Wheat Productivity Under Different Sources and Levels of Nitrogenous Fertilization

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ABSTRACT: Two field experiments were carried out at Etay El– Baroud Agricultural Research Station, El- Beheira Governorate during 2013/ 2014 and 2014/2015 seasons to study the effect of three nitrogen sources (Urea, Ammonium sulphate and Ammonium nitrate) and four different levels of nitrogen fertilization (0, 50, 75 and 100 kg N/fed) on some physiological characters, yield and yield components of wheat. Results indicated that days to heading was significantly affected by N sources in the second season only. While, days to maturity and plant height were insignificantly affected by N sources in the two seasons. Whereas, days to heading, days to maturity and plant height were significantly increased by increasing nitrogen levels from 0 up to 100 kg N/fed in the two seasons. Number of spikes/m^2, number of grains/spike, grain weight /spike and 1000- grain weight were gradually and significantly influenced by nitrogen sources in the first and second seasons. The highest number of spikes/m^2 and number of grain/spike were obtained when nitrogen fertilizer added as urea while lowest values obtained when nitrogen fertilizer added as Ammonium sulphate during the two seasons. Whereas, 1000-grain weight recorded the highest value at Ammonium nitrate and the lowest at Urea, On the other hand, spike length and number of spikes/m^2 were insignificantly influenced by nitrogen sources in both seasons. All above parameters: were significantly increased by increasing nitrogen levels from zero to 100 kg N /fed during the two studied seasons. The highest values obtained at 100 kg N/fed while, the lowest ones were obtained under control. Grain, straw and biological yields were significantly influenced by N. sources in the two studied seasons. Urea as sources of N surpassed on the others sources under study for all studied characters. On the other side, harvest index (%) was significantly affected by N sources in the second season only. All other studied parameters were significantly increased by increasing N levels from zero to 100 kg N/fed in the two seasons. The heaviest grain, straw and biological yields were given at 100 kg N/fed while, the lightest at control in the 1st and 2nd seasons. It is important to clear that, the highest value of harvest index (%) was taken at 75 kg N/fed and the lowest at control treatment (zero N). The interaction between nitrogen sources and N levels significantly affected, plant height, number of spikes /m^2, grain weight/spike and 1000- grains weight. The highest numbers were taken at 100 kg N/fed of Urea during the first and the second seasons. Each of straw and biological yield was insignificantly affected by the interaction between nitrogen sources and nitrogen levels in the two studied seasons.

Keywords: wheat, yield, yield components, nitrogen fertilization, N source and levels.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is considered to be one of the most important cereal crops in the world as well as in Egypt. It ranks first among the main four crops namely rice, maize and barely. It occupies about 30% of the world cropping area. It used as human food and animal feed. In Egypt the cultivated area of wheat reached about 3.1 million feddan in 2015/2016 giving 8.2 million tons of grains with a national average of about 18.1 ardab/fed. However, the local consumption in the same year surpassed 14-15 million tons (FAO, 2016). Egypt import about 55% of its wheat consumption to face the

great need of the high population increment and the shortage of production and the main target is to approximate between production and consumption. Most of researches conducting to evaluate performance of different sources of nitrogen on yield and yield components of wheat. Mohammed *et al.* (2015) found that Diammonium phosphate surpassed Ammonium sulphate and Urea in all studied characters. Whereas, Tereza *et al*. (2012) revealed that grain yield was insignificantly affected by nitrogen sources. Nitrogen fertilization had vital role in increasing yield and yield attributes in various crops especially wheat. Concerning the effect of nitrogen fertilizer levels on wheat grain yield and its attributes, Ahmed *et al.* (2009) reported that addition of nitrogen fertilizer up to 102 kg/fed significantly increased plant height, number of spikes/m^2, spike length, number of grains/ spike, 1000-grains weight, straw yield and grain yield. El- Hawary and Shahein (2015) indicated that application of nitrogen fertilizer up to 105 kg N./fed lead to increase number of grain /spike, 1000-grains weight and grain yield (ardab/fed). El- Hag *and* Shahein (2017) stated that increase in nitrogen fertilizer levels significantly increased number of days to heading and maturity, plant height, spikes/m^2, grains/spike, grains and straw yields and 1000- grains weight.

The objective of this investigation was to study the effect of different sources and levels of nitrogenous fertilization on wheat productivity under El-Beheira conditions.

MATERIALS AND METHODS

Two field experiments were conducted at Etay El- Baroud Agricultural Research Station, El- Beheira Governorate, Egypt during 2013/2014 and 2014/2015 seasons to study the effect of three nitrogen sources and four nitrogen levels on yield and yield components of wheat *(Triticum aestivum* L.*).*

The preceding crop was corn in the two seasons. Soil samples of the experimental sites were taken at the depth of zero to 15 cm and 15 to 30 cm from soil surface before sowing. Some physical and chemical analyses were done according to Chapman and Pratt (1978). Detailed results of the soil characteristics are presented in Table (1).

The experimental design was split plot design in three replications. Three sources of nitrogenous fertilization (Urea (46.5%, Ammonium sulphate (20.5%), and Ammonium nitrate (33.5%)) were randomly allocated in the main plots and four levels of nitrogen fertilization (control (without N fertilizers), 50, 75 and 100 kg N/fed) were allocated in the sub- plot.

Each sub plot size was 10.50 m^2 (3 m in length and 3.5 m in width). The grains of the tested wheat cultivar (Gemiza 11) were obtained from wheat Research Section of Agriculture Research Center, Ministry of Agriculture, Egypt. Sowing dates were 29th and 21th November 2013 and 2014 in both seasons, respectively, while seeding rate was 70 kg/fed.

The application of nitrogen fertilizer was added in two equal doses, the first one before the first irrigation (21 days after sowing) and the second one

before the second irrigation (21 days later). Phosphorus fertilizer was applied at the rate of 15.5 kg P_2O_5/fed (100 kg calcium phosphate) during seed bed preparation. Potassium fertilizer was applied before sowing (during seedbed preparation) at rate of 24 kg K_2O/fed. Other agricultural practices were done as recommended by the Ministry of Agriculture.

Plant height (cm), days to heading, days to maturity, spike length, number of spike/m^2, number of spikelets/spike, grain weight/spike, 1000- grain weight, grain yield (ton/fed), straw yield (ton/fed), biological yield(ton/fed), and harvest index (HI%) were studied.

All data collected were subjected to analysis of variance according to Gomez and Gomez (1984).

Table (1). Some physical and chemical properties of the experimental soils in both seasons

Soil properties	2013/2014	2014/2015
A) Mechanical analysis:		
Sand (%)	20.3	20.0
Silt (%)	26.1	25.3
Clay (%)	53.6	53.7
Soil texture class	Clay	Clay
B) Chemical analysis		
E.C (1:1) (dS/m)	2.1	2.12
p^H	8.1	8.3
1) Soluble cations (mg/L)		
Ca^{++}	190.5	190.52
Mg^{++}	45.75	45.77
K^+	51.32	51.33
Na^+	201.11	201.22
2) Soluble anions (mg/L)		
Cl^-	250.6	250.65
HCo_3^-	262.028	262.033
$So_4^=$	500.51	500.55
O.M %	1.77	2.23
Available N (mg/kg)	35.5	54.7
Available P (mg/kg)	11.1	11.5
Available K (mg/kg)	221	225

RESULTS AND DISCUSSION

The presented results in Table (2) cleared that days to heading was significantly affected by nitrogen sources in the second season, only. It is clear that the maximum days to heading was achieved at Urea. while, the minimum was at Ammonium sulphate.

Results listed in the same table pointed out that days to heading significantly increased by increasing nitrogen levels from zero up to 100 kg N/fed in the two studied seasons. These results may be due to the role of nitrogen in vegetative growth of plant. Similar results are in agreement with those obtained by El- Hag and Shahein (2017).

Results also revealed that, days to maturity parameter was insignificantly affected by nitrogen sources in the two seasons. Whereas, this trait was gradually increased by increasing nitrogen levels up to 100 kg N/fed. The highest value was taken at 100 kg N/fed and the lowest value at control in both seasons. Development may explain the role of nitrogen in motivating all division and elongation, the internodes elongation. However, the role of N in hopeful metabolic processes in wheat plant, consequently, their growth, spike beginning and grain filling is responsible for the increase of spike length, number of spikelets, grains / spike and 1000- grains weight, similar results were obtained by Selem and Abd El-Dayem (2013) Khalid and Hammad (2014) and El- Hag and Shahein (2017).

Results in the same table pointed out that, plant height was insignificantly affected by nitrogen sources in the two investigated seasons. While, there was gradually increased by increasing nitrogen levels. The tallest plants seen at 100 kg N/fed and the shortest at control treatment. These findings may be due to nitrogen role in cell divisions and elongation. These results are agreement with those obtained by Abd El- Hameed (2012); Khaled and Hammad (2014) and El-Hag and Shahein (2017).

Table (2). Effect of sources and levels of nitrogen fertilization on days to heading, days to maturity and plant height of wheat plant during 2013/2014 and 2014/2015 seasons

Treatments	Days to heading		Days to maturity		Plant height (cm)	
	2013/2014	2014/2015	2013/2014	2014/2015	2013/2014	2014/2015
A) Sources of nitrogenous fertilization						
Urea	102.1	102.1	143.1	142.6	91.5	92.1
Ammonium Sulphate	101.9	101.6	143.1	139.6	92.0	91.3
Ammonium nitrate	101.9	102.0	143.2	142.9	91.8	92.2
L.S.D at 0.05	N.S	0.46	N.S	N.S	N.S	N.S
B) levels of nitrogenous fertilization (kg/fed)						
0	98.7	98.5	140.3	140.2	77.3	79
50	100.9	100.5	142.3	137.2	88.5	88.9
75	103.2	103.3	144.2	144.0	99.8	98.9
100	105.1	105.4	145.7	145.5	101.6	100.3
L.S.D at 0.05	0.26	0.28	0.26	5.61	0.57	1.25
Interaction						
A x B	N.S.	N.S.	N.S.	N.S.	*	*

N.S.: Not significant difference at 0.05 level of probability, *: Significant different at 0.05 level of probability.

The results presented in Table (3) indicated that the number of spikes/m^2 was significantly affected by nitrogen sources in the two studied seasons. The maximum numbers (244.2 and 237.8) were obtained with nitrogen fertilization in form of Urea and the minimum numbers were (222.4 and 219.6) were with Ammonium sulphate form in the first and second season, respectively. These results are in agreement with those recorded by Treza *et al.* (2012). On the other hand, number of spike/m^2 significantly increased by increasing nitrogen levels from zero to 100 kg N/fed. These results may be due to the ability of wheat plants to produce more tillers and consequently more spike under the application of nitrogen fertilizer. Similar results were obtained by Abdel- Nour and Fateh (2011) and Nour El- Din *et al*. (2013) who found that number of spikes/m^2 was increased by increasing N. levels from zero up to 75kg N/fed.

Results also showed that spike length was insignificantly influenced by nitrogen sources during the two studied seasons and significantly increased by increasing levels of nitrogen fertilization. The tallest spikes were (12.1 and 11.9 cm) obtained at 100 kg N/fed. Whereas, the shortest spikes (9.9 and9.8 cm) with control were in the first and second seasons, respectively. Similar results are in agreement with those reported by Abd El-Hameed (2012), and Nour El-Din (2013) Mansour et al. (2016).

Results listed in Table (3) indicated that nitrogen sources significantly affected number of spike/m^2 and 1000-grain weight.While, non-significantly affected spike length, number of grain/spike, number of spikelets/spike and grain weight/spike.

Table (3). Effect of sources and levels of nitrogen fertilization on yield components of wheat during 2013/2014 and 2014/2015 seasons

Treatments	No. of spikes/m^2		Spike length (cm)		No. of grains/spike		No. of spikelets/spike		Grains weight/spike (g)		1000-grain weight (g)	
	2013/2014	2014/2015	2013/2014	2014/2015	2013/2014	2014/2015	2013/2014	2014/2015	2013/2014	2014/2015	2013/2014	2014/2015
A) Sources of nitrogenous fertilization												
Urea	244.2	237.8	11.2	11.0	56.6	56.8	20.9	21.1	2.1	2.1	34.7	34.9
Ammonium Sulphate	222.4	219.6	11.1	10.8	56.3	56.3	20.8	20.8	2.1	2.1	35.8	35.2
Ammonium nitrate	233.5	228.9	11.2	11.0	56.3	56.7	20.7	20.9	2.2	2.2	35.9	36.4
L.S.D at 0.05	1.53	1.74	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	0.73	0.46
B) Levels of nitrogenous fertilization (kg/fed)												
0	147.3	149.4	9.9	9.8	31.2	31.7	19.4	19.3	0.82	0.84	26.1	25.9
50	190.1	193.0	10.7	10.5	49.4	50	20.5	20.7	1.7	1.7	33	33.1
75	284.8	283	11.9	11.6	71.2	71.0	21.7	21.9	2.9	2.9	41.1	41.3
100	292.8	291.4	12.1	11.9	73.8	73.7	21.7	21.8	3.1	3.1	41.7	41.7
L.S.D. at 0.05	1.78	1.45	0.12	0.13	0.47	0.39	0.29	0.31	0.04	0.03	0.57	0.45
Interaction												
A x B	*	*	N.S.	N.S.	N.S.	N.S.	*	*	*	*	*	*

N.S.: Not significant difference at 0.05 level of probability, *: Significant different at 0.05 level of probability.

Results presented in Table (4) indicated that grains, straw and biological yield were significantly affected by nitrogen sources during the two studied seasons. Results cleared that maximum grains yield values were (2.33 and 2.36 tons/fed) were given at Urea application in the first and second seasons respectively. While, the application of nitrogen fertilizer as Ammonium sulphate given the lowest values in the first and the second seasons. On the other side, straw yield value surpassed at Urea application followed by Ammonium nitrate in the first season and lowest value was taken at Ammonium sulphate, same trend seen in the second season. It is important to clear that biological yield achieved the highest values (5.82 tons/fed) at Urea fertilization in the two studied seasons and the lowest values were (5.59 and 5.56 tons/fed) were given at ammonium sulphate in the first and second seasons respectively. It is important to clear that harvest index (%) was insignificant at 5% level during the first season and significant in the second season. The highest numbers were given at Ammonium sulphate during the second investigated season, Treza *et al.* (2012) cleared that grain yield was insignificantly affected by nitrogen sources. While, Mohammed *et al.* (2015) found that grain, straw and biological yields were significantly affected by nitrogen sources and they pointed out that the highest values were given at Di-ammonium phosphate (DAP) followed by Ammonium sulphate. while, the lowest values were at Urea.

Results listed in Table (4) pointed out that the application of the four different levels of nitrogen fertilization had significant effect on grain, straw and biological yields during the two investigated seasons. All values of parameters were gradually increased by increasing nitrogen fertilization from zero up to 100 kg N/fed. Similar results are in agreement with those obtained by Ali *et al.* (2011) who concluded that among N. levels, the highest grain yield (3.848 tons/fed) was obtained by application of (180 kg N/fed). In addition, results recorded that Harvest Index (%) parameter was significantly affected by nitrogen levels in the first and second season. However, the highest values were recorded at 75 and 100 kg N/fed in the first and the second seasons. While, the lowest values were recorded at control. Similar findings are in agreement with that obtained by Selem and Abd El- Dayem (2013) and El- Hag and Shahein (2017).

Results in Table (4) cleared that the interaction between nitrogen sources and nitrogen fertilizer levels had significant effect on grain yield during both seasons. While, straw and biological yields as well as HI insignificantly affected by the interaction between N sources and levels in both seasons. These results cleared that nitrogen sources and nitrogen fertilization levels act independently on the pervious mentioned characters under this study.

Table (4). Effect of three sources and four levels of nitrogen fertilization on grain, straw and biological yields (ton/fed) as well as harvest index (%) of wheat during 2013/2014 and 2014/2015 seasons

Treatments	Grains yield (ton/fed)		Straw yield (ton/fed)		Biological yield (ton/fed)		H.I (%)	
	2013/2014	2014/2015	2013/2014	2014/2015	2013/2014	2014/2015	2013/2014	2014/2015
Sources of nitrogenous fertilization								
Urea	2.33	2.36	3.48	3.46	5.82	5.82	38.8	39.1
Ammonium Sulphate	2.27	2.29	3.33	3.27	5.59	5.56	39.2	39.9
Ammonium nitrate	2.30	2.32	3.43	3.42	5.73	5.74	38.8	39.0
L.S.D 0.05	0.01	.011	0.07	0.05	0.07	0.04	N.S	0.49
Levels of nitrogenous fertilization (kg/fed)								
0	1.07	1.08	2.82	2.82	3.88	3.89	27.8	27.9
50	2.10	2.15	3.35	3.32	5.44	5.47	38.6	39.4
75	3.00	3.01	3.71	3.64	6.71	6.65	44.7	45.3
100	3.04	3.05	3.78	3.77	6.82	6.82	44.5	44.8
L.S.D0.05	0.01	0.013	0.06	0.07	0.06	0.07	0.46	0.53
Interaction								
A x B	*	*	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

N.S.: Not significant difference at 0.05 level of probability, *: Significant different at 0.05 level of probability.

Results presented in Table (5) pointed out that plant height was significantly influenced by the interaction between nitrogen sources and nitrogen levels in the 1st and 2nd seasons. It's important to remember that the highest plants were (101.7 and 100.9 cm) given when applied 100 kg N/fed of ammonium sulphate in the first and second season, respectively. These results may be attributed to on important of nitrogen in cell division and elongation.

Results also cleared that number of spikes/m^2 was significantly affected by nitrogen sources and nitrogen levels interaction during the two investigated seasons. Whereas, the results detected superiority when nitrogen levels applied at 100 kg N/fed as urea formation in the first and second season. However, weight of grains/spike was significantly affected by the interaction between nitrogen sources and levels in the first and second seasons. The highest value was (3.12 and 3.1g) was given at 100 kg/fed as ammonium nitrate in the first and second seasons, respectively. While, 100 kg N/fed of Ammonium sulphate form came in the first and equaled in the second rank. On the other side, 1000-grain weight was significantly varied by the interaction between nitrogen sources and nitrogen levels in the two studied seasons. The highest weight (41.7 g) was taken at 100 kg N/fed as ammonium nitrate in the first season and (41.87 g) of ammonium sulphate form in the second season. While, the highest weight were taken at control.

Also, results presented in Table (5) showed that grain yield was significantly varied by the interaction between nitrogen sources and nitrogen levels. The greatest grains yield (3.08 and 3.10 tons /fed) was taken under N-fertilizer in form as Urea at the rate of 100 kg N/fed in the first and second seasons respectively. These findings may be due to increase in yield components during the investigation.

Table (5). The interaction effect between nitrogen sources and nitrogen levels on plant height (cm) No. of spike /m^2, grains weight / spike (g) and 1000-grain weight (gm) and grain yield (t/fed) during 2013/2014 and 2014/2015 seasons

Sources of nitrogenous fertilization	Levels of nitrogenous fertilization (kg/fed)	Plant height (cm)		No. of spikes/m^2		Grains weight/spike (g)		1000- grain weight (g)		Grain yield (ton/fed)	
		2013/2014	2014/2015	2013/2014	2014/2015	2013/2014	2014/2015	2013/2014	2014/2015	2013/2014	2014/2015
Urea	0	77.5	80.4	150.6	153.9	0.83	0.83	25.9	25.7	1.07	1.09
	50	87.8	89.1	198.7	205.4	1.6	1.6	30.6	31.3	2.15	2.19
	75	99.2	98.8	297.7	293.0	2.9	2.9	40.8	41.2	3.03	3.05
	100	101.5	100.3	304.2	302.1	3.1	3.1	41.3	41.5	3.08	3.10
Ammonium sulphate	0	78.0	77.9	143.7	145.0	0.83	0.81	26.2	25.7	1.07	1.08
	50	88.4	87.3	180.9	180.7	1.7	1.6	34.3	32.2	2.05	2.11
	75	100.1	99.2	272.7	272	2.9	2.9	40.9	41.3	2.96	2.98
	100	101.7	100.9	281.2	280.2	3.1	3.1	41.7	41.8	2.99	3.00
Ammonium nitrate	0	76.4	80.0	147.8	149.4	0.82	0.87	26.1	26.5	1.07	1.07
	50	89.4	90.6	190.9	193	1.7	1.8	34.1	35.8	2.09	2.15
	75	100.1	98.5	284	284	3.0	2.9	41.5	41.5	3.00	3.01
	100	101.4	99.6	293	291.9	3.1	3.1	42.1	41.7	3.03	3.05
L.S.D at 0.05		0.98	2.17	3.09	2.51	0.07	0.05	0.98	0.77	0.02	0.02

CONCLUSION

It was concluded form the present results that sowing wheat cultivar Gemiza 11 with fertilizing 100 kg N/fed in form as Urea which increased yield and its components of wheat crop under El- Beheira Governorate conditions.

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الملخص العربي

إنتاجية القمح تحت مصادر ومستويات مختلفة من التسميد النيتروجيني

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أجريت تجربتان حقليتان بالمزرعة البحثية – محطة البحوث الزراعية بإيتاى البارود – محافظة البحيرة – خلال موسمى الزراعة ٢٠١٣/٢٠١٤ و ٢٠١٤/٢٠١٥ لدراسة تأثير مصادر ومستويات محتلفة من التسميد الأزوتى على المحصول ومكوناته لصنف قمح الخبز "جميزة ١١ " وكان التصميم المستخدم القطع المنشقة مرة واحدة حيث وزعت ثلاثة مصادر من التسميد الازوتي (اليوريا, سلفات الأمونيوم, نترات الأمونيوم) في القطع الرئيسية ، بينما وزعت الأربع مستويات من التسميد الأزوتى وهى (صفر,٥٠, ٧٥, ١٠٠ كجم نتروجين / فدان) بالقطع الشقية.

وتتلخص أهم النتائج فيما يلى :-

- تأثر عدد الأيام حتى طرد السنابل معنوياً بمصادر التسميد النتروجيني المختلفة خلال الموسم الثانى فقط , ولم تظهر عدد الأيام حتى النضج وكذلك طول النبات أى معنوية بصور اضافة السماد الآزوتى كما ازداد كل من عدد الأيام حتى طرد السنابل ، وعدد الأيام حتى النضج تدريجياً بزيادة مستوى التسميد الأزوتى خلال الموسمين ، وكذلك طول النبات وكانت أعلى القيم عند إضافة ١٠٠ كحم أزوت/ فدان ، وأقلهم عند الكنترول.

- أظهرت كل من عدد السنابل فى المتر المربع ، وعدد حبوب السنبلة ووزن حبوب السنبلة ووزن ال١٠٠٠ حبة إختلافاً معنوياً بإختلاف مصادر الاضافة خلال الموسمين حيث سجلت أعلى القيم بالنسبة لعدد السنابل / م٢ ، وعدد حبوب السنبلة أعلى القيم عند اضافة الآزوت على صورة يوريا ، وأقل القيم عند إضافته على صورة سلفات امونيوم خلال الموسمين، أما بالنسبة لصفة وزن حبوب السنبلة ووزن ال١٠٠٠ حبة فقد سجلت على القيم عند اضافة نترات امونيوم ، وأقلهم باضافة اليوريا . أما الصفات طول السنبلة، وعدد السنابل /م٢ لم تظهر معنوية مع صور الاضافة.

- وقد ازدادت جميع الصفات ومكونات المحصول معنوياً بزيادة مستوى التسميد الأزوتى ,وكانت أعلى القيم عند المستوى ١٠٠كجم نيتروجين/فدان ، وأقلهم عند الكنترول.

- أظهرت صفات محصول الحبوب والقش والبيولوجى اختلافاً معنوياً مع اختلاف صور الاضافة فى الموسمين وكانت أعلى القيم عند اضافة اليوريا أما صفة دليل الحصاد فقد اظهرت اختلافاً معنوياً فى الموسم الثانى فقط. كما ازدادت تلك الصفات تدريجياً بزيادة المستوى التسميد الآزوتى معنوياً خلال موسمى الدراسة , وكان أعلى محصول

حبوب وقش وبيولولوجى عند اضافة ١٠٠ كجم نيتروجين/ فدان ، وأقل القيم عند مستوى صفر نيتروجين/فدان ، أما دليل الحصاد فكان أعلى قيمة عند المستوى ٧٥كجم نيتروجين/فدان ، وأقلهم عند المستوى صفر كجم نيتروجين/فدان.

- أظهر التفاعل بين صور الاضافة ومستويات الاضافة اختلافاً معنوياً للصفات طول النبات وعدد السنابل/م٢ ، ووزن حبوب السنبلة ووزن ال١٠٠٠ حبة حيث سجل أعلى طول للنبات عند اضافة ١٠٠كحم نيتروجين/فدان من سلفات الامونيوم فى الموسمين وكما سجلت اعلى قيم لعدد السنابل /م٢ عند اضافة ١٠٠كحم نيتروجين/فدان على صورة يوريا اما وزن حبوب السنبلة ووزن ال١٠٠٠ حبة قد اظهرت تفوقاً عند اضافة١٠٠ وحدة نتروجين على صورة نترات الامونيوم.

- اختلفت صفة محصول الحبوب للفدان معنوياً مع التفاعل بين صور ومستويات الاضافة حيث اعطى اعلى محصول حبوب عند اضافة١٠٠كحم نيتروجين/فدان من سماد اليوريا خلال موسمى الدراسة.

- لم يظهر محصول القش والمحصول الكلى اختلافاً معنوياً خلال موسمى الدراسة نتيجة للتفاعل بين صور ومستويات الأزوت.