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# RESPONSE OF WHEAT TO BIO AND MINERAL NITROGEN FERTILIZERS

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**ABSTRACT:** *Two field experiments were carrid out at the Experimental Farm the Faculty of Agriculture, Kafr EL-Sheikh University, Egypt, during both 2007/2008 and 2008/2009 seasons, To investigate the response of wheat cultivar Giza 168 to four nitrogen levels (0,50, 75, 100 kg N/fed.) and three of biofertilizer sources (uninoculation , Nitrobin, Cerealin and Mixture of cerealin and nitrobin). A split plot design with four replication was used (Nitrogen levels were laid in the main plots, while, biological fertilizer treatments were allocated in the subplots). It can summarize the obtained results as follows :*

*In both seasons, increasing nitrogen fertilizer levels signficantly an increase in plant height, number of spikes /m2 , number of grains /spike, 1000-grains weight , Grain yield , straw yield , harvest index and grain protein content except for straw yeild and harvest index only in the first season. 100 kg N/fed. recorded the greatest values for growth , yeild, yeild attributes and Grain protein content (%) compared with the control treatment which recorded the lowest values, but without significant differences between nitrogen levels of 100 and 75 kg N/fed.*

*The biological fertilizer sources treatments had significant effects on all studied characters of wheat plants except for Number of grains /spike in the first season; while straw yield and harvest index in both seasons were non significantly affected. The results show that mixture of Nitrobin and Cerealin or Nitrobin alone inoculation recorded the highest significant values at all growth traits (plant height ), yield and yield attributes (Number of spikes /m2 , Number of grains /spike, 1000-grains weight, Grain yield/fed. and Grain protein content ) compared with the control treatment which gave the lowest values, However the Cerealin treatment was among those having great plant height, number of spikes /m2, Number of grains /spike, 1000-grains weight (g), grain yield (t/fed.) without significant between with mixture of Nitrobin and Cerealin or Nitrobin alone.*

*The results show that the interaction between mineral nitrogen levels and biofertilizer sources significantly affected days to heading, plant height, number of grains/spike and grain yield in the second season, and on the number of spikes/m2 and grain protein content (%) in the first season. 1000 grain weight was affected by the interaction in both seasons. Plants received* *the level of 100 kg N/fed. plus biofertilizer sources as Nitrobin and /or Cerealin inoculation was among those having more days to heading, plant height, number of grains /spike, number of spikes/m2, 1000-grains weight (g), Grain yield (t/fed.) and Grain protein content compared with the control treatment (without mineral nitrogen fertilizer and without biofertilizer inoculation) which recorded the lowest values, the level of 100 kg N/fed. plus biofertilizer sources as Nitrobin and/or Cerealin inoculation did not significantly differ than with the combinations of 75 kg N/fed with Cerealin or 75 kg N/fed with the mixture of Cerealin and Nitrobin inoculation for number of grains/spike in the second season.*

*It could be concluded that under the conditions of this study, application of 100 kg N/fed along with biofertilizers inoculations (Nitrobin and/or Cerealin inoculation) gave the heighest grain yelld/fed. of Giza 168 wheat cultivar is recommended for increasing grain yield of wheat.*

*Key words: Wheat, yield, yield components, protein, N fertilizer, Bioferilizer.*

## INTRODUCTION

Wheat is considered one of the most important cereal crops in the world for human food. It is a stable food for more than one third of the world population; it contributes more calories and protein in human being other diet than any food crop. Now, it is needed to increase wheat grain yield to enhance food security.

In Egypt, the national wheat production is insufficient to meet local consumption. Wheat production in Egypt had been increased from 2.06 million tons in 1983 to 8 million tons in 2007. This sharp increase in grain yield in the last years was achieved not only by increasing the cultivated area (from 1.32 million feddans in 1983 to about three million feddans in 2007), but also by the increase in grain yield per fed. (From 9.25 ardab /fed. in 1983 to 18.1 ardab/fed. in 2007), as a result of planting high yielding cultivars and improving the cultural treatment.

The plant nutrition is one of the important factors to increase wheat grain yield, especially nitrogen which is essential for growth and reproduction of plants, Nitrogen plays a major role in development and function of protoplasm, being an essential constituent of all proteins. In this respect, *Eissa (1996) Moussa (2001), Basaha (2004), Abo- Marzoka (2005), Abu- Grab et al., (2006), ElSayed and Hammad (2007) and Hammad and El- Basuny (2008)* reported that increasing nitrogen level resulted in significant gradual increase plant height, number of spikes/m$^2$, number of grain/spike, grain yield/fed., straw yield/fed., harvest index and crude protein, but decreased 1000 grain weight.

The nitrogen deficiency in Egyptian soils is one of the most limiting factors for wheat production. So, the farmers are using a lot of mineral fertilizers to wheat soil. Since, mineral fertilizers are very expensive for most farmers, the low purchasing power of peasants restricts the use of costly fertilizer inputs and farming practices are creating environmental problems by increasing utilization of mineral fertilizers as well as pollution. There for there is a need to explore the possibilities of using the expanding native sources of plant nutrition. The biofertilizers are one of nutrient sources for the crops which conserve the environment from pollution as a result of excessive use of mineral fertilizer also biofertilizers increase the amount of fixed nitrogen in the plants and amount of nitrogen left in the soil .Such microbial logical processes change unavailable forms of nutrients into available forms that can be early assimilated by plants. There is a possibility to hasten the effect of *Azospirillum Sp* through integration with judicious combination of nitrogen levels application. Sushila and Giri (2000), Abd- El maksoud (2002), Khafary (2003), Ibrahim *et al.* (2004) and ElZeky (2005) Darwish *et al.* (2008), Khaled (2007) investigated the response of wheat to biofertilizer (cerealin) inoculation under different levels of nitrogen fertilizers. The obtained results indicated that inoculation of wheat grain with biofertilizers resulted in markedly increase in plant height, number of spikes/m2, number of grains/spike 1000 grain weight, grain and straw yields/fed. and protein content. Khaled (2007) found that the application of 70 kg N/fed.+ biofertilizers (Nitrobin) significantly increased plant height, straw, grain and biological yields as well as harvest index and protein content. Darwish *et al.* (2008), found that, the application of Cerealien +75 kg N/fed. and 75kg N/fed. gave the highest values of yield, yield components and grain quality compared to 50 kg N/fed.

The different fertilizer sources are not complete for wheat nutrition then, no one is sufficient to sustain soil fertility and crop productivity. The present investigation aimed to study the response of wheat cultivar Giza 168 to mineral nitrogen levels and bio fertilizer sources.

## MATERIALS AND METHODS

Tow field experiments were conducted at the Experimental Farm of the Faculty of Agriculture, Kafr EL-Sheikh University, Egypt, in 2007/2008 and 2008/2009 seasons. The experiments were conducted to investigate the effect of mineral nitrogen levels and bio fertilizers sources on yield and its components of the wheat, Giza 168 cultivar. Each experiment included four nitrogen levels (0, 50, 75, 100 kg N/fed) and four biofertilizer source, i.e uninoculation, Nitrobin inoculation "N", (Mixture of non symbiotic biological N2-fixation ) and Cerealin inoculation (*Azospirillum brasilense* ) and mixture of Nitrobin plus Cerealin inoculation "C+N" .

The experimental design was split plot with four replicates. Nitrogen levels occupied the main plots and biological fertilizer sources were allocated in the sub plots. The sub plot area was 10.5 m2 (3.0 x 3.5 m) in both experiments. Nitrogen fertilizers was applied in the form of urea (46.6 % N) at two equal doses, the first dose at sowing, which was incorporated in dry soil, while the second dose was applied before tillerring stage. Prior to sowing, the experimental soils was fertilized with 15.5 kg $p_2o_5$ in the form of Calcium Super phosphate (15.5 % $P_2O_5$) during soil preparation. The tested bio fertilizers were produced by the General Organization for Agricultural Equalization Fund, Ministry of Agriculture and Land Reclamation, Egypt. Wheat seeds were inoculated with Cerealine and/or Nitrobine at the rate of 400 g /fed. Just before broadcasting.

The preceding crop was corn and rice in the first and second season respectively. The Physical and chemical analysis of soil samples was determined according to Piper (1950) which were taken at 30 cm depth from the experimental sites before soil preparation in the tow seasons. The soil type was clay with a value of pH 7.59, having 1.6 % organic matter, containing 0.047 % total nitrogen and 11.42 ppm available P (means of the two seasons).

Grains of wheat cv. Giza 168 at rate of 60 kg / fed. Was uniformly broadcasted in the field on 20th and 25th November of 2007 and 2008 seasons, respectively, the other agricultural practices were applied during the two growing seasons as recommended in wheat fields.

At harvest, $1m^2$ from each plot was taken as a random sample then the following traits were recorded: plant height (cm), number of spikes /$m^2$, number of grains /spike, 1000-grains weight (g), weight of grains /spike (g), grain yield (t/fed.), straw yield (t/fed.) harvest index. Grain protein content (%) was determined by using Micro-kjeldahl method to estimate the total nitrogen in the grains percentage and multiplied by the factor (5.75) to obtain the grain protein percentage according to A.O.A.C. (1990).

The analysis of variance was carried out according to Gomez and Gomez (1984) for all collected data. Treatment means were compared by Duncan's Multiple Range test according to Duncan (1955). All statistical analysis were performed using analysis of variance technique by means of "MSTATC" computer software package.

## RESULTS AND DISCUSSION

### A: Growth:

The values of plant height, as an indicator to the growth of wheat plant, as affected by bio and mineral nitrogen fertilizers in the two seasons are shown in Table (1). Application of mineral nitrogen up to 50 kg N/fed. in the first season and up to 100 kg N/fed in the second season significantly increased

Table (1): Plant height, Number of spikes /m$^2$, number of grains /spike and 1000-grain weight as affected by mineral nitrogen levels, bio fertilizer sources and their interaction during 2007/2008 and 2008/2009 seasons.

| Treatment | Plant height (cm ) | | No. of spikes /m$^2$ | | No. of grains /spike | | 1000-grain weight (g ) | |
|---|---|---|---|---|---|---|---|---|
| N level (kg N /fed). (A) | 2007/2008 | 2008/2009 | 2007/2008 | 2008/2009 | 2007/2008 | 2008/2009 | 2007/2008 | 2008/2009 |
| 0 | 88.52 b | 93.87 d | 326.16 c | 295.50 c | 52.08 b | 54.31 c | 42.08 c | 44.01 c |
| 50 | 90.88 a | 101.12 c | 343.50 b | 366.50b | 55.16 a | 58.18 b | 44.57 b | 46.06 b |
| 75 | 91.23 a | 106.25 b | 353.33 a | 375.25 ab | 56.16 a | 64.43 a | 44.78 b | 47.50 ab |
| 100 | 91.53 a | 109.90 a | 356.00 a | 382.25 a | 56.16 a | 65.93 a | 46.22 a | 48.47 a |
| F-test | * | * | ** | ** | * | * | ** | ** |
| Bio fertilizer (B) | | | | | | | | |
| Control | 89.69 b | 93.75 b | 337.16 b | 322.25 b | 54.25 | 52.75 b | 43.95 b | 45.43 b |
| Nitrobin ( N ) | 91.10 a | 104.71 a | 350.25 a | 361.50 a | 55.83 | 62.25 a | 44.71 a | 46.70 a |
| Cerealin ( C ) | 90.86 a | 104.31 a | 346.83 a | 367.25 a | 55.25 | 63.87 a | 44.71 a | 46.66 a |
| Mixture ( N+C ) | 90.51 a | 105.43 a | 344.75 a | 368.50 a | 54.25 | 64.00 a | 44.27 a | 47.25 a |
| F-test | * | * | ** | ** | NS | * | * | * |
| Interaction (Ax B) | NS | ** | * | NS | NS | * | ** | ** |

**, * and NS indicate $p < 0.05$, $< 0.01$ and not significant, respectively. Means of each factor designated by the same letter are not significantly different at 5% level, according to Duncan's multiple range test.

plant height compared with the control treatment (zero N ). A significant increase in plant height was accompanied with each increment of applied nitrogen in the second season. The effect of nitrogen on plant height may be occurred due to the stimulation cell division and cell elongation of internodes and consequently increased plant height. The promoting effect of nitrogen on plant height was reported by Abu- Grab *et al.* (2006), El-Sayed and Hammad (2007) and Hammad and El- Basuny (2008).

Plant height also was significantly influenced by the tested bio fertilizer treatments compared to uninoculated plants (control) in both seasons. There are no significant differences in plant height among all plants inoculated with each of Nitrobin and Cerealin alone or with their mixture in both seasons. Such effect of inoculation may be attributed to more absorption of nutrients, which reflect more growth activity, nitrogenous compounds assimilation, forming more growth substances, more cell division and enlargement, more forming of tissues and organs and plant elongation. These results are in agreement with those reported by Eissa (1996), Khafary (2003), Ibrahim *et al.* (2004) , ElZeky (2005) and Khaled (2007).

The interaction between mineral nitrogen levels and biofertilizer sources had a significant effect on plant height in the second season, only as shown in Table (2). The data show that the inoculated plants by any biofertilizer source singly or together significantly increased plant height compared to non inoculated plants at the same mineral nitrogen level. Application of 100 kg N/fed along with biofertilizer inoculation produced the tallest plants, while unfertilizer treatment produced the shortest ones.

Table (2): Plant height as affected by the interaction between mineral nitrogen fertilizers, bio fertilizer sources in 2008/2009 seasons.

| Treatment | N- Level (Kg N/fed.) | | | |
|---|---|---|---|---|
| | Plant height | | | |
| | $N_0$ | $N_{50}$ | $N_{75}$ | $N_{100}$ |
| Control | 86.25 i | 94.5 h | 101.0 f | 105.0 d |
| N | 96.25 g | 103.0 e | 108.0 bc | 111.6 a |
| C | 96.25 g | 103.0 e | 107.0 c | 111.0 a |
| N+C | 96.75 g | 104.0 de | 109.0 b | 112.0 a |

Means designated by the same letter are not significantly different at 5% level, according to Duncan's multiple

## B. Yield components:

Data in Table (1) show the number of spikes /m2, number of grains/ spike and 1000-grain weight as affected by the tested mineral nitrogen levels in the two seasons. The data show that the three traits were significantly increased with the application of any tested nitrogen levels compared to the unfertilized plants in both seasons. Moreover, it can be noticed that increasing nitrogen levels caused a significant increase in the number of spikes/ $m^2$ up to 75 kg N/ fed. in both season, number of grains/ spike up to 50 and 75 kg N /fed. in the first and second seasons, respectively and 1000- grain weight up to 100 and 75 kg N/fed. In the first and second respectively. On the other hand , the control treatment recorded the lowest values for three yield attributes in both season. This effect of nitrogen fertilization on yield components is expected, since nitrogen is an essential element for early growth, in turn increased the most of yield components. Similar results were obtained by Eissa (1996), Moussa (2001), Basaha (2004), Abo-Marzoka (2005), Abu-Grab *et al.,* (2006), ElSayed and Hammad (2007) and Hammad and El- Basuny (2008).

The data in Table (1) show the means of number of spikes/m2, number of grains/spike and 1000 grain weight (gm) as affected by biofertilizer sources in both seasons. Moreover, it can be noticed that wheat plants inoculated with Nitrobin and/or Cerealin significantly increased the number of spike/$m^2$ and 1000 grain weight in both seasons as well as number of grains /spike in the second season only compared to the uninoculated plants but without significant differences among the three inoculation treatments for three traits in both seasons. The increase in these yield components due to seed inoculation may be attributed to considerable increase in nitrogen supply, which produced by bacteria in addition to cytokinens, GA3 and IAA, Subsequently, increased vegetative growth and increase number of and yield components. This observation is supported by other researchers Sushila and Giri, 2000 ; Abd- El maksoud, 2002; Khafary, 2003; Ibrahim *et al.,* 2004; ElZeky, 2005; Khaled, 2007 and Darwish *et al.,* 2008).

The effect of interaction between mineral nitrogen levels and and biofertilizer sources exerted significant effect on number of spike/$m^2$ in the first season, number of grains/spike in the second season and 1000 grain weight in both season (Table 3). Moreover, it can be found that the highest significant values were obtained by wheat plants inoculated with Nitrobin and received 100 kg N/fed produced greater number of spike/$m^2$ than those of other combination of nitrogen levels and biofertilizer inoculation. The unfertilized plants produced the lowest number of spike/$m^2$ in this season. Combinations of Nitrobin or Cerealin inoculations with 100 kg N/fed recorded the highest number of grains/spike, while unfertilized treatment recorded the lowest one in the second season. However, the highest significant values of number of grain/spike were obtained by plants fertilized with 75 kg N/fed. with Cerealin or mixture of Cerealin and Nitrobin. The interaction between mixture of Nitrobin and Cerealin inoculations with 100 kg N/fed significantly exceeded all other combination in 1000-grain weight in both seasons. On the other hand the lower significant values of number of spikes/$m^2$ , number of grains/ spike and 1000 grain weight were recorded by the control (without adding nitrogen with uninoculation). Similar results were obtained by Khafary (2003), Ibrahim *et al.* (2004) El-Zeky (2005) Khaled (2007) and Darwish *et al.* (2008),

Table (3) : Number of spikes /m$^2$, number of grains /spike, 1000-grain weight as significantly affected by interactions between mineral nitrogen levels, bio fertilizer sources and their interaction in 2007/2008 and 2008/2009 seasons .

| Kg N/fed. (A) | Bio fertilizer sources (B) | No. of spikes /m$^2$ | No. of grains /spike | 1000-grain Weight (gm ) | |
|---|---|---|---|---|---|
| | | 2007/08 | 2008/09 | 2007/08 | 2008/09 |
| 0 | Control | 312.3 k | 46.50 f | 41.00 i | 42.25 n |
| | Nitrobin ( N ) | 332.0 j | 56.25 d | 42.13 h | 44.30 m |
| | Cerealin ( C ) | 329.3 j | 56.75 d | 42.26 h | 44.50 l |
| | Mixture(N+C ) | 331.0 j | 57.75 d | 42.93 g | 45.00 k |
| 50 | Control | 335.0 i | 52.50 e | 43.83 f | 45.25 j |
| | Nitrobin ( N ) | 351.0 e-g | 57.25 d | 44.80 e | 46.25 h |
| | Cerealin ( C ) | 349.0 g | 61.25 c | 44.65 e | 46.00 i |
| | Mixture(N+C ) | 339.0 h | 61.75 c | 45.00 e | 46.75 f |
| 75 | Control | 350.0 fg | 55.50 d | 45.50 d | 46.50 g |
| | Nitrobin ( N ) | 357.3 b | 66.25 b | 45.66 d | 47.75 d |
| | Cerealin ( C ) | 353.7 c-e | 68.25 ab | 45.80 cd | 47.50 e |
| | Mixture(N+C ) | 352.3 d-f | 67.75 ab | 46.15 bc | 48.25 c |
| 100 | Control | 351.3 e-g | 56.50 d | 45.50 d | 47.75 d |
| | Nitrobin ( N ) | 360.7 a | 69.25 a | 46.25 b | 48.50 b |
| | Cerealin ( C ) | 355.3 b-d | 69.25 a | 46.15 bc | 48.65 b |
| | Mixture(N+C ) | 356.7 bc | 68.75 ab | 47.00 a | 49.00 a |

Means within the same column designated by the same letter are not significantly different at 5% level, according to Duncan's multiple range tests

## C. Grain and straw yields and harvest index:

Means of grain yield, straw yield and harvest index as affected by tested nitrogen levels and biofertilizer sources in the two seasons are presented in Table (4). There was a substantial difference obtained among nitrogen rates in grain yield (t/fed) in both seasons, straw yield (t/fed) and harvest index in the second season. Plants received 75 or 100 kg N/fed significantly outyielded control plants in grain yield/fed in both seasons. The levels of 75 and 100 kg N/fed were statistically at par in grain yield in the two seasons. Thus, the high nitrogen level increased grain yield through increasing number of spikes/m2, number of grains/ spikes and 1000-grain weight. Application of mineral nitrogen fertilizer resulted in a significant increase in straw yield/fed and harvest index compared with non application in the second season, only. There were no significant differences among 50, 75 and 100 kg N/fed in straw yield/fed and harvest index in the mentioned season. The increase in straw yield by application of mineral nitrogen was due to the increase in plant height and the number of tillers/m2. Similar conclusion was previously drawn by Eissa (1996) Moussa (2001), Basaha (2004,),Abo-Marzoka (2005), Abu- Grab *et al.*, (2006), Elsayed and Hammad (2007) and Hammad and El- Basuny (2008).

Table (4): Grain yield, Straw yield, harvest index and grain protein content as affected by mineral nitrogen levels, bio fertilizer sources and their interactions in 2007/2008 and 2008/2009 seasons.

| Treatment | Grain yield (t/fed.) | | Straw yield (t /fed.) | | Harvest index | | Grain protein content (%) | |
|---|---|---|---|---|---|---|---|---|
| kg N/fed. (A) | 2007/2008 | 2008/09 | 2007/2008 | 2008/09 | 2007/2008 | 2008/09 | 2007/2008 | 2008/09 |
| 0 | 2.28 b | 1.75 c | 2.80 | 3.80 b | 0.450 | 0.315 b | 8.38 d | 8.69 d |
| 50 | 2.58 a | 2.45 b | 3.23 | 4.57 a | 0.444 | 0.349 a | 9.23c | 9.44 c |
| 75 | 2.64 a | 2.62 ab | 3.27 | 5.03 a | 0.447 | 0.343 a | 10.06 b | 10.49 b |
| 100 | 2.64 a | 2.81 a | 3.31 | 5.17 a | 0.444 | 0.352 a | 10.93 a | 11.15 a |
| F-test | * | ** | NS | * | NS | * | ** | ** |
| Bio fertilizer (B) | | | | | | | | |
| Control | 2.43 b | 2.33 b | 3.08 | 4.42 | 0.420 | 0.343 | 9.34 c | 9.58 c |
| Nitrobin(N) | 2.63 a | 2.40 a | 3.21 | 4.67 | 0.541 | 0.338 | 9.77 ab | 10.04ab |
| Cerealin(C) | 2.60 a | 2.41 a | 3.18 | 4.67 | 0.448 | 0.339 | 9.58 c | 9.94 b |
| Mixture ( N+C ) | 2.50 a | 2.49a | 3.14 | 4.81 | 0.444 | 0.340 | 9.93 a | 10.20 a |
| F-test | * | * | NS | NS | NS | NS | * | * |
| Interaction (Ax B) | NS | ** | NS | NS | NS | NS | ** | NS |

**, * and NS indicate p <0.05, <0.01 and not significant, respectively. Means of each factor designated by the same letter are not significantly different at 5% level, according to Duncan's multiple range test.

Moreover, it can be noticed that the inoculation with tested biofertilizer had a positive effect on grain yield/fed in both seasons. However, biofertilizer source did not significantly affected on straw yield and harvest index in both seasons (Table 4). Seed inoculation by Nitrobin or/and Cerealin significantly increased grain yield/fed compared with non inoculation in both seasons. There were no significant differences among plants inoculated by nitrobin or/and cerealin in grain yield/fed in the two seasons. The increase in grain yield due to inoculation might be attributed to the increase in yield components viz., number of spikes/m2, number of grains /spike and 1000-grain weight. Since biofertilizer could be increase availability of some nutrients such as NPK and growth regulators extraction, and raising sink efficiency. Similar results were obtained by Sushila and Giri (2000), Abd- El maksoud (2002), Khafary (2003), Ibrahim *et al.* (2004) and El-Zeky (2005), Khaled (2007) and Darwish *et al.* (2008).

The interaction between mineral nitrogen levels and biofertilizer had a significant effect on grain yield/fed in the second season only (Table 5). Grain yield was gradually increased by increasing nitrogen level at any inoculation treatments, addition of 100 kg N/fed along with seed inoculation with Nitrobin + Cerealin significantly surpassed all other combinations in grain yield in the two seasons. However, the unfertilized treatment produced the lowest grain yield in both seasons, similar results were obtained by Khafary (2003), Ibrahim *et al.* (2004) and El- Zeky (2005), Khaled (2007) and Darwish *et al.* (2008).

## D. Grain protein content:

The results in Tables (4) show the effect of mineral nitrogen levels and biofertilizer on grain protein content in 2007/2008 and 2008/2009 seasons

The data show that mineral nitrogen fertilizer significantly affected wheat grain protein content in both seasons. Each increment of applied nitrogen resulted in a significant increase in grain protein content up to 100 kg N /fed. This result is true in the two seasons. This increase in grain protein content indicates that fairly high proportion of photosynthesis was converted to protein. Similar results were obtained by other investigators who found that protein percentage in wheat grains was significantly increased with increasing nitrogen fertilizer levels up to 9o kg N/fed *(Allam, 2005)* , 100 kg N/fed *(Koriem, 2002)* and 105 kg N/fed *(Hafez, 2007)*.

Inoculation treatments with Nitrobin and/or Cerealin significantly affected grain protein content in the two seasons of study. Inoculation wheat grains by mixture of Cerealin + Nitrobin produced in the highest grain protein content without significant differences with inoculation by Nitrobin alone in both seasons. Similar results were obtained by EL-Zeky (2005) and Khaled (2007).

Table (5): Grain yield and grain protein content as significantly affected by interactions between mineral nitrogen levels, bio fertilizer sources in 2007/2008 and 2008/ 2009 seasons respectively.

| Bio fertilizer sources (B) | Grain yield t/fed. | | | | Grain protein content (%) | | | |
|---|---|---|---|---|---|---|---|---|
| | 2008/2009 | | | | 2007/2008 | | | |
| | N- Level (Kg N/fed.) | | | | | | | |
| | $N_0$ | $N_{50}$ | $N_{75}$ | $N_{100}$ | $N_0$ | $N_{50}$ | $N_{75}$ | $N_{100}$ |
| Control | 1.65 p | 2.38 l | 2.55 h | 2.73 d | 8.05 o | 8.88 k | 9.79 h | 10.65 d |
| N | 1.77 n | 2.42k | 2.64 f | 2.79 c | 8.51 m | 9.4 i | 10.18 f | 11 b |
| C | 1.74 o | 2.49 j | 2.61 g | 2.83 b | 8.31 n | 9.18 j | 9.96 g | 10.87 c |
| N+C | 1.83 m | 2.52 i | 2.70 e | 2.90 a | 8.66 l | 9.48 i | 10.39 e | 11.21 a |

Means designated by the same letter are not significantly different at 5% level, according to Duncan's multiple

With respect to the interaction between mineral nitrogen levels and biofertilizer, the data show that such interaction significantly affected grain protein content in the first season only, Table (5) it is clear that the highest protein content was obtained by combination between 100 kg N /fed. Plus inoculation with the mixture of Nitrobin + Cerealin). However, the lowest value was recorded with control treatment (without mineral nitrogen and without biofertilizers). Similar results were obtained by *EL-Zeky (2005), Khaled (2007) and Darwish et al. (2008).*

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# استجابة صنف القمح جيزة ١٦٨ للأسمدة الأزوتيه الحيوية والمعدنية

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## الملخص العربى

أجريت تجربتان حقليتان بالمزرعة البحثية بكلية الزراعة بكفر الشيخ خلال موسمى ٢٠٠٧/ ٢٠٠٨ و٢٠٠٨/ ٢٠٠٩ لدراسة استجابة صنف القمح جيزة ١٦٨ لأربع مستويات من السماد النيتروجينى ( صفر ؛ ٥٠ ؛ ٧٥ ؛ ١٠٠ كجم أزوت /فدان) وأربعة مصادر للأسمدة الحيوية (بدون تلقيح ؛ التلقيح بالنيتروبين ؛ التلقيح بالسيريالين ؛ التلقيح بمخلوط من النيتروبين و السيريالين ) ،وقد استخدم فى تنفيذ التجارب تصميم القطع المنشقة فى أربعة مكررات حيث وزعت معاملات السماد الازوتى المعدنى فى القطع الرئيسية بينما وزعت معاملات التسميد الحيوى عشوائيا على القطع الشقية ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى :

١. أدى زيادة معدل السماد الازوتى حتى ١٠٠ كجم أزوت /فدان إلى زيادة معنوية فى صفة ارتفاع النبات ، صفات المحصول ومكوناته ( عدد السنابل/م$^2$ ، عدد الحبوب للسنبلة ، وزن الالف حبة ) محتوى البروتين فى الحبوب فى كلا موسمى الدراسة صفة محصول القش ودليل الحصاد فى الموسم الثانى فقط . وذلك مقارنة بمعاملة الكنترول التى حققت اقل القيم وذلك بدون اختلافات معنوية بين معدل ١٠٠كجم ن / فدان ,٧٥ كجم ن / فدان فى معظم الصفات .

٢. أوضحت النتائج أن مصادر الأسمدة الحيوية المختبرة كان لها تأثير معنوى ايجابى على كل الصفات المدروسة على النبات القمح فيما عدا عدد الحبوب/سنبله فى الموسم الأول فقط ، بينما لم تتأثر معنويا كلا من محصول القش ودليل الحصاد فى الموسمين بمصادر الأسمدة الحيوية. هذا وقد سجل لقاح النيتروبين منفردا أو مخلوطا مع السيريالين اعلى قيم معنوية

لكل من صفة ارتفاع النبات وصفات المحصول ومكوناته ( عدد السنابل /م$^2$ وعدد الحبوب /سنبله ووزن الألف حبه ومحصول الحبوب ومحتوى الحبوب من البروتين ) مقارنة بمعاملة الكنترول التى أعطت القيم الدنيا .

٣. تبين النتائج ان التفاعل بين مستويات النيتروجين المعدنى ومصادر الأسمدة الحيوية لها تأثير معنويا على عدد السنابل /م$^2$ ومحتوى الحبة من البروتين (%) فى الموسم الأول ، وارتفاع النبات ، عدد الحبوب/ سنبله ، محصول الحبوب فى الموسم الثانى بينما وزن الالف حبة فى كلا الموسمين.

٤. وجد أن تسميد نباتات القمح بمعدل ١٠٠كجم ن / فدان بالإضافة للتلقيح بلقاح النيتروبين منفردا أو السيريالين منفردا أو مخلوطهما قد حقق أعلى القيم فى صفات ارتفاع النبات ، عدد الحبوب/سنبلة ، عدد السنابل /م٢ ، وزن الألف حبة ، ومحصول الحبوب للفدان ، ومحتوى البروتين بالحبة مقارنة بمعاملة الكنترول ( بدون تلقيح وبدون تسميد معدنى ) التى سجلت القيم الأقل بينما وجد إن معاملة التسميد بمعدل ١٠٠ كجم ن /فدان مضافا إليها السيريالين منفردا او مخلوطا مع النيتروبين لم تختلف معنويا مع معاملة ٧٥ كجم ن /فدان مضافا اليها مخلوط السيريالين و النيتروبين وذلك فى صفة عدد الحبوب/سنبلة فى الموسم الثانى فقط.

٥. يمكن التوصية انه تحت ظروف هذه الدراسة وللحصول على أقصى محصول من حبوب القمح وأفضل نسبة بروتين تسميد نباتات القمح صنف جيزة ١٦٨ بمعدل ١٠٠ كجم أزوت /فدان مع تلقيح التقاوى بلقاح مخلوط السيريالين والنيتروبين.