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Response of Wheat to Mineral Nitrogen Levels and Foliar Application with Alga Extract

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ABSTRACT

Two field experiments in the form of strip - plot design with four replications were conducted at the Experimental Station Farm, Faculty of Agriculture, Mansoura University, Dakahlia Governorate, Egypt during 2016/2017 and 2017/2018 growing seasons. The aim of study was to determine the response of wheat *cv. Gemmiza* 11 to different nitrogen fertilizer levels (40, 50, 60 and 70 kgN/fed) and foliar spraying with alga as extract biofertilizer (1, 2, 3 g/L and without spraying). Data indicate that significant differences among nitrogen fertilization levels and foliar concentrations with alga extract for all studied characters in the two seasons. It can be summarized that fertilizing wheat with 70 kg N/fed as well as spraying with alga extract as biofertilizer at 3 g/L to give the highest averages of number of days to heading, plant height , spike length , number of spikes/m^2, number of grains/spike, 1000 - grain weight, biological yield and harvest index and also scored maximal values for grain yield (24.15 and 22.78 ardab/fed) and (24.22 and 23.15 ardab/fed), respectively for both seasons. More, the interaction effect show significant differences on plant height and biological yield in both seasons and spike length in the 2nd season only.From the obtained results in this study ,it can be concluded that planting wheat ,Cv Gemmiza 11 and mineral fertilizing with 70 KgN\fed and twice foliar spraying with alga extract at the rate of 3g\L to maximize wheat productivity under the environmental conditions of EL Mansoura, Dakahlia Governorate, Egypt.

Keywords: Wheat, nitrogen levels, biofertilizer, alga extract, yields.

INTRODUCTION

Wheat (*Triticum aestivum L.*) is one of the most important food grain crops grown in the world, which has been used as food since prehistoric times. Wheat considered a staple food for over 10 billion people in as many as 43 countries of the world and it provides about 20% of the total food calories for human race (Reddy, 2004). In Egypt, wheat cultivated on an area of 1.343 million hectares season with an annual production of 8.800 million ton,with average yield of 6.55 t/ha (FAO,2020).

All over the world, intensive cultivation methods were found to remove higher quantities of elements from the soil reservoir. Both of macro and micronutrients are essential for developing plants and improving its yield characteristics, since it serves as co-enzymes and in the redox systems for essential processes in the plant cell performance (Hall and Williams, 2003 and Imran and Gurmani, 2012). Nitrogen occupies a conspicuous place in plant metabolism. It's scientifically known that all plant vital processes are associated with protein, of which nitrogen is an essential constituent, therefor Khaled and El Rawy (2012) and Shahzad *et al.* (2013) reported that proper management of nitrogen fertilization is essential and important to obtain high crop production. According to Ralcewicz *et al.* (2009) and Mandic *et al.* (2015) nitrogen is the most limiting nutrient for wheat production that affects the rapid plant growth and improves grain yield, so nitrogen fertilization should be performed according to wheat needs at suitable rates, proportions and times. More, many researchers such as Subedi *et al.* (2007), Seadh *et al.* (2009), Ali *et al.* (2011), Asif *et al.* (2012), Khaled and Hammad (2014), Gomaa *et al.* (2015) and El-Hag,Dalia and Alaa, Shahein (2017) concluded that the addition of the nitrogen element in the form of chemical fertilizers significantly affected the plant height, spike length, number of tillers/m^2, number of spikes/m^2, number of grains/spike, 1000-grain weight, biological and grain yield.

Nowadays scientific studies have mentioned the threat of using chemical fertilization and its harmful effects on the human health and environment. Therefore, relying on the concept of sustainable agriculture was necessary to replace the use of chemical fertilizers with organic and bio-fertilization which can improve physiological performance and productivity of plants, in addition it's a low cost, renewable and environmentally friendly source. The informations about agricultural use of alga extract as a bio-fertilizer in wheat plants are little. With reference to the chemical analysis of algae extract, Zhang and Ervin (2004) revealed that a wide diversity of plant growth regulators such as cytokinins and auxins, in addition to the presence micro elements *i.e* Fe, Mn, Zn and Cu. Earlier researchers showed that using alga as foliar or soil application enhanced physiological performance, where it contains of essential growth hormones and nutrients, which are important to increase productivity (Prasad *et al.*, 2010 and Latique *et al.*, 2013). In previous studies, many researchers recommended algae extract as foliar application for enhance the growth parameters of potato (Awad *et al.*, 2006), mung bean

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(Pramanick *et al*., 2013) and garlic plants (Shalaby and El-Ramady, 2014). More, Karthikeyan and Shanmugam (2015) showed that spraying algae as foliar bio-fertilizer recorded a relative increase 51% in peanut and sunflower seed yield. Concerning the use of most superior alga concentration as foliar application, Furthermore, Shaaban *et al.* (2010) on his study on the effect of fertilization with alga extract on wheat nutrient balance, showed that application of modified alga extract at 2 gm/l resulted in the superiority of N, P, K and Mg-uptakes. While, Nofal *et al.* (2016) reported that using Alga at 300 g/fed as foliar application significantly increased the Zinc, Iron, Copper, Manganese content, and it also improved protein and nitrogen contents of maize grains. Mansour *et al.* (2019) cleared that the most effective dose of using algae on wheat plant was 1.5 g/L which led to increase grains number/spike, spikes number/m^2, 1000-grain weight, straw yield/fed and grain yield/fed.

In view of the importance of fertilization wheat with mineral and bio-fertilizers, the purpose of this study was to assess the effect of levels of mineral nitrogen fertilization and foliar application with alga extra as biofertilizer as well as their combinations on the productivity of wheat.

MATERIALS AND METHODS

Two field experiments were conducted at Experimental Station Farm, Faculty of Agriculture, Mansoura University, Dakahlia Governorate Egypt, during the two successive seasons of 2016/2017 and 2017/2018. The soil surface (0-30 cm depth) samples were taken representative before adding fertilizers and during soil preparation. The physical and chemical properties of soil samples are shown in Table 1. Wheat grains cv. *Gemiza-11* were sown at the 15th of November 2016 and 2017 at the rate of 60 kg/fed. The preceding summer crop was maize (*Zea mays* L.) in both seasons.

Table 1. The Mechanical and chemical analysis of the experimental soil in both growing seasons.

2016/2017				2017/2018			
Mechanical analysis				**Mechanical analysis**			
Clay	50.5%	Fine sand	21.5%	Clay	50.0 %	Fine sand	21.3%
Silt	25.9%	Coarse sand	2.1%	Silt	26.3 %	Coarse sand	2.4%
Clayey				Clayey			
Chemical analysis				Chemical analysis			
$CaCO_3$	3.8%	Organic M	1.7%	$CaCO_3$	3.6%	Organic M	1.8%
N_{Total}	0.078 %	$P_{Available}$	9.5 ppm	N_{Total}	0.087 %	$P_{Available}$	10.8 ppm
$K_{Available}$	300 ppm	EC (ds/m)	1.93	$K_{Available}$	350 ppm	EC (ds/m)	1.89
pH = 7.7				pH = 7.6			

The experiments were laid-out in a Strip - plot design, having four replications. Four nitrogen levels of 40, 50, 60 and 70 kg/fed were assigned to vertical plots, while four foliar spraying with alga extract concentrations *i.e* 1, 2 and 3 g/liter and without spraying, were devoted to horizontal plots. The net size of plot unit was 3×3.5 m^2 with a row to row distance of 20 cm. Each foliar solution volume was 200 l/fed and spraying was conducted by hand sprayer (for experimental plots) until saturation point twice after 20 and 40 days from sowing. The chemical analysis of Alga extract product which was used in this study is listed in Table 2.

Table 2. **Chemical composition of some macro and micro-nutrients of alga bio-fertilizer**

Elements	N	P	K	Mg	Ca	Fe	Zn	Mn	Cu
Concentration	**%**					**ppm**			
	8.00	2.45	0.68	0.20	0.93	1986	31	58	88

Various doses of nitrogen were applied in two equal doses prior to each of the first and second irrigation in the form of ammonium nitrate (33.5 % N). Potassium fertilizer in the form of potassium sulphate (48% K_2O) at the rate of 50 kg/fed was applied at one dose before the first irrigation. Calcium superphosphate (15% P_2O_5) at the rate of 150 kg/fed was added during land preparation. All the recommended agronomic practices including irrigation and weeding control were carried out uniformly as recommended.

Days to heading was taken at the emergence of 50% of the full spike from each plot, while other observations were recorded at harvest time for each plot as follows: 1- Plant height (cm) was measured from soil surface to tip of plant, excluding awns, as an average of 10 readings. 2- Spike length (cm) was measured from the base of the peduncle (lower spikelet) to the tip of the top spikelet as an average of 10 random spikes. 3- Number of spikes/m^2 as the total number of fertile spikes per square meter. 4- Number of grains/spike: as the total number of grains for 10 random guarded plant spike's. 5- 1000-grain weight (g) as an average of 1000-grain sample taken random from guarded plants. 6- Biological yield (ton/fed) as the total weight of plants harvested from 10 m^2 and converted to ton/fed. 7- Grains yield (ardab/fed) as the weight of grains harvested from 10 m^2 and converted to ardab/fed. 8- Harvest index was calculated according to the formula (Grain yield / Biological yield) × 100.

The obtained data were subjected to the analysis of variance, using MSTAT-C statistical software package (Bricker, 1991). For means comparisons, the least significant differences (LSD) test at 0.05 level of probability was used according to Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Data presented in Table 3 showed that plant height (cm), spike length (cm) and number of days to heading significantly affected by nitrogen fertilization levels. The application of 70 kg N/fed gave the highest values for plant height (104.9 and 101.6 cm), spike length (13.2 and 12.4 cm) and number of days to heading (95 and 92 day) in the 1st and 2nd growing season respectively as compared with the application of 40 kg N/fed. It's clear that Increasing nitrogen fertilization levels from 40 to 70 kg/fed led to an increment in such parameters. The increment in plant height and spike length can be attributed to the role of nitrogen in stimulating cell division and elongation, which extremely helps plants to expose its potential to grow vigorously.

While, the lateness of heading date could be explained by the increasing in vegetative period with every increase in nitrogen level, and so it takes more days to reach up to heading stage. These results are in agreement with those obtained by Shahzad *et al*.(2013), Gomaa *et al.* (2015) and Hassanein *et al.* (2018).

Regarding to the effect of alga extract foliar concentrations treatments on plant height (cm), spike length (cm) and number of days to heading (Table 3), results reveal that the highest plants (105.8 and 102.5 cm) were produced by using alga extract at 3 gm/l in the 1st and 2nd growing seasons respectively, without significant differences between spraying alga at 1 gm/l and without spraying treatment in the 1st season only. Fore spike length, spraying wheat with alga extract at 3 g/L resulted in a gradual and significant increases in this trait (13.4 and 12.3 cm) in the 1st and 2nd growing seasons, respectively as compared with the other concentrations. Similar trend was obtained by Al-Naqeeb *et al.* (2018) and Mansour *et al.* (2019) when used EM-1 bio-fertilizer 3 times spraying on wheat. Also, significant differences for number of days to heading were detected, while the differences between spraying at 1 g/L and without spraying treatment, as well as between spraying at 2 g/L and at 3 g/L failed to reach the significant level at 0.05 in both growing seasons. Maximum days for heading (94.5 and 91.1) was obtained in plots which sprayed with alga at 3 g/L, while minimum number of days (93.4 and 89.6) were recorded in plots that was not sprayed. These results explain the role of Alga extract in activating plant growth and photosynthesis through its content of growth regulators, amino acids and some of macro and micro elements, thus the plant takes maximum number of days for reaching to the heading stage. These findings are in compatible with those obtained by Hafez and Badawy (2018) they reported that, inoculation with biofertilizers caused significant decrease in days to be heading by 1-2 day.

Table 3. Plant height, spike length and number of days to heading averages as affected by mineral nitrogen levels and alga bio-fertilizer concentrations as well as their interaction in 2016/2017 and 2017/2018 growing seasons.

	Plant height (cm)		Spike length (cm)		Days to heading (day)	
	2016/17	2017/18	2016/17	2017/18	2016/17	2017/18
A: N.levels						
40 kg N /fed	97.5	96.6	10.9	10.4	92.8	88.4
50 kg N /fed	99.8	97.4	11.5	10.8	93.4	89.8
60 kg N /fed	101.1	99.2	12.9	11.9	94.4	91.3
70 kg N /fed	104.9	101.6	13.2	12.4	95.0	92.0
LSD at 0.05	1.7	1.3	0.9	0.7	0.9	0.9
B:Alga levels						
Without Alga	97.2	95.3	11.1	10.5	93.4	89.6
Alga at 1 g/L	97.8	96.7	11.5	11.0	93.7	90.2
Alga at 2 g/L	102.6	100.2	12.5	11.7	94.0	90.6
Alga at 3 g/L	105.8	102.5	13.4	12.3	94.5	91.1
LSD at 0.05	1.0	1.2	0.3	0.3	0.7	0.7
A×B	*	*	NS	*	NS	NS
LSD at 0.05	2.1	2.3	--	0.6	--	--

A significant interaction among nitrogen fertilization levels and alga extract foliar concentrations on plant height in cm (1st and 2nd growing seasons) and spike length in cm (2nd growing season) were detected. While, there was insignificant effect due to the interaction on affecting average number of days to heading in both growing seasons. The results graphically stated in Figures 1 and 2 showed that, plant height (cm) was responded to the increase of nitrogen levels. Furthermore, was highly magnitude by spraying alga extract at 3 g/L. Therefore, the highest value of plant height (cm) was recorded by fertilization with 70 kg N/fed when alga extract sprayed at 3 g/L in the 1st and 2nd seasons. Respecting spike length (cm), as shown in Figure 3 the heights significant value was obtained by fertilization with 70 kg N/fed and spraying alga extract at 3 g/L as compared with the lowest value of this trait which induced by application of 40 kg N/fed without spraying alga extract.

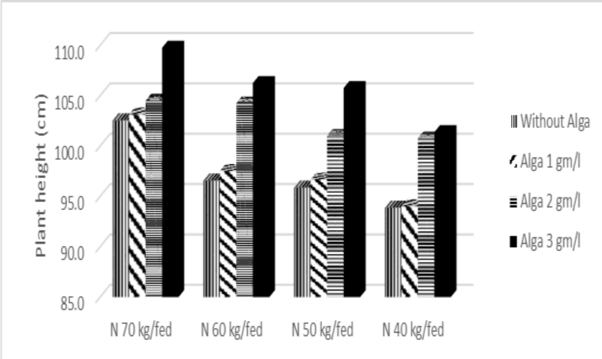

Fig. 1. Means of plant height as affected by the interaction between nitrogen levels and alga extract foliar concentrations in 2016/2017 growing season.

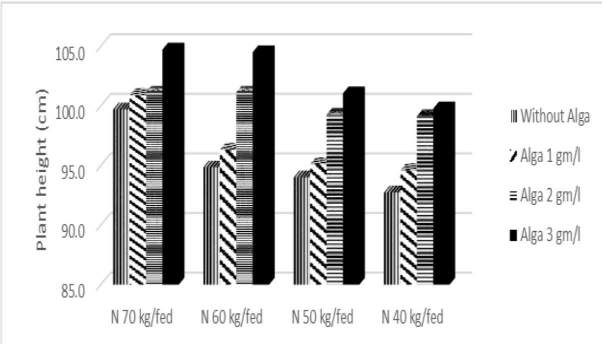

Fig. 2. Means of plant height as affected by the interaction between nitrogen fertilization levels and alga extract foliar concentrations in 2017/2018 growing season.

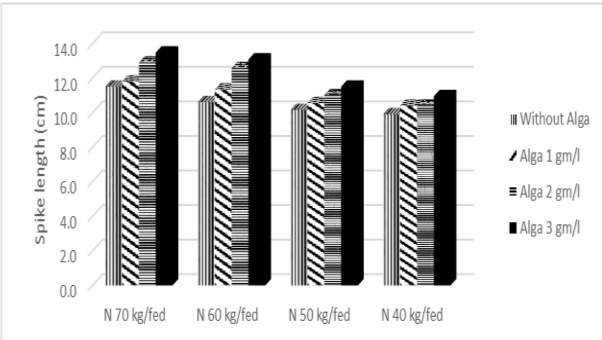

Fig. 3. Means of spike length as affected by the interaction between nitrogen levels and alga extract foliar concentrations in 2017/2018 growing season.

Data listed in Table 4 showed that nitrogen fertilization levels had significant effects on number of spikes/m^2, number of grains/spike and 1000-grain weight (gm). While, the differences between fertilization with 50 or 60 kg N/fed did not reach the significant level in the two growing seasons for these traits, the exception was when marked difference was detected on number of grains/spike in the 2nd season. It can be concluded that, increasing of nitrogen fertilizer from 40 to 70 kg/fed led to increase number of spikes/m^2 by 20.8 and 24.3%, number of grains/spike by 8.9 and 7.3% and 1000-grain weight by 9.5 and 12% for in the 1st and 2nd growing seasons, respectively. The difference in the above-mentioned traits due to nitrogen fertilization levels might be attributed to the fact that increasing nitrogen doses resulted in higher rate of vegetative growth and photosynthesis which increased the content of carbohydrate in grains. Seadh *et al*. (2009), Kandil *et al*. (2011), Mosslem *et al*. (2014) and Hassanein *et al.* (2018) reported the same findings.

Concerning alga extract foliar application effects, Table 4 clearly showed the positive effect of alga concentrations on improving number of spikes/m^2, number of grains/spike and 1000-grain weight (g). Maximum number of spikes/m^2 was recorded in plots sprayed with alga extract at 3 or 2 g/L without significant differences between them in both growing seasons. Spraying wheat plants at 3 g/L with alga extract statistically increased number of grains per spike and produced heavier grains than other foliar concentrations i.e. 1g /L, 2g /L and without spraying. Data revealed that an increment of 24.7 and 24.2% for number of spikes/m^2, 13.4 and 15.9% for number of grains/spike and 13 and 16.1% for 1000-grain weight (g) in plants which treated with alga extract at 3 g/L as compared with those untreated in the 1st and 2nd growing seasons, respectively.

Table 4. Number of spikes/m^2, number of grains/spike and 1000-grain weight averages as affected by mineral nitrogen levels and Alga bio-fertilizer concentrations as well as their interaction in 2016/2017 and 2017/2018 growing seasons.

	No. of spikes/m^2		No. of grains/spike		1000-grain weight (g)	
	2016/17	2017/18	2016/17	2017/18	2016/17	2017/18
A; N.levels						
40 kg N /fed	340.63	317.63	53.31	51.63	42.23	40.93
50 kg N /fed	368.88	357.13	54.63	52.06	44.02	42.71
60 kg N /fed	392.63	381.50	56.63	53.56	44.79	43.39
70 kg N /fed	411.50	394.75	58.06	55.38	46.25	45.85
LSD at 0.05	45.53	53.32	2.11	1.47	1.01	1.50
B:Alga levels						
Without Alga	338.13	328.25	52.31	49.63	41.38	40.16
Alga at 1 g/L	366.88	352.88	54.75	50.75	43.66	41.42
Alga at 2 g/L	387.13	362.13	56.44	54.75	45.50	44.68
Alga at 3 g/L	421.50	407.75	59.13	57.50	46.75	46.63
LSD at 0.05	57.54	46.46	1.46	1.40	1.04	0.94
A×B	NS	NS	NS	NS	NS	NS
LSD at 0.05	--	--	--	--	--	--

It's clear that, using alga as foliar biofertilizer showed a good means in that concern. These findings may be attributed to the role of alga as a biofertilizer in increasing total chlorophyll and enhancing the physiological activities in plants, which reflects on the activity of photosynthesis and plants growth characteristics. Results were corroborated with the findings of Mansour et al. (2019) when he used alga at 1.5 g/L. Also, Attia and Abd El Salam (2016) reported that, number of spikes/m^2, number of grains per spike, 1000 - grain weight were significantly increased with application of microbein bio-fertilizer compared to control (without bio-fertilizer).

No significant effects were recorded due to the interaction between nitrogen fertilization treatments as well as alga extract concentration on number of spikes/m^2, number of grains/spike and 1000-grain weight (g) in both seasons.

Different levels of mineral nitrogen fertilization treatments had a significant influence on biological yield (ton/fed), grain yield (ardab/fed) and harvest index (%) as shown in Table 5. The highest biological yield (8.544 and 8.147 ton/fed), grain yield (24.15 and 22.78 ardab/fed) and harvest index (42.31 and 41.85%) were observed when plants were fertilized with 70 kg N/fed. More, no significant differences were detected between the application of 50 or 60 kg N/fed on grain yield (ardab/fed) in the 2nd season and harvest index (%) in the 1st and 2nd season. It's clear that, increasing nitrogen levels from 40 to 70 kg/fed led to an increment by 19.2 and 16.5% for biological yield (ton/fed), 30.1 and 30.7% for grain yield (ardab/fed) and 9.1 and 12.1% for harvest index (%) in the 1st and 2nd season, respectively. Superiority in biological and grain yields as well as harvest index of wheat with successive increase in nitrogen levels possibly came through the positive impact of increasing nitrogen levels on growth parameters in terms of plant height, spike length, number of spikes/m^2 and number of grains/spike. Similar results were reported by Asif *et al.* (2012), Gomaa *et al*. (2015), El- Hag and Shahein (2017) and Mosanaei *et al*. (2017).

The analysis of variance showed the significant effect of alga extract foliar spraying concentrations on biological yield (ton/fed), grain yield (ardab/fed) and harvest index (%) in both seasons (Table 5).

Table 5. Biological yield (t/fed), grain yield (ardab/fed) and harvest index averages as affected by mineral nitrogen levels and alga bio-fertilizer concentrations as well as their interaction in 2016/2017and 2017/2018 growing seasons.

	Biological yield (ton/fed)		Grain yield (ardab/fed)		Harvest index	
	2016/17	2017/18	2016/17	2017/18	2016/17	2017/18
A; N.levels						
40 kg N /fed	7.166	6.993	18.57	17.43	38.81	37.32
50 kg N /fed	7.672	7.378	20.42	19.39	39.85	39.37
60 kg N /fed	8.219	7.683	22.63	20.32	41.23	39.63
70 kg N /fed	8.544	8.147	24.15	22.78	42.31	41.85
LSD at 0.05	0.309	0.225	1.414	1.06	2.24	1.70
B:Alga levels						
Without Alga	7.190	6.705	18.32	17.13	38.17	38.21
Alga at 1 g/L	7.585	7.189	20.27	18.89	40.01	39.35
Alga at 2 g/L	8.283	7.821	22.96	20.76	41.54	39.77
Alga at 3 g/L	8.544	8.486	24.22	23.15	42.47	40.85
LSD at 0.05	0.162	0.154	1.12	0.65	2.21	1.15
A×B	*	*	NS	NS	NS	NS
LSD at 0.05	0.324	0.308	--	--	--	--

According to the results, plants which sprayed with alga extract at 3 g/L achieved marked superiority and gave highest values of biological yield (8.544 and 8.486 ton/fed), grain yield (24.22 and 23.15 ardab/fed) and harvest index (42.47 and 40.85 %) the 1st and 2nd seasons, respectively.

More, calculated increases as a percentage due to spraying plants with alga at 3 gm/l or 2 g/L over untreated plants were 18.8 and 15.2% for biological yield (ton/fed), 32.2 and 25.3% for grain yield (ardab/fed) and 11.3 and 8.8% for harvest index (%) in the 1st growing season, respectively. While were, 26.6 and 16.6% for biological yield (ton/fed), 35.1 and 21.2% for grain yield (ardab/fed) and 6.9 and 4.1% for harvest index (%) in the 2st growing season, respectively. These results confirm the efficiency of the alga extract as a biofertilizer that regulate the balance between photosynthesis and respiration processes in plants. Mansour *et al*. (2019) reported that using algae at 1.5 g/L led to significant increase in grain yield as compared with control treatment. Similar trend was obtained by Khalil *et al*. (2011) and Abd El-Razek and El-Sheshtawy (2013).

The interaction effect between nitrogen fertilization treatments and alga extract concentration on biological yield (ton/fed) showed significant effect in the two seasons, while grain yield (ardab/fed) and harvest index (%) traits did not show significant influence with the interaction effect in both seasons. The highest biological yield (9.23 and 8.48 t/fed) were observed at the combination of 70 kg N/fed × spraying alga extract at 3 g/L. Correspondingly, the lowest values (6.42 and 5.89 t/fed) were observed when fertilizing wheat with 40 kg N/fed without spraying alga extract in the 1st and 2nd seasons, respectively (Figures 4 and 5).

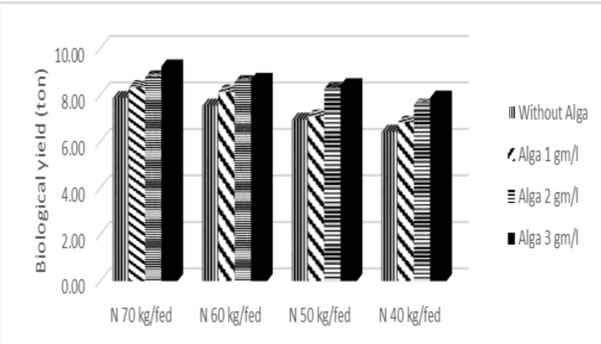

Fig. 4. Means of biological yield as affected by the interaction between nitrogen fertilization levels and alga extract foliar concentrations treatments on 2016/2017 growing season.

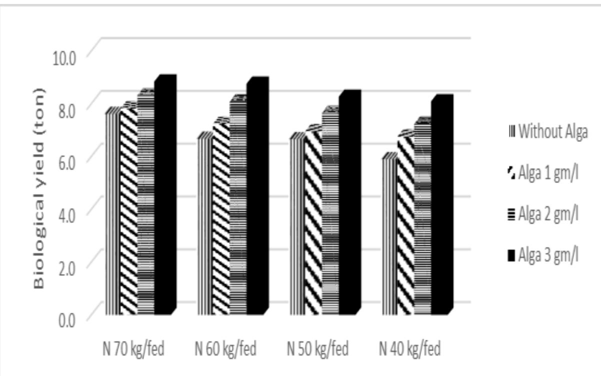

Fig. 5. Means of biological yield as affected by the interaction between nitrogen fertilization levels and alga extract foliar concentrations treatments on 2017/2018 growing season.

CONCLUSION

Generally, it could be concluded that wheat responded significantly to nitrogen levels and alga extract concentrations. Therefor, application nitrogen at the level of 70 kgN/ fed with spraying with alga extract at 3 g/L twice after 20 and 40 days from sowing is recommended for enhancing growth, yield and it's component in such conditions.

REFERENCES

Abd El-Razek, U.A. and A.A. El-Sheshtawy (2013). Response of some wheat varieties to bio and mineral nitrogen fertilizers. Asian J. of Crop Sci., 5: 200-208.

Ali, A.; A. Ahmad; W.H. Syed; T. Khaliq; M. Asif; M. Aziz and M. Mubeen (2011). Effects of nitrogen on growth and yield components of wheat. Sci. Int. (Lahore), 23(4): 331-332.

Al-Naqeeb, M.A.; I.H.H. Al-Hilfy; J.H. Hamza; A.S.M. Al-Zubade and H.M.K. Al-Abodi (2018). Biofertilizer (EM-1) effect on growth and yield of three bread wheat cultivars. J. of Central European Agric., 19(3): 530-543.

Asif, M.; M. Maqsood ; A. Ali; S.W. Hassan; A. Hussain; S. Ahmad and M.A. Javed (2012). Growth yield components and harvest index of wheat (*Triticum aestivum L.*) affected by different irrigation regimes and nitrogen management strategy. Sci. Int. (Lahore), 24(2): 215-218.

Attia, M.A. and A.A. Abd El Salam (2016). Effect of mineral, organic and bio- fertilizer on yield and yield components of bread wheat at Siwa Oasis. Alex. J. Agric. Sci., 61(3): 211-219.

Awad, E.M.; N.S. Youssef and Z.S. Shall (2006). Effect of foliar spraying seaweed extracts and inorganic fertilizer levels on growth, yield and quality of potato crop. J. Agric. Sci., Mansoura Univ., 31(10): 6549-6559.

Bricker, B. (1991). MSTATC: A Microcomputer Program for the Design, Management and Analysis of Agronomic Research Experiments. Crop and Science Department, MSU, East Lansing Mi 48824 USA.

EL Hag, Dalia A.A. and Alaa, M.E.A. Shahein (.2017). Effect of different nitrogen rates on productivity and quality traits of wheat cultivars. Egypt. J. Agron., 39 (3): 321-335.

FAO (2020). Food and Agriculture Organization of the United Nations, FAOSTAT, FAO Statistics Division 2019,March 2020.

Gomaa, M.A.; F.I. Radwan; I.F. Rehab and W.S. Mabrouk (2015). Response of bread wheat to organic and nitrogen fertilization. Middle East J. of Agric. Res., 4(4): 712-716.

Hafez, E.M. and S.A. Badawy (2018). Effect of bio fertilizers and inorganic fertilizers on growth, productivity and quality of bread wheat cultivars. Cercetări Agronomice în Moldova, 4(176): 1-16.

Hall, J.L. and L. E. Williams (2003). Transition metal transporters in plants. J. of Experimental Botany, 54(393): 2601-2613.

Hassanein, M.S.; Amal, G. Ahmed and Nabila, M. Zaki (2018). Effect of nitrogen fertilizer and bio-fertilizer on yield and yield components of two wheat cultivars under sandy soil. Middle East J. of Applied Sci., 8(1): 37-42.

Imran, M. and Z.A. Gurmani (2012). Role of macro and micronutrients in the plant growth and development. Sci. Tech. and Devel., 30(3): 36-40.

Kandil, A.A.; M.H. El-Hindi ; M.A. Badawi; S.A. El-Moursy and F.A.H.M. Kalboush (2011). Response of wheat to rates of nitrogen, biofertilizers and land leveling. Crop & Environment, 2(1): 46–51.

Karthikeyan, K. and M. Shanmugam (2015). Yield and oil content of peanut (var. TMV-7) and sunflower (var. Co-2) applied with bio stimulant AQUASAP manufactured from seaweed. African J, of Agric. Res., 10(10):1031-1042.

Khaled, M.A. and A.M. El-Rawy (2012). Influence of some seeding and nitrogen rates on grain yield and insect natural infestation of some wheat cultivars. Egypt J. Agric. Res., 90(3):1169-1187.

Khaled, M.A. and S.M. Hammad (2014) . Effect of nitrogen and potassium levels on yield and its components of four new bread wheat cultivars. J. Plant Production, Mansoura Univ., 5(1): 95-105.

Khalil, Asmaa A.Sh.; A.A. Shiha; S.M.M. Dahdouh and A.M. Helmy (2011). Response of wheat to biofertilizer inoculation under different sources and levels of nitrogen. Zagazig J. Agric. Res., 38(5): 1207 - 1224.

Latique, S.; H. Chernane; M. Mansori and M. El Kaoua (2013). Seaweed liquid fertilizer effect on physiological and biochemical parameters of bean plant (*Phaseolus vulgaris* variety paulista) under hydropnic system. Euro. Scient. J., 9(30): 174-191.

Mandic, V.; V. Krnjaja; Z. Tomic; Z. Bijelic; A. Simic; D. R. Muslic and M. Gogic (2015). Nitrogen fertilizer influence on wheat yield and use efficiency under different environmental conditions. Chilean J. of Agric. Res., 75(1): 92-97.

Mansour, H.A.; O.A. Nofal; M.S. Gaballah and A.B. El-Nasharty (2019). Impact of algae extract foliar application on two wheat varieties with using two irrigation systems. Bioscience Res., 16(1): 356-366.

Mosanaei, H.; H. Ajamnorozi; M.R. Dadashi; A. Faraji and M. Pessarakli (2017). Improvement effect of nitrogen fertilizer and plant density on wheat (*Triticum aestivum L*.) seed deterioration and yield. Emirates J. of Food and Agric., 29(11): 899-910.

Mosslem, S.H.A.; F.M.F. Abdel-Motagally; G.R. El-Nagar and R.A. Dawood (2014). Response of wheat productivity to different rates of compost and nitrogen fertilizer under new valley conditions. Assiut J. Agric. Sci., 45(3): 1-12.

Nofal, O.A.; F.A. Hellal; S.A.A. El-Sayed and A.B. Bakry (2016). Response of peanut and maize crops to foliar application of algae extracts under sandy soil condition. Res. J. of Pharmace. , Biolo. and Chem. Sci., 7(5): 151-157.

Pramanick, B.; K. Brahmachari and A. Ghosh. (2013). Effect of seaweed saps on growth and yield improvement of green gram. African J. Agric. Res., 8(13): 1180-1186.

Prasad, K.; A.K. Das; A.K. Siddhanta; M.D. Oza; H. Brahmbhatt;R. Meena; K. Eswaran; M.R. Rajyaguru and P.K. Ghosh (2010). Detection and quantification of some plant growth regulators in a seaweed-based foliar spray employing a mass spectrometric technique sans chromatographic separation. J. Agric. Food Chem., 58(8): 4594-4601.

Ralcewicz, M.; T. Knapowski; W. Kozera and B. Barczak (2009). Technological value of spring wheat of Zebra cultivar as related to the way of nitrogen and magnesium application. J. of Central European Agric., 10(3): 223-232.

Reddy, S.R.(2004). Agronomy of Field Crops. Ludhiana, Kalyani Publishers. ISBN: 9788127248994-8127248991, p.143.

Seadh, S.E.; M.I. EL-Abady; A.M. El-Ghamry and S. Farouk (2009). Influence of micronutrients foliar application and nitrogen fertilization on wheat yield and quality of grain and seed. J. of Biological Sci., 9 (8): 851-858.

Shaaban, M.M.; A.M. El-Saady and A.B. El-Sayed (2010).Green microalgae water extract and micronutrients foliar application as promoters to nutrient balance and growth of wheat plants. J. of American Sci., 6(9): 631-636.

Shahzad, K.; A. Khan and I. Nawaz (2013). Response of wheat varieties to different nitrogen levels under agro-climatic conditions of mansehra. Sci. Tec. and Deve., 32(2): 99-103.

Shalaby, T.A. and H. El-Ramady (2014). Effect of foliar application of bio-stimulants on growth, yield, yield components, and storability of garlic (*Allium sativum* L.). AJCS., 8(2): 271-275.

Snedecor, G.W. and W.G. Cochran (1980). Statistical Methods. 7th Edn., Iowa State Univ. Press, Iowa, USA., 507.

Subedi, K.D.; B.L. Ma and A.G. Xue (2007). Planting date and nitrogen effects on grain yield and protein content of spring wheat. Crop Sci., 47: 36-44.

Zhang, X. and E.H. Ervin (2004). Cytokinin-containing seaweed and humic acid extracts associated with creeping bentgrass leaf cytokinins and drought resistance. Crop Sci., 44(5): 1737-1745.

إستجابة محصول القمح للتسميد النيتروجيني والرش الورقى بمستخلص الطحالب الخضراء

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يعتبر السماد النيتروجيني من الأسمدة الهامة والمغذية للنبات لما له من أهمية كبيرة في زيادة المحصول. كذلك وجد أن الرش بمستخلص الطحالب الخضراء يلعب دوراً كبيراً وهام في العمليات الفسيولوجية للنبات. لذا أجريت تجربتان حقليتان بالمزرعة البحثية بكلية الزراعة جامعة المنصورة خلال موسمى ٢٠١٧/٢٠١٦ و٢٠١٨/٢٠١٧ لدراسة تأثير مستويات التسميد النيتروجينى والرش الورقى بمستخلص الطحالب الخضراء على نمو ومحصول القمح صنف جميزة ١١. وقد تم إجراء التجارب في تصميم الشرائح المتعامدة في أربع مكررات. حيث احتلت معدلات التسميد النيتروجيني (٤٠ ، ٥٠ ، ٦٠ و ٧٠كجم نيتروجين /فدان) القطع الرأسية أما القطع الافقية فاحتوت على أربع تركيزات من مستخلص الطحالب الخضراء وهى بدون ،١ ، ٢ و ٣جرام/ لتر ماء وتم الرش مرتين بعد ٢٠ , ٤٠ يوماً من الزراعة. ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى : أدى التسميد النيتروجيني بمعدل ٧٠كجم نيتروجين/ فدان إلى زيادة معنوية لكل الصفات تحت الدراسة مثل عدد الأيام لطرد السنابل , ارتفاع النبات , طول السبلة , عدد السنابل/م٢ , عدد الحبوب في السبلة , وزن ١٠٠٠ حبة والمحصول البيولوجي ومحصول الحبوب للفدان في كلا الموسمين. أدى الرش الورقى بمستخلص الطحالب بتركيز ٣ جرام/ لتر إلى زيادة معنوية لكل الصفات تحت الدراسة خلال موسمى الزراعة بالمقارنة بالرش بالماء.كان للتفاعل بين التسميد النيتروجينى و الرش الورقى بمستخلص الطحالب تأثير معنويا على صفات ارتفاع النبات (خلال الموسمين) , طول السنبلة (خلال الموسم الثانى) والمحصول البيولوجي (خلال موسمي الزراعة) وكانت أعلى القيم عند التسميد النيتروجيني بمعدل ٧٠كجم نيتروجين/فدان والرش الورقى بمستخلص الطحالب بتركيز ٣ جرام/لتر.عموما توصى الدراسة للحصول على أعلى محصول من القمح تحت ظروف منطقة المنصورة – محافظة الدقهلية بالتسميد بمعدل ٧٠كجم نيتروجين/فدان والرش بمستخلص الطحالب ٣ جرام/لتر مرتين بعد ٢٠ و ٤٠ يوم من الزراعة .