUE of 6.29, 5.43 and 5.36 kg grain/kg N, respectively in the combined analysis. In other words raising N rate from 30 to 60 and 90 kg N/ fed reduced NUE by 13.67 and 14.78%, respectively in the combanalysis (Table 3).

Similar results were also obtained by Shams EL- Din and EL-Habbak (1992); EL- Bially and Abd EL-Samie (1995); Hamed (1998) and Mehasen (1999).

D- Effect of the interactions:

The significant interactions between wheat varieties, Agrison application and N fertilizer rates on the studied traits are shown in Tables (4A,B and C)

The combination of wheat varieties with Agrispon application indicated that the highest values were obtained by Sids 3 +Agrispon spraying for number of spikelets / spike, number of kernels/spike, biological and grain yields/ fed, and by Sids 1 or 3 without Agrispon for 1000-grain weight and by Sids 1 or Giza 167 without Agrispon for NUE (Table 4A).

Table(4 A). Effect of the interaction between wheat varieties and Agrispon on number of spikelets and kernels/spike, 1000-grain weight (g) , biological and grain yield (ton / fed) and NUE (kg grain/kg N) (combined analysis)

Agrispon treatments	Varieties			Varieties		
	Sids 1	Sids 3	G167	Sids 1	Sids 3	G167
No. of spikelets / spike				**No. of kernels /spike**		
Without Agrispon	20.01	20.21	19.15	46.36	46.93	43.91
Agrispon	20.90	21.14	19.44	48.70	49.22	44.46
L.S.D 5%	o.21			0.45		
1000- grain weight (g)				**Biological yield (ton /fed)**		
Without Agrispon	45.27	45.42	37.55	6.220	6.293	5.683
Agrispon	43.12	43.57	38.52	6.317	6.500	5.913
L.S.D 5%	1.14			0.05		
Grain yield (ton /fed)				**NUE kg grain/kg N**		
Without Agrispon	1.922	1.899	1.800	4.88	3.94	4.57
Agrispon	1.925	1.962	1.895	4.36	4.02	3.85
L.S.D 5%	0.02			0.41		

The combination of wheat varieties with N rate showed that Sids 3+90 kg N/ fed for biological and straw yields /fed, Sids 1 or 3 + 90 kg N/fed for grain yield/fed and Sids1 or Giza 167 + 30kg N/ fed for NUE recorded the highest values (Table 4B).

The data presented in Table (4C) demonstrated that maximum values were gained in biological and straw yields /fed by Sids 3+ Agrispon application + 90 kg N/ fed, whereas the lowest values in both traits were exhibited by Giza 167 + check treatments of Agrispon and N.

Table (4B) Effect of the interaction between wheat varieties and N rates on biological, grain and straw yields (ton / fed) and NUE (kg grain /kg N) (combined analysis)

N rates (kg/ fed)	Varieties			Varieties		
	Sids 1	Sids 3	G 167	Sids 1	Sids 3	G 167
Biological yield (ton /fed)				**Grain yield (ton /fed)**		
Zero	5.434	5.31	4.894	1.660	1.687	1.605
30	6.117	6.215	5.588	1.877	1.833	1.808
60	6.556	6.688	6.052	2.013	2.029	1.889
90	6.967	7.152	6.657	2.143	2.172	2.087
L.S.D 5%	0.07			0.03		
Straw yield (ton / fed)				**NUE (kg grain /kg N)**		
Zero	3.774	3.843	3.189	0.00	0.00	0.00
30	4.240	4.382	3.780	7.24	4.85	6.77
60	4.542	4.658	4.162	5.88	5.69	4.73
90	4.824	4.981	4570	5.35	5.37	5.35
L.S.D 5%	0.06			0.59		

Table (4C) Effect of the interaction between wheat varieties, Agrispon and N rates on biological and straw yield (ton /fed) (combined analysis)

Varieties	Agrispon treatments	N rates (kg /fed)				N rates (kg /fed)			
		Zero	30	60	90	Zero	30	60	90
Biological yield (ton /fed)						**Straw yield (ton/fed)**			
Sids 1	**Without Agrispon**	5.348	6.052	6.547	6.933	3.703	4.177	4.522	4.790
	Agrispon	5.520	6.183	6.565	7.000	3.845	4.303	4.563	4.858
Sids3	**Without Agrispon**	5.472	6.128	6.590	6.82	3.812	4.322	4.588	4.855
	Agrispon	5.590	6.302	6.785	7.325	3.875	4.442	4.728	5.107
G 167	**Without Agrispon**	4.768	5.437	5.900	6.628	3.228	3.670	4.055	4.578
	Agrispon	5.020	5.740	6.203	6.687	3.350	3.890	4.270	4.562
L.S.D 5%		0.10				0.08			

It could be concluded that under the conditions of the experiment, growing Sids 3 and application of Agrispon + 90 kg/fed is recommended

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استجابة بعض أصناف القمح للرش بالاجرسبون والتسميد الأزوتى.

صديق عبد العزيز صديق محيسن.

قسم المحاصيل – كلية الزراعة بمشتهر– جامعة الزقازيق

أقيمت تجربتان حقليتان بمركز البحوث والتجارب بكلية الزراعة بمشتهر – جامعة الزقازيق خلال موسمى ١٩٩٥/١٩٩٦ و ١٩٩٦/١٩٩٧ م لدراسة استجابه ثلاثة أصناف من القمح (سدس ١–سدس٣–جيزة ١٦٧) لمعاملتين من الأجرسبون (بدون معاملة والرش بالأجرسبون) واربعة مستويات من التسميد الأزوتى (صفر–٣٠–٦٠–٩٠كجم ن/ ف)

–ويمكن تلخيص أهم نتائج التحليل التجميعى للموسمين فيما يلى .

- سجل صنف سدس ٣ أعلى متوسطات لكل من طول النبات – عدد السنيبلات والحبوب للسنبلة - وزن حبوب السنبلة – وزن الـ ١٠٠٠ حبة – محصول الحبوب/ف والمحصول البيولوجى والقش / ف مقارنه بالأصناف الأخرى. وسجل صنف سدس ١ و جيزة ١٦٧ أعلى قيمة لكفاءة استخدام النتروجين بفرق معنوى مقارن بصنف سدس ٣ .
- ازداد كل من طول النبات – عدد السنيبلات والحبوب للسنبلة – المحصول البيولوجى ومحصول الحبوب والقش / ف زيادة معنوية بالرش بالأجرسبون بينما نقص كل من وزن الـ ١٠٠٠ حبه وكفاءة أستخدام النتروجين معنويا عند الرش بالجرسبون .
- أدت زيادة معدل التسميد الأزوتى حتى مستوى ٩٠ كجم ن /ف إلى زيادة معنوية فى كل من طول النبات – طول السنبلة – عدد السنبلات والحبوب للسنبلة- وزن حبوب السنبلة – المحصول البيولوجى ومحصول الحبوب والقش/ف . بينما أدت الزيادة فى مستويات النتروجين إلى نقص معنوى فى كفاءة استخدام النتروجين. بلغت الزيادة فى محصول الحبوب/ ف ١١.٤٤ – ١٩.٧٤ – ٢٩.٢٥% لمستويات ٣٠- ٦٠-٩٠كجم ن/ف مقارنة بمستوى صفر ن/ف على الترتيب.
- تأثر معنويا كل من عدد السنيبلات والحبوب بالسنبلة – وزن الـ ١٠٠٠ حبة – المحصول البيولوجى ومحصول الحبوب /ف وكفاءة استخدام النتروجين بالتفاعل بين الأصناف والرش بالأجرسبون . كما تأثر المحصول البيولوجى وحصول الحبوب والقش /ف وكفاءة استخدام النتروجين بالتفاعل بين الأصناف ومستويات التسميد الأزوتى . وكذلك تأثر المحصول البيولوجى ومعدل القش/ ف بالتفاعل بين الأصناف والرش بالأجرسبون والتسميد الأزوتى وكانت أفضل النتائج تحت ظروف هذه التجربة والتى يمكن التوصية بها هى زراعة سدس ٣ والرش بالأجرسبون والتسميد بمعدل ٩٠ كجم ن /ف.