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Response of two Wheat Cultivars to Foliar Fertilizer in Newly Cultivated Land

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ABSTRACT

Two field experiments were carried out at Wadi El-Rayan, Fayoum governorate, Egypt, 2012 / 2013 and 2013 / 2014 seasons to study the effect of foliar spraying with Nitrophoska fertilizer on growth, yield, yield components and chemical composition in two wheat cultivars to improve wheat productivity. The results could be summarized as follows: Misr-2 cultivar surpassed significantly Baniswef-4 cultivar in all growth characters under study in all growth stages in both seasons such as plant height (cm), number of leaves/plant, number of tillers/plant, total dry weight (g), flag leaf area (cm^2) at 70, 100 and 130 days from sowing, also, number of spikes/m^2 and weight of spikes (g/m^2) at 100 and 130 days after sowing. Significant variation were recorded between the tested foliar spraying treatments for growth characters at three growth stages in both seasons. The effective treatments for plant height, number of leaves and tillers/plant, total dry weight and flag leaf area / plant at 70, 100 and 130 days after sowing and number of spikes/m^2 and weight of spikes/m^2 at 100 and 130 days after sowing were obtained by spraying with 250cm^3/100 L. The interaction between wheat cultivars and foliar spraying with Nitrophoska fertilizer was significant increased in growth characters at all growth stages in both seasons. The highest values of all growth characters were obtained by using Misr-2 cultivar with 250cm^3/100L Nitrophoska fertilizer.

Misr-2 cultivar gave higher plant height, number of spikes/m^2, grain and straw yields/m^2, weight of spikes/m^2,grain index, grain and straw yields (ton/fed.) and biological yield than Baniswef-4 cultivar in both seasons. Also, Misr-2 cultivar significantly surpassed Baniswef-4 cultivar for protein and carbohydrate percentage. While Baniswef-4 cultivar gave higher harvest index and productivity score than Misr-2 cultivar in both seasons. Spraying Nitrophoska fertilizer at rate of 250cm^3/100 L resulted in a significant increment in yield, yield component and chemical composition of wheat grain in both seasons. Significant variation between the tested rate of fertilizer treatments for all yield characters in both seasons. The effective treatment for all characters under study, except harvest index and productivity score was 250cm^3/100 L, while spraying with 200 cm^2/100 L gave the highest values of harvest index and productivity score. The effective treatments for number of spikes/m^2, grain yield g/m^2, grain index (g), biological yield g/m^2, grain yield ton/fed., straw yield ton/fed., biological yield ton/fed., protein percentage and carbohydrate percentage were obtained from Misr-2 cultivar, with 250 cm^2/100 L. The differences between the two cultivars with 250 cm^3/ 100 L were not significant in plant height, weight of spikes/m^2 and straw yield g/m^2. The highest values of harvest index and productivity score were obtained from Baniswef-4 cultivar with 250 cm^3/100 L Nitrophoska fertilizer in both seasons.

Key words: Wheat (*Triticum aestivum* L.)**,** foliar spraying**,** growth, yield, chemical composition

Introduction

Wheat (*Triticum aestivum* L.) is one of most important crop used in human food and animal feed in Egypt. Recently, a great attention of several investigation has been directed to increase the productivity of wheat to minimize the gap between the Egyptian production and consumption by increasing the cultivated area and wheat yield per unit area. The total biomass is a result of the integration of metabolic reaction in the plants. Consequently, any factor influencing the metabolic activity of the plant at any period of its growth can affect the yield. Metabolic processes in wheat plants are greatly governed by both internal i.e. genetic make up of the plant and external conditions which namely climatic and edaphically environmental factors. Thus, increasing wheat production per unit area can be achieved by breeding and cultivating the promising wheat cultivars and applying the optimum cultural practices such as suitable fertilizer. Hassanein *et al* (2001), El-Esh (2007) and Zaki *et al* (2012) reported that there were significant differences among cultivars in all characters under study such as leaf area, leaf area index, dry matter accumulation, plant height at harvest, spike length, number of spikelets/spike, number of spikes/m^2, number of tiller/m^2, number of grains /spike, grains weight/spike, grain, straw and biological yields/fed. Also, nitrogen content, protein percentage differed significantly between cultivars. Nutrition is essential for plant life and yield therefore; mineral fertilization is a common agronomic practice that leads to improve productivity.

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As macro and micro-nutrients added to the soil, their availability will be affected by soil environmental factors. Foliar application techniques, as a particular way to supply macro and micro-nutrients could avoid these factors and results in rapid absorption. If applied properly, foliar sprying can be considered practical to supply nutritional plant requirements. Numerous studies confirmed positive response for the foliar application with the complete foliar, fertilizers (Hassanein and Ahmed, 1996, Shalaby, 2001, Ahmed and Ahmed, 2005 and Gomaa *et al.,* 2015).

The primary objective of foliar application such as nitrogen fertilizer is to allow for maximum absorption of nutrients such as N into the plant tissue. Foliar application of fertilizer should be viewed as temporary as emergency solution only but still it showed excellent results in some crops. The foliar application method is usually preferred because very small amounts of fertilizers are applied per unit area. Foliar application is also less likely to result in ground water pollution. Recently, Parvez *et al* (2009) and Yassen *et al* (2010) revealed that spraying wheat plants with 1% urea increased grain and straw yields, grain-weight, biological yield, grain micronutrients concentration and uptake as well as grain-protein content. It is well known that the important role of phosphorus on growth and high yield with good quality. It plays a key role in metabolic processes. High pH in sandy soil affects the absorption ability of phosphorus fertilizer on plants.

Potassium (K) is a essential macro-element required in large amounts for normal plant growth and development. This attributed of K in plant biochemical path pathway (Shalaby, 2001). Potassium increases the photosynthetic rates of crop leaves, co_2 assimilation and facilitates carbon movement (Basha, 2004).

The aim of this investigation was designed to study the effect of foliar spray by Nitrophaska fertilizer on growth, yield, yield components and chemical composition in two wheat cultivars.

Material and Methods

Two field experiments were conducted at new land at Wadi El-Rayan, Fayoum governorate, Egypt, during 2012 / 2013 and 2013 / 2014 seasons. The experiments were carried out to study the effect of foliar spraying with Nitrophoska fertilizer (10 % N, 4 % P, 7 % K and micro elements) on two wheat cultivars (*Triticum aestivum* L.). The physical and chemical characters of soil (30 cm depths) in the experimental site were as follows : sand 52.5 percentage, silt 20 percentage, clay 27 percentage, PH 8.02, organic matter 0.84 percentage, $CaCO_3$ 20.9 percentage, Ec 2.9 mm hos/cm^3, soluble N 74 ppm according to as described by Chapman and Pratt 1978.

The experimental design was split plot design with four replications. Wheat cultivars were allocated in the main plots and foliar spraying with Nitrophoska were allocated in sup-plots. The size of each plot was 10.5 m^2 (1/400 feddan) 3.5 m long and 3.0 m wide. Each experiment included 32 treatments which were the combination among two cultivars and foliar spray treatments. The experimental treatments can be described as follows:

Cultivars :

1- Misr- 2
2- Baniswef-4

Foliar spraying

1- Control (without spraying)
2- 150 cm^3/100L
3- 200 cm^3/100L
4- 250 cm^3/100L

Foliar spraying with Nitrophoska fertilizer were spraying twice, the first one at tillering and the second at the beginning of heading stage. Nitrogen fertilizer was added in three doses at a rate of 100 kg N/fed. Where, 20 kg N/fed., were added at sowing time, 40 kg N/fed., added at the first irrigation and the third dose were applied 25 days after the first irrigation. N fertilizer added in the form of ammonium nitrate (33.5%). Super phosphate fertilizer (15.5% P_2O_5) was applied before sowing at the rate of 150 kg/fed. Potassium fertilizer was applied before sowing at a rate of 50 kg/fed., in the form of potassium sulphate (48 % k_2O). Sowing dates were November 26th and November 23rd in both seasons, respectively, while seeding was 70 kg/fed. The normal agronomic practices of wheat were followed until harvest as recommended by Wheat Research Dept., Agric. Research Centre.

Growth characters:

Samples of ten guarded plants were taken of random of each plot for the four replication to determine the growth parameters at 70, 100 and 130 days after sowing were plant height (cm), No. of leaves/plant, No. of tillers/plant, total dry weight (g)/plant, flag leaf area (cm^2), weight of spikes/m^2 and No. of spikes/m^2 were measured.

Yield and its components:

Plant height(cm)	Weight of spikes (g/m^2)	No. of spikes/m^2	Grain yield (g/m^2)
Grain index (g)	Straw yield (g/m^2)	Biological yield (g/m^2)	Grain yield (ton/fed.)
Straw yield (ton/fed.)	Biological yield (ton/fed.)	Harvest index %	Productivity score

Grain quality:

Protein percentage Carbohydrates percentage.

Data obtained were exposed to the proper method of statistical analysis of variance differentiate among means of different as described by Gomez and Gomez (1989). The treatments means were compared using the least significant differences (L.S.D.) test at 5% level of probability. Combined analysis was made from the two growing seasons hence the results of two seasons followed similar trend.

Results and Discussion

Growth characters:

Effect of cultivars :

Data in table (1) show clearly that there differences between wheat cultivars in plant height (cm), number of leaves/plant, number of tillers/plant, flag leaf area (cm^2) and total dry weight g/plant in both seasons at 70 days after sowing (before heading stage) 100 DAS (at heading stage) and 130 DAS (at milk stage). Likewise, number of spikes/m^2 and weight of spikes/m^2 at 100 and 130 DAS in both seasons were significant. It could be concluded that varietal differences between wheat cultivars may be due to genetic differences between cultivars and differences between genotypes concerning partitioning of dry matter, where, wheat cultivars differed in carbon equivalent, yield energy per plant and per feddan (Said, *et al*, 1999).

Table 1: Effect of varietal differences on growth characters of wheat plants at 70, 100 and 130 days after sowing. (average of 2012/2013and 2013/2014 seasons)

Characters	Cultivars: Days after sowing	Misr-2	Baniswef-4	L.S.D at 5 %
Plant height "cm"	70	108.01	104.60	1.03
	100	118.43	115.91	0.90
	130	122.82	120.37	1.60
No. of leaves/plant	70	48.60	45.16	0.37
	100	56.63	47.39	1.53
	130	39.17	35.48	1.90
No. of tillers/plant	70	43.66	35.20	0.84
	100	47.15	41.45	2.94
	130	39.16	32.71	1.58
Weight of spikes "g"/m^2	100	644.24	618.70	2.80
	130	649.83	635.76	2.46
No. of spikes/m^2	100	541.61	518.83	2.00
	130	551.91	541.78	2.05
Plant total dry weight "g"	70	1363.30	1345.03	2.22
	100	1569.70	1548.67	3.9
	130	1690.46	1547.84	1.45
Flag leaf area/cm^2	70	50.05	48.10	0.64
	100	59.73	56.52	0.30
	130	54.57	49.77	0.49

Agradual and consistent increase in plant height of wheat cultivars was recorded during the period from 70 to 130 DAS. In this respect (Gomaa, *et al*, 2011) reported that the differences in plant height among wheat cultivars might be attributed to the differences in number or length of internodes reflecting the genetic make up. This differences in plant height among cultivars might be attributed to differences in number and/or length of internode or length of the peduncle reflecting the genetically make up of the plant during heading stage.

Results revealed that Misr-2 cultivar at the three mentioned stages of growth surpassed Baniswef-4 cultivar in plant height, number of tillers/plant, flag leaf area, number of leaves per plant, number of spikes/m^2 and weight of spikes/m^2. This may be due to the increase in the efficiency of Misr-2 in utilizing more water and minerals from soil. This was reflected in increasing the production of dry matter. These results are in harmony with those obtained by (Hassanein and Gomaa, 2001; Mousa; 2001, Basha, 2004; Zaki *et al*, 2004; Tabl *et al*, 2005, Abdel-Ati and Zaki, 2006, Gomaa *et al*, 2011, Ahmed *et al*, 2011, Hassanien *et al,* 2013 and 2014 and Radwan *et al*, 2014).

Effect of foliar spraying:

Data reported in table (2) show that applied level 150, 200 and 250 cm^3/100L Nitrophoska fertilizer have a significantly stimulatory effect on growth characters of wheat plants i.e. plant height (cm), number of leaves/plant, number of tillers/plant, flag leaf area (cm^2), total dry weight/plant, number of spikes/m^2 and weight of spikes/m^2 in both seasons and all growth stages. Data show that the highest level of Nitrophoska fertilizer (250 cm^3/100L) gave the highest values of growth characters in both seasons except number of leaves at 100 DAS, followed by (150 cm^3/100L) and (200cm^3/100L), respectively, meanwhile, untreated plants (control treatments) recorded the lowest growth parameter values. It is not worthy to mention that the superiority of (250 cm^3/100L) from Nitrophoska fertilizer in growth characters may be attributed to its higher content of N.P.K. and micronutrients than the other two levels under study. Numerous studies confirmed positive response for the foliar application with the complete foliar fertilizers (Hassanein and Ahmed, 1996, Shalaby, 2001, Ahmed and Ahmed, 2005 and Gomaa *et al* ,2015).

Table 2: Effect of foliar fertilizer "Nitrophoska" on growth characters of wheat plants at 70, 100 and 130 days after sowing. (average of 2012/2013and 2013/2014 seasons)

Characters	Foliar fertilizer / Days after sowing	Control	150 cm^3/100L	200 cm^3/100L	250 cm^3/100L	L.S.D at 5 %
Plant height "cm"	70	93.68	103.98	110.88	116.67	2.05
	100	106.00	114.71	121.70	126.27	1.80
	130	110.38	118.18	125.83	131.99	1.16
No. of leaves/plant	70	40.25	44.16	49.94	53.16	1.27
	100	47.64	51.56	54.74	54.11	0.94
	130	33.32	35.68	38.71	41.58	1.50
No. of tillers/plant	70	34.32	38.09	41.22	44.10	1.14
	100	40.61	42.52	44.58	49.48	1.71
	130	33.05	35.30	36.75	38.66	0.76
Weight of spikes "g"/m^2	100	616.63	627.44	636.51	645.29	1.71
	130	629.43	637.39	649.96	654.39	2.61
No. of spikes/m2	100	511.26	524.96	536.35	548.30	1.90
	130	532.35	541.86	552.92	560.26	1.87
Plant total dry weight "g"	70	1333.91	1346.83	1360.92	1375.01	3.59
	100	1512.10	1531.27	1547.65	1645.72	4.80
	130	1594.02	1612.65	1629.37	1640.55	2.49
Flag leaf area/cm^2	70	43.72	47.61	51.08	53.89	1.00
	100	52.70	56.00	60.28	63.53	1.53
	130	48.65	51.11	53.32	55.60	1.87

Effect of interaction:

Table (3) indicate that growth characters of wheat plants significant affected by the interaction between wheat cultivars and foliar spraying. Concerning the interaction effect, data in table (3) indicated that Misr-2 and (250 cm^3/100L) foliar spraying with Nitrophoska fertilizer produced the tallest plant height, number of tillers/plant, number of leaves/plant, flag leaf area cm^2, number of spikes/m^2 and weight of spikes/m^2 in both seasons at all growth stages. It was observed that the best treatment for total dry weight/plant was Misr-2 with 250 cm^3/100L at 70 and 130 DAS in both seasons, while the difference between Misr-2 with 250 cm^3/100L and Baniswef-4 with 250 cm^3/100L was not significant at 100 DAS in both seasons. Misr-2 with 250 cm^3/100L foliar spraying gave the highest values for growth characters followed by Misr-2 with 200 cm^3/100L and 150 cm^3/100L foliar spraying with Nitrophoska fertilizer.

Yield and its components and chemical composition :

Effect of cultivars :

Data in Table (4) revealed that the differences between the studied cultivars in yield and its components i.e. plant height (cm), number of spikes/m^2, weight of spikes/m^2, grain yield g/m^2, grain index (g), straw yield g/m^2, biological yield g/m^2, grain yield ton/fed., straw yield ton/fed., biological yield ton /fed., harvest index productivity score, protein percentage and carbohydrate percentage in both seasons were significant. Misr-2 cultivar significantly surpassed Baniswef-4 cultivar in all characters under study except harvest index and productivity score in both seasons. Where, Baniswef-4 cultivar overcome Misr-2 in these characters.

These results revealed that Misr-2 cultivar recorded the greatest plant height (cm), number of spikes/m^2, weight of spikes g/m^2, grain yield g/m^2, grain index, straw yield g/m^2, biological yield g/m^2, grain yield ton/fed., straw yield ton/fed., biological yield ton/fed., protein percentage and carbohydrate percentage. However, results reveal the superiority of Baniswef-4 cultivar in harvest index and productivity score in both seasons. These differences may be due to the genetic differences between the two cultivars. Also, the differences in grain index

might be attributed to the variation in translocation rate of photosynthate from leaves to the storing organs i.e. the grain. These finding are in similar trend with those of Zaki *et al*, 2004, crude protein in wheat grains was affected by wheat cultivars, El-Esh (2007), Hossam El-Din (2007) and Zaki *et al*, 2012. Protein in wheat grains resulted from other parts of wheat plant, especially leaves and translocated to the grains during grain filling period. Grain expressed as a percentage, is essentially an experession of the ratio of protein and non protein aqueous material in grain (Carter *et al*., 2002).

These results are in harmony with those reported by Hassenein and Gomaa (2001), Abd El-Razik (2002), Saleh (2003), Zaki *et al*., (2004), Shoman *et al* (2006), Suzan (2007), El-Habbasha *et al*. (2008), Ahmed *et al* (2011), Zaki *et al* (2012) and Bouchareb *et al* (2014).

Table 3: Effect of interaction between cultivars and foliar fertilizer on growth characters of wheat plants at 70, 100 and 130 days after sowing. (average of 2012/2013and 2013/2014 seasons)

Characters \ Treatment	Days after sowing	Misr-2				Baniswef-4				L.S.D. at 5%
		Control	150 cm^3/100L	200 cm^3/100L	250 cm^3/100L	Control	150 cm^3/100L	200 cm^3/100L	250 cm^3/100L	
Plant height "cm"	70	94.51	105.05	113.30	119.17	92.86	102.90	108.46	114.16	2.90
	100	107.92	114.57	122.96	128.25	104.08	114.85	120.44	124.29	2.54
	130	111.68	118.02	128.10	133.48	109.09	118.35	123.55	130.50	1.64
No. of leaves /plant	70	41.97	46.19	51.31	54.92	38.53	42.12	48.58	51.39	1.80
	100	50.88	54.18	58.92	62.56	44.41	48.94	50.55	45.66	1.33
	130	35.82	37.18	40.24	43.44	30.82	34.19	37.17	39.73	2.13
No. of tillers /plant	70	37.28	41.92	46.38	49.07	31.35	34.25	36.07	39.12	1.61
	100	43.37	45.36	46.64	53.22	37.85	39.67	42.52	45.74	2.42
	130	35.93	38.69	39.82	42.22	30.16	31.92	33.67	35.10	1.08
Weight of spikes "g"/m^2	100	637.02	641.22	645.97	652.74	596.23	613.66	627.05	637.84	2.42
	130	643.22	645.56	654.31	656.23	615.63	629.23	645.61	652.55	3.69
No. of spikes/m^2	100	524.44	538.44	545.58	557.98	498.07	511.49	527.13	538.61	2.69
	130	538.49	545.57	557.27	566.32	526.21	538.15	548.57	554.20	2.64
Plant total dry weight "g"	70	1343.16	1356.40	1367.61	1386.04	1324.65	1337.26	1354.24	1363.97	5.08
	100	1527.83	1547.97	1558.37	1644.61	1496.36	1514.56	1536.93	1646.84	6.73
	130	1675.21	1688.03	1696.84	1701.77	1512.83	1537.28	1561.90	1579.34	3.53
Flag leaf area/cm^2	70	45.79	48.94	51.06	54.40	41.64	46.27	51.10	53.38	1.42
	100	54.51	57.66	61.34	65.43	50.90	54.34	59.22	61.64	2.16
	130	52.04	53.73	55.69	56.83	45.25	48.50	50.95	54.37	2.65

Table 4: Effect of varietal differences on yield, its components and chemical content of wheat plants. (average of 2012/2013and 2013/2014 seasons)

Characters \ Cultivars	Misr-2	Baniswef-4	L.S.D at 5 %
Plant height "cm"	127.52	123.37	1.19
No. of spikes/m^2	552.32	545.08	0.86
Weight of spikes "g"/m^2	852.69	842.95	3.48
Grain yield "g"/m^2	639.52	633.06	1.56
Grain index "g"	3.84	3.66	0.02
Straw yield "g"/m^2	875.12	859.84	5.46
Biological yield "g"/m^2	1514.64	1492.90	5.45
Grain yield "ton/fed."	3.47	3.34	0.01
Straw yield "ton/fed."	5.44	5.27	0.02
Biological yield "ton/fed."	9.16	8.58	0.08
Harvest index %	37.97	38.91	0.29
Productivity score	50.59	50.83	0.23
Protein %	12.58	11.86	0.02
Carbohydrate %	83.54	80.21	0.48

Effect of foliar spraying of Nitrophoska fertilizer:

Data in Table (5) indicate that foliar spraying with Nitrophoska (complete foliar fertilizer compound) caused a significant stimulate effect on all studied characters (plant height, number of spikes/m^2, weight of spikes g/m^2, grain and straw yields per plant and per fed., biological yield per plant and per fed., grain index "g", harvest index, productivity score, protein percentage and carbohydrate percentage) in both seasons. Data show that the highest level of Nitrophoska fertilizer (250 cm^3/100L) gave the greatest mean value of plant height, number of spikes/m^2, weight of spikes/m^2, grain yield per plant and per fed., straw yield per plant, biological yield per plant and per fed., protein percentage and carbohydrate percentage in both seasons. The difference between (250 cm^3/100L) and (200 cm^3/100L) was not significant straw yield per fed., while 250 cm^3/100L gave

the lowest value for harvest index. The highest value for productivity score was obtained from 200 $cm^3$100L. Meanwhile, control treatment (i.e. untreated plants) gave the lowest yield and its components and chemical composition except harvest index and productivity score in both seasons. The superiority of 250 cm^3/100L that the other treatments in yield, yield components and chemical composition may be due to its out weight in content from N.P.K. and micro nutrient that the other treatments.

Table 5: Effect of foliar fertilizer "Nitrophoska"on yield, its components and chemical content of wheat plants. (average of 2012/2013 and 2013/2014 seasons)

Foliar fertilizer / Characters	Control	150 cm^3/100L	200 cm^3/100L	250 cm^3/100L	L.S.D at 5 %
Plant height "cm"	112.90	121.23	131.07	136.57	1.78
No. of spikes/m^2	533.65	545.87	552.92	562.37	1.37
Weight of spikes "g"/m^2	836.01	842.28	849.43	863.55	6.02
Grain yield "g"/m^2	623.38	631.27	642.56	647.95	1.36
Grain index "g"	3.55	3.65	3.80	3.98	0.02
Straw yield "g"/m^2	845.40	858.61	876.08	889.83	4.44
Biological yield "g"/m^2	1468.78	1489.87	1518.64	1537.78	4.49
Grain yield "ton/fed."	3.28	3.37	3.43	3.54	0.01
Straw yield "ton/fed."	5.19	5.31	5.45	5.48	0.05
Biological yield "ton/fed."	8.47	8.67	8.88	9.46	0.12
Harvest index %	38.75	38.75	38.65	37.61	0.55
Productivity score	50.50	50.75	50.97	50.62	0.14
Protein %	12.01	12.20	12.27	12.41	0.05
Carbohydrate %	76.68	80.52	83.34	86.94	1.34

Our positive response for foliar spraying with the complete foliar fertilizers are in harmony with those obtained by Hassanein and Ahmed (1996), Shalaby (2001), Ahmed and Ahmed (2005), El-Kramany and Gobarah (2005), Bahr (2007), Mohamed *et al* (2011) and Gomaa *et al* (2015).

Effect of interaction :

The effect of interaction between wheat cultivars and foliar spraying with Nitrophoska fertilizer on plant height, number of spikes/m^2, weight of spikes g/m^2, grain and straw yields per plant and per feddan, biological yield per plant and per fed., harvest index, productivity score, protein percentage and carbohydrate percentage were significant (Table 6) in both growing seasons. Misr-2 cultivar with the application of 250 cm^3/100L Nitrophoska fertilizer gave the highest values of number of spikes/m^2, grain and straw yields per plant and per fed., grain index, biological yield per plant and per fed., protein percentage and carbohydrate percentage. On the other hand, the effective treatments for harvest index and productivity score was Baniswef-4 cultivar with the application of 250 cm^3/100L foliar spray fertilizer.

Data in Table (6) revealed that the differences between Misr-2 cultivar and Baniswef-4 cultivars with 250 cm^3/100L Nitrophoska fertilizer in plant height and weight of spikes/m^2 were not significant in both seasons. Numerous studies confirmed our investigation **(**Shalaby, 2001, Ahmed and Ahmed, 2005 and Gomaa, *et al*, 2015).

Table 6: Effect of interaction between cultivars and foliar fertilizer on yield, its components and chemical content of wheat plants. (average of 2012/2013 and 2013/2014 seasons.

Treatment / Characters	Misr-2				Baniswef-4				L.S.D. at 5%
	Control	150 cm^3/100L	200 cm^3/100L	250 cm^3/100L	Control	150 cm^3/100L	200 cm^3/100L	250 cm^3/100L	
Plant height "cm"	114.41	123.56	134.37	137.73	111.39	118.90	127.77	135.41	2.52
No. of spikes/m^2	537.79	549.26	555.00	567.23	529.51	542.47	550.83	557.51	1.94
Weight of spikes "g"/m^2	846.12	850.02	853.13	861.48	825.90	834.54	845.72	865.63	8.51
Grain yield "g"/m^2	625.10	635.05	645.53	652.39	621.65	627.48	639.58	643.52	1.92
Grain index "g"	3.64	3.76	3.91	4.03	3.47	3.54	3.68	3.94	0.03
Straw yield "g"/m^2	855.21	868.79	885.09	891.40	835.59	848.42	867.07	888.26	6.28
Biological yield "g"/m^2	1480.31	1503.84	1530.61	1543.79	1457.24	1475.90	1506.66	1531.78	6.35
Grain yield "ton/fed."	3.35	3.40	3.47	3.65	3.21	3.33	3.39	3.43	0.02
Straw yield "ton/fed."	5.29	5.39	5.53	5.54	5.08	5.23	5.37	5.42	0.07
Biological yield "ton/fed."	8.64	8.79	9.00	9.19	8.29	8.56	8.76	8.85	0.17
Harvest index %	38.77	38.72	38.59	35.80	38.73	38.79	38.71	39.41	0.77
Productivity score	50.75	50.85	51.07	49.68	50.24	50.65	50.86	51.56	0.63
Protein %	12.31	12.55	12.63	12.85	11.71	11.84	11.91	11.97	0.07
Carbohydrate %	78.14	82.07	85.28	88.65	75.21	78.97	81.41	85.23	1.89

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