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Studies on The Effect of Bio Fertilization on the Technological Characteristics of Some Egyptian Wheat Varieties

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Abstract

Three pot experiments were carried out at Agric. Res. Station, Fac. Agric., Al-Azhar Univ. Nasr City during 2011/2012, 2012/2013 seasons, each one was to investigate the effect of four un mineral package for each N, P and K on quality of three wheat Egyptian varieties, such as, Sakha-93, Masr-1 and Banisweif-6. The N package were 75 kg N/fed (control), 75 kg N/fed + the twice cysteine spraying (each 150 ppm), 37,5 kg N/fed + bio N fertilizer (cerialen) + the twice cysteine spraying and 37,5 kg N/fed + bio N fertilizer (biogen) + the twice cysteine spraying. The p fertilizer packages were phosphorine, humic acid 6%, phosphorine+ humic 6% acid and control (without P). The K fertilizer package were Potassiumage, Banana ash 4%, Potassiumage + Banana ach 4% and control (without K fertilizer). On the other hand, a field experiment was applied in 2013/2014 session at El Klag region, Kaliobia Governorate, Egypt to confirm the result gaved from the pot experiments. However pot experiments were designed in complete randomizes design, the field experiment was in split plot design. Results showed significant differences between the three tested wheat varieties such as grain protein contents, wet and dry gluten content. Baniswif-6 gave grains quality characters higher than Sakha-93 and Masr-1 varieties in cache season under pot and field experiments. Technological properties were differed significantly between the studied nitrogen fertilizers packages treatments during the three growing seasons under pot or field experiments. In the second experiments, there were significant differences between the various phosphorus fertilizer packages treatments in both seasons under pot and field experiments. P4 and P3 treatments recorded the highest values of technological properties as compared with P1 treatment in the three seasons in pot or field experiments. The interaction effect between (var. X P. packages) showed that must of the studied characters were significant by the interaction between the two studied factors. Finally, in the third experiment, significant differences were observed between the four studied potassium fertilizers packages for all studied characters under pot and field experiment in both seasons, whereas K4 treatments gave the highest values of technological characters. Also K3 treatment ranked the second and produced the highest values of the previous traits in both seasons. Accordingly, the three wheat varieties showed highest responsibility to different N, P and K fertilizer packages in relation to some technological properties in pot or field experiments under these conditions

Keywords*: biogen, phosphorin bacteria, potassumage, protein, wheat varieties*

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I. Introduction

Wheat (*Tritium aestivium.L*.) is considered the main source of food in Egypt as well as in many parts of the world. The total wheat cultivated area on the world during 2010/2011 reached 220.38 million hectare with total production of 704.8 million ton with an average of 3194 kg/ha.

Wheat is one of the most important cereal crops in Egypt and all over the world used in human food and animal feed. Wheat provides 29% of the total calories for the people and 32.6% of the protein in the Egyptian* diet. The total cultivated area of wheat in Egypt reached 3.05 million acre with total production of 8.4 million ton with an average 2.75 ton/acre under Egyptian conditions. Increasing wheat production is considered as one of the most important strategy goals in order to minimize the great gab between the national production and the consumption especially under the yearly increase in the population with more rate than production. Solving these problems need pressing hard to increase wheat yield. It can happen through two ways, one of that can go through producing highly productive varieties than the used under the recent cultivation (vertical extension). Other way can attain through cultivation wheat under the new reclaimed lands and desert invasion (horizontal extension), as well as increase the productivity of the soil by enhancing its fertility with different sources of fertilizers especially NPK which considered as one of the limiting factors to achieve the high yielding quality of wheat corp. Recently, much interest is focused on using bio-fertilizers to minimize consumption cost environmental pollution. Nitrogen fixing bacteria have been tried in cereal crop with considerable success. Regarding humic acid is the major component of soil organic matter that more stimulating plant growth with direct and indirect effects. The indirect effect involve component of the soil properties such as aggregation, permeability water holding capacity micronutrient transport and availability, so it is a commercial product contains many elements. [21], reported that the positive effect of mineral fertilizer on wheat growth characters may be due to the role nitrogen in protoplasm formation and all proteins e.g. amino acid, many enzymes and energy transfer materials ADP and ATP. [24], observed highly significance differences among the studied wheat genotypes (doven, Shandaweel I, Gemmiza9 and Sakha93 and sakha94) concerning all protein draymeters e.g protein wet and dry gluten contents. Also, they indicated that the highest protein content in the studied wheat varieties was obtained as the application of 75 kg N/fed. [9], revealed that inoculated wheat grains with Azotobacter recorded higher values of protein content surpassing the un inoculated treatments. [13], revealed that wheat plants treated with the combination of the recommended dose of NPK fertilizer and both bio fertilizers, (Cerealein, as grain inoculum and Nameless as soil treatment) recorded considerable increments regard to growth character, nutrients, amino acid, photo hormones and crude protein % in the produced grains. [18], suggested that treating wheat plants with humic acid stimulated metabolic activity resulting in a net increase in metabolism due to enhancement in production of enzymes, amino acids, proteins and other metabolites. [7], detected that, in wheat plants, no relation was found between the high rates of P and K fertilizer and nitrogen content of the grains that reflects on protein content. [19], experimented the effect of potassium humic (10%) as foliar spray on chlorophyll a, chlorophyll b and protein contents in wheat plants. After 35 days from sowing these traits were determined, significant increase will be acted for them that reflected on yield and its components. [6], argued the influences of phosphorus solubilizing (Bacillus megaterium var. phosphaticium (M-13) and Ralstonia picketti (73) bacteria and chemical fertilizer treatments on wheat quality parameters as they were compared with control treatment. The results recorded that, single, dual and triple bacteria combination yielded significant increases in grain filling period and grain protein ratio.

Therefore, the present work aimed to study the effect of unmineral N or P or K fertilizers packages on some technological properties of grains for three promising wheat cultivars under pot and field experiments.

II. Materials and methods

Under the condition of sandy loam soil in Agriculture Farm, Faculty of Agriculture, Al Azhar University, three pot experiments were conducted during 2011/2012 and 2012/2013 seasons followed by field experiment conducted at El-klag region, Kaliobia Governorate, Egypt, during 2013/2014 to study the effect of applying some mineral (N, P, K,) or un mineral sources of N, P and K (Humic acid, Potassumage and banana ash) and some bio fertilizer (Cerealein, Biogen and phosphorein) on some technological properties of three promising wheat cultivars Sakha-93, Masr-1, Bani swif-6.

The physical and chemical analysis of the soil site during the three growing seasons were recorded in Table (1), The above-mentioned treatments were distributed to check it through three indicated experiments at seasons 2011/2012 and 2012/2013 were as follows:

- **The first experiment** aimed to study the effect of N fertilizer treatments on the three wheat cultivars. The experiment treatments were as follow:-
  1-Control 75 kg N/fed as ammonium nitrate (35.5% N).
  2-Twice doses of Cysteine (150 ppm) as foliar application the first, was sprayed at plant age of 25 days for sowing date and the second one was applied at plant age of 75 days (formation of flag leaf). +75 kg N/fed as soil application.
  3-Twice doses of Cysteine (150 ppm) + Cerealein (N bio-fertilizer at the rate of 4 envelopes/fed) + 37.5 kg N/fed. as soil application.
  4- Twice doses of Cysteine (150 ppm) + Biogen (N. bio-fertilizer at the rate of 4 envelopes/fed) + 37.5 kg N/fed. as soil application.

- **The second experiment** aimed to study the impact of some application affecting the availability of the huge amount of phosphorus fixed in the
  Egyptian soil on some wheat cultivars traits. The experiment treatments were as follow:
  1. Control (only had recommended dose of N and K)

  2. Adding phosphorein (bio- fertilizer) at the rate of 8 envelopes/fed., (the weight of each equals 500 g). in two equal portions the first at sowing by mix it by the grains before planting, the second was added before the first irrigation by mixing the content of the envelops with an amount of the soil and broadcast it just before irrigation.

  3. Adding the organic fertilizer Humic acid 6 % at the rate of 20 L/fed. as foliar application in 200 L/fed.

  4. Adding phosphorein (at the previous rate and methodology) + Humic acid as foliar application at the previous rate.

- **The third experiment** aimed to study the effect of potassiumag as bio-fertilizer and organic potassium source from the by-products of banana farm as ash on the three wheat cultivars traits,

  The experiment treatments were as follows:-

  1- Control (only had recommended dose of N and P)

  2- Potassiumag (bio-fertilizer) alone at the rate of 8 envelopes it was added in two equal portions, the first was mixed with the grains then planted and the irrigated and the second portion was added by mixing it with amount of soil and broadcast it just before the first irrigation.

  3- Banana ash (4%) at the rate of 600 kg/fed. by mixing the amount with soil.

The banana ash was prepared by burning the by-product of it and the obtained product was analyzed, it contains 4% (K) in the dry matter

Table (1) some physical and chemical analysis of the experimental sites during the three growing seasons

Soil analysis	***The pot experiments during***		***The field experiments during***
	2011/2012	***2012/2013***	***2013/2014***
A-Physical analysis:			
-particle size distribution :			
Sand%	77.65	76.9	72.7
Clay%	10.35	10.8	14.1
Silt%	12	12.3	13.2
B-Chemical analysis :			
-catins(mg/L)			
Na^{++}	2.6	2.4	1.88
Mg^{++}	1.3	1.2	1
Ca^{++}	1.5	1.4	2
-Anions (mg/L).			
CL^{-}	1.91	1.88	1.5
So_4^{--}	2.6	2.71	2.23
HCO3	1.8	1.82	1.6
CO3	0.0	0.0	0.0
PH	7.4	7.3	8.2
EC(dsm-1)	0.72	0.78	0.4
Cu^{+} (ppm)	0.6	0.52	0.48
Zn^{++}	0.65	0.72	0.92
Mn^{++}	4.2	4.3	6
Fe^{++}	1.87	1.92	11
Available N (ppm)	15	15	15
Available P (PPm)	137	135	140
Available K (PPm)	728	720	604
Texture	Sandy loan	Sandy loan	Sandy loan

4- Potassiumag at the rate of 8 envelopes/fed and added as described before+ Banana ash at the rate of 600 kg/fed.

The previous three pot experiments, each one included 12 treatment, which were the combination between the three wheat cultivars and four fertilizer applications for each one, in three replications.

Some experimental processes had been detected as follow:-

1- The soil amount needed of the three experiments mixed with compost at the rate of 6 ton/fed. (75 g/pot).

2- The black polyethylene pot is characterized by surface area 1074.6 cm2 (37 cm diameter) and 52 cm long each one was occupied by 16 kg of the tested soil and placed in plastic dish to collect the flash water.

3-Chemical analysis of applied compost during the two growing seasons were recorded in Table (2**)**

Table (2) chemical analysis of the applied compost during the three growing seasons

Each treatment was in three replications, so, it has been 108 pots for the three experiments The coated grains of each treatment were left in shaded area for 15 minute and sown immediately at 20 and 22th November in 2012/2013 and 2013/2014 seasons respectively.

Determination	***The pot experiments during***	***The field experiments during***
	2011/2012	***2012/2013***	***2013/2014***
PH	7.8	7.7	7.6
O.M	38.11	38.33	36.45
EC(dsm-1)	4.71	4.65	5.13
C/N	14.8	14.72	15.28
N %	1.48	1.51	1.43
P %	0.55	0.56	0.54
K %	0.45	0.45	0.46
Fe (ppm)	1.25	1.28	1.27
Cu (ppm)	1.58	1.62	1.59
Zn (ppm)	1.82	188	1.91
Mn (ppm)	1.12	1.15	1.21

After germination by 15 days, the plants were thinned to 5 plants/pot. The nitrogen fertilizer was added as needed for each pot according to the different treatment of each experiment as shown before. To keep the tested fertilizer treatment of each pot, the flash water was collected in the plastic dish and repeated to it. The pot of each experiment was arranged in completely randomized design in the three replications.

The field experiments studied

Was conducted in field conditions at EL-klag, Al-Kalubia Governorate during 2013/2014 season to check the results gained in both seasons of the three pot experiments, under the field conditions.

The physical and chemical analysis of the experimental site as well as used compost analysis was recorded in the Table1 and 2 respectively. It wealthy to mention that, the above mentioned treatments studied in each pot experiment were repeated under the field conditions.

The spilt plot design with three replications was used in each experiment, whereas the three tested wheat varieties were allocated in the main plots its area 56 m2 [16 × 3.5] and the four studied fertilizer treatments of each experiment were devoted in the sub plots 14 m2 (3.5 × 4 m).

All cultural practices except studied treatments were followed as recommended for wheat cultivation in that area. Sowing was done on the 28th of November in 2013 season. Harvesting took place on 10th of May in 2014.

The studied technological properties:

1- Crude protein content: was determined by using micro-Kieldahl apparatus. The crude protein was calculated by multiplying the total nitrogen by 5.85 according to [1]

2- Dry gluten content.

3- Wet gluten content.

Wet and dry gluten contents in grains were determined by hand washing the meal according to the standard method [20], until starch was not detected in the washing water then dried and washed. The hydration capacity of gluten calculated as follows:

Hydration percentage = (Wet gluten – dry gluten) ×100/dry gluten.

4- Elasticity: was determined according to the standard method [2]

Statistical analysis:-

The data obtained from each season were subjected to the analysis of the variance of completely randomize and split plot designs for the pot experiment and field one respectively. As described by [23], however the treatment means were compared using the least significant difference (LSD) test at 0.05 levels, for each

III. Results

FIRST EXPERIMENT
NITROGEN FERTILIZER PACKAGES

Effect of some nitrogen fertilizer packages on some technological properties of of Sakha- 93, Masr- 1 and Banisweif-6 wheat varieties, in the two pot experiments at 2011/2012, 2012/2013 seasons and the field experiments in 2013/2014 session were shown in Tables 3 to 9.

A. Grain protein and wet gluten contents:

Table (3) show the effect of some nitrogen fertilizer packages on grain protein content and wet gluten content of three wheat varieties and their interaction during 2011/2012, 2012/2013 and 2013/2014 seasons.

The results cleared that, the studied varieties and nitrogen fertilizer packages were differed significantly on their effect on grain protein content and wet gluten content during the three experimental seasons. The results revealed that, Banisweif-6 variety surpassed significantly the other tested two wheat varieties during the three experimental seasons. That were 10.12, 11.56 and 11.44% for wet gluten content by through the pot and the field experiments during the three experimental seasons, respectively. [9], [11], [15], [16], [24], and [22], mentioned similar results.

Regarding to nitrogen fertilizer packages, results in pot experiment during 2011/2012 and 2012/2013 seasons revealed that the application of treatment 37.5 kg N/fed. + biogen + cysteine(N4) produced the highest values of grains protein content 13.05 and 13.03% during the previous seasons. Respectively as compared to other N packages. The same result was found under the condition of the field experiment in 2013/2014 seasons (12.94%). On the contrary, N1 treatment gave the lowest values of protein content 12.20, 12.16 and 12.09% during the three experimental seasons, respectively. Under field conditions, the differences between F3 and F4 did not reach the level of significant. In this, respect [8], [11], [15], and [24], Came to the same results.

Table 8 show that cultivating Banisweif-6 wheat variety and fertilized the plants by 37.5 kg N/fed + biogen + Cysteine (N4) gave the highest values of protein content in grains in the pot experiments 13.46 and 13.54% also in the field experiment 13.65% while the lowest protein values were recorded by cultivating Sakha-93 wheat variety and fertilized it's plants by adding N1 treatment during the three experimental seasons 11.80, 11.76 and 11.61% respectively. [24], and [22], reported these findings.

As for wet gluten content in grains, data recorded in Table (8) revealed that wet gluten affected significantly by N fertilizer packages in the three experimental seasons, and it's significantly was increased under the conditions of applying 37.5 kg N/fed + biogen + Cysteine (N4) by 11.22, 11.17 and 12.08% in 2011/2012, 2012/2013 and 2013/2014 seasons, respectively compared to N1 treatment (recommended N rate). It worthy to mentioned that the differences between N3 and N4 did not reach to the significant level.

Results in Table (8) clear that treating Banisweif-6 plants by 37.5 kg N/fed + biogen + Cysteine (N4) gave the greatest wet gluten content during the two seasons of the pot experiments or during the field experiment 28.39,28.55 and 28.53% respectively. These results are in the same line with those gained by [22].

B. Dry gluten content and Elasticity (BOU):

Results recorded in Table (4) show the effect of some nitrogen fertilizer packages on dry gluten content and elasticity of the three wheat varieties and their interaction during 2011/2012, 2012/2013 and 2013/2014 seasons.

The results cleared that the studied varieties and nitrogen fertilizer packages were differed significantly on its effect on dry gluten content and elasticity during the three experimental seasons. That results cleared that Banisweif-6 wheat variety surpassed the other two tested wheat varieties Sakha-93 and Masr-1 under the condition of the pot experiment during 2011/2012 and 2012/2013 seasons and the field experiments during 2013/2014 seasons.

Banisweif-6 gave the greatest dry gluten content 8.63, 8.62 and 8.68% under the three experimental seasons, respectively. Banisweif-6 variety exceeded Sakha-93 variety by 4.86, 4.61% and 5.36% for 2011/2012 and 2012/2013 as well as 2013/2014 seasons under the condition of the pot and the field experiments, respectively. It worthy to mentioned that dry gluten content and Elasticity of Masr-1 wheat variety and Sakha 93 wheat variety were in significantly differed. Similar results reported [24].

Regarding to nitrogen fertilizer packages of the pot experiments during 2011/2012 and 2012/2013 seasons revealed that the application of 37.5 kg N/fed +biogen + cysteine (N4) gave the highest values of dry gluten content 8.71 and 8.60% during the previous seasons, respectively as compared to the other N packages. The same trend was found 8.61% under the condition of the field experiment in 2013/2014 seasons .In this respect N4 treatment gave 4.81, 3.49 and 3.36% higher in dry gluten content than N1 treatment during the seasons in the pot and the field experiments, respectively. It worthy to mentioned that the differences between N1, N2 and N3 did not reach the level of significant in 2011/2012 and 2012/2013 seasons under the conditions of the pot experiment, and in the 2012/2013 season under the conditions of field experiment.

In respect with elasticity trait, results in table (4) show that the three tested wheat varieties were differed significantly with each other. Banisweif-6 gave 334.33, 353.08 and 349.52% higher elasticity over Sakha-93 wheat variety under the three experimental seasons in the pot and field experiments respectively. The differences between the three tested wheat varieties could mainly be attributed to the differences in their genetically constitution and their response to the environmental conditions. [16], and [41], reported similar results.

Table (3) Effect of some nitrogen fertilizer packages on grain protein content (%) and wet gluten of the three wheat varieties in 2011/2012, 2012/2013 and 2013/2014 seasons

character	Protein%														
season	2011/2012(pot exp.)					2012/2013(pot exp.)					2013/2014(field exp.)				
N fert. packge / Varieties	N1	N2	N3	N4	Mean	N1	N2	N3	N4	Mean	N1	N2	N3	N4	Mean
Sakha-93	11.80	12.52	12.72	12.79	12.46	11.76	12.40	12.62	12.67	12.36	11.61	12.23	12.40	12.47	12.18
Masr-1	11.98	12.63	12.83	12.90	12.59	11.89	12.58	12.75	12.88	12.53	11.84	12.43	12.62	12.71	12.40
Banisweif 6	12.82	13.27	13.35	13.46	13.23	12.82	13.37	13.47	13.54	13.30	12.81	13.38	13.59	13.65	13.36
Mean	12.20	12.81	12.97	13.05	12.76	12.16	12.79	12.95	13.03	12.73	12.09	12.68	12.87	12.94	12.64
LSD at 5 %															
Varieties (V)		0.08					0.06					0.14			
k.fertilizer(N)		0.09					0.07					0.11			
V x N		0.16					0.13					0.19			

character	wet Gluten%														
Season	2011/2012(pot exp.)					2012/2013(pot exp.)					2013/2014(field exp.)				
N fert. packge / Varieties	N1	N2	N3	N4	Mean	N1	N2	N3	N4	Mean	N1	N2	N3	N4	Mean
Sakha-93	23.13	25.16	25.57	25.71	24.89	23.14	24.92	25.37	25.46	24.72	22.94	24.82	25.17	25.31	24.56
Masr-1	23.97	25.63	26.04	26.19	25.46	23.72	25.43	25.75	26.00	25.23	23.76	25.48	25.86	26.06	25.29
Banisweif-6	25.07	28.02	28.18	28.39	27.41	25.12	28.20	28.43	28.55	27.58	24.59	27.96	28.41	28.53	27.37
Mean	24.06	26.27	26.60	26.76	25.92	23.99	26.18	26.52	26.67	25.84	23.76	26.09	26.48	26.63	25.74
LSD at 5 %															
Varieties (V)		0.34					0.29					0.74			
k.fertilizer(N)		0.40					0.34					0.37			
V x N		0.69					0.59					0.64			

N fertilizer package. N1=75kg N/fed. N2=37.5kg N/fed. +cysteine N3=37.5kg N/fed. +biogen N4=37.5kg N/fed. +biogen+cysteine

Table (4) Effect of some nitrogen fertilizer packages on dry gluten% and elasticity (B0U) of the three wheat varieties in 2011/2012, 2012/2013 and 2013/2014 seasons

character	Dry Gluten%														
season	2011/2012(pot exp.)					2012/2013(pot exp.)					2013/2014(field exp.)				
N.fert.packge / Varieties	N1	N2	N3	N4	Mean	N1	N2	N3	N4	Mean	N1	N2	N3	N4	Mean
Sakha-93	8.07	8.14	8.18	8.52	8.23	8.09	8.15	8.22	8.48	8.24	8.11	8.12	8.19	8.41	8.21
Masr-1	8.36	8.33	8.43	8.85	8.49	8.34	8.27	8.41	8.53	8.39	8.32	8.24	8.39	8.54	8.37
Banisweif-6	8.51	8.52	8.72	8.76	8.63	8.49	8.53	8.68	8.78	8.62	8.57	8.53	8.74	8.87	8.68
Mean	8.31	8.33	8.44	8.71	8.45	8.31	8.32	8.44	8.60	8.41	8.33	8.30	8.44	8.61	8.42
LSD at 5 %															
Varieties (V)		0.16					0.15					0.20			
N.fertilizer(N)		0.19					0.17					0.17			
V x N		N.S					N.S					N.S			

character	Elasticity(B0U)														
Season	2011/2012(pot exp.)					2012/2013(pot exp.)					2013/2014(field exp.)				
N.fert.packge / Varieties	N1	N2	N3	N4	Mean	N1	N2	N3	N4	Mean	N1	N2	N3	N4	Mean
Sakha-93	60.50	66.09	67.87	69.28	65.93	61.40	65.18	66.06	66.70	64.84	60.00	65.20	66.80	68.20	65.05
Masr-1	171.48	183.18	186.41	187.65	182.18	169.72	183.21	184.30	185.71	180.74	170.00	182.10	185.12	186.76	180.99
Banisweif-6	285.52	293.60	295.24	297.45	292.95	287.20	286.88	297.90	303.16	293.78	280.00	293.02	297.69	298.94	292.41
Mean	172.50	180.95	183.17	184.79	180.36	172.77	178.42	182.76	185.19	179.79	170.00	180.11	183.20	184.63	179.49
LSD at 5 %															
Varieties (V)		2.18					3.82					6.60			
N.fertilizer(N)		2.49					2.48					3.91			
V x N		4.30					4.29					6.77			

N fertilizer package. N1=58kg N/fed. N2=58kg N/fed. +cysteine
N3=37.5kg N/fed. +cerealin +cystine N4=37.5kg N/fed. +biogen +cystine

It worthy to mention that the differences between N3 and N4 did not reach to the significant level. The interaction effect between wheat varieties × N fertilizer packages showed significant effect on elasticity trait during the two seasons of the pot experiment as well as field experiment Insignificant integration effect between the two studied factors was observed for dry gluten content traits. This show that each of the two studied factors acted independently on this trait. As for elasticity trait, results in Table (4) clear that treating Baniwif-6 plants with N4 treatment gave the greatest elasticity during the two seasons of the pot experiment 297.45 and 303.16 BOU or during the field experiment 298.94 BOU. [16], and [24], cleared similar results.

IV. Discussion

In Egypt, different wheat varieties (Triticum aestivum L.) had been found that cultivated from the south to north of Delta and Upper Egypt according to their genetically differences, environmental factors and soil types. Therefore the varietal difference could be summarized in Protein parameters and gluten (dry or weight) content, as well as wheat quality i.e. elasticity are main part of evaluating the varietal value, as reported by [4], and [5]. As for protein content, dry and wet gluten % and elasticity, Banisweif-6 var. pronounced it's superiority, as compared with Masr-1 that located the second order and Sakha–93 var. which represented the third order. These results may be due to, the presence of mineral nitrogen fertilizer in the experimental soil increases the plant capacity to absorb nutrients by the increase of root surface / unit of soil volume and the high capacity of the plants supplied with N in building metabolism, which in turn contributes much to the enhancement of nutrient uptake, as explicated by [17], compost that was added to the experimental soil, during the three growing seasons, improves the physical and chemical soil properties, raising the level of organic matter and the soil ability for saving irrigation water, the application of different sources of nitrogen (mineral and bio fertilizer) play an important role in wheat productivity i.e. Nitrogen in general is essential for synthesis of chlorophyll, enzymes and proteins as published by [10], With respect to the importance of Cysteine as amino acid and it's impact on wheat productivity, first of all Cysteine in plants is fundamental process for protein biosynthesis and

all anabolic pathways that required reduced sulfur. Bacteria is able to reduce sulfate by assimilatory sulfate reduction to sulfate reduction to sulfide and to integrate in to Cysteine in the cytosol. [14], Cysteine had substantial influence on photosynthetic pigments and enzymes activities in the plants, [12], advocated the previous results, they found that treating wheat plants with Cysteine at the rate of 10-4 M was partially effective for ameliorating the harmful effect of heat temperature stress on photosynthetic pigments and the determined enzymes activities of wheat plants.

As for the interaction (V x N) effect on the studied parameters. It was significant on protein percentage, wet and dry gluten and elasticity.

The highest percentage of protein content, wet gluten and elasticity associated with Banisweif-6 that fertilized with N4 as shown in Tables

The preponderancy of Masr-1 or Banisweif-6 varieties might be ascribed to the fact that photosynthetic accumulated from the source to the sink were great enough to full all grains of these varieties as compared with Sakha 93 Var. and this reflected on protein and wet gluten contents in grains. On the other hand, increasing N fertilizer individually or in combination with bio fertilizer resulted in an increase in nitrogen absorption and assimilation in the plant and this in turn might account much of the increase content in grains. It could be concluded that, nitrogen fertilization favored the storage capacity of protein in grains.

SECOND EXPERIMENT
PHOSPHORUS FERTILIZER PACKAGES

Effect of some phosphorus fertilizer packages on grain protein content of Sakha-93, Masr-1 and Banisweif-6 wheat varieties: are presented in Table 10-15.

A. Grain protein content (%):

Results recorded in Table (5) show the effect of some phosphorus fertilizer packages on protein content in grains of the three wheat varieties and their interaction during 2011/2012, 2012/2013 and 2013/2014 seasons. The results cleared that wheat varieties studied and the phosphorus fertilizer packages were differed significantly due grain protein content during the three experimental seasons.

As for the variance between the tested wheat varieties, the results revealed that, Banisweif-6 wheat variety surpassed significantly Sakha-93 and Masr-1 varieties during the three experimental.

Results in Table (5) show that, the differences between Masr-1 and Sakha-93 wheat

Table (5) Effect of phosphorien, humic acid and phosphorien+ humic acid on grain protein content (%) of the three wheat varieties in 2011/2012, 2012/2013 and 2013/2014 seasons

character	Protein%														
season	2011/2012(pot exp.)					2012/2013(pot exp.)					2013/2014(field exp.)				
p.fert.packge / Varieties	p1	p2	p3	p4	Mean	p1	p2	p3	p4	Mean	p1	p2	p3	p4	Mean
Sakha-93	11.43	11.72	12.03	12.13	11.83	11.39	11.69	11.96	12.01	11.76	11.44	11.71	12.12	12.18	11.86
Masr-1	11.53	11.83	12.13	12.26	11.94	11.62	11.83	12.18	12.20	11.96	11.57	11.80	12.19	12.29	11.96
Banisweif-6	12.82	12.92	13.00	13.08	12.95	12.82	12.94	12.99	13.18	12.98	12.81	12.92	12.97	13.16	12.97
Mean	11.93	12.16	12.39	12.49	12.24	11.94	12.15	12.38	12.47	12.23	11.94	12.14	12.43	12.54	12.26
LSD at 5 %															
Varieties (V)		0.32					0.34					0.51			
P.fertilizer(P)		0.37					0.39					0.38			
V X P		NS					NS					NS			

P fertilizer package. P1=control 0 phosphorus P2=Phosphorien bactria P3=humic acid P4=Phosphorien bactria + humic acid

Varieties did not reach to the significant level in 20111/2012, 2012/2013 and 2013/2014 (field experiment). Appreciable differences were obtained between the three tested wheat varieties in grain yield /fed (Table 5). The preponderance of Banisweif-6 wheat variety might be ascribed to fact that, the photosynthesis accumulated from the source to the sink were great

enough to full all grains of Banisweif-6 compared with Sakha-93 wheat variety and this was reflected on protein content in grains. These findings are in accordance with those obtained by [22], and [24],Regarding to phosphorus fertilizer packages , results in the pot experiment during 2011/2012 and 2012/2013 seasons revealed that the application of phosphorein + Humic acid (P) produced the highest grain protein content (12.49 and 12.47%) during the previous seasons, respectively. The same results were found under the conditions of the field experiment. However, P1 treatment (zero phosphorus) recorded the lowest values of protein content. It worthy to mentioned that the differences between P4 and P3 did not reach to the significant level.

Results in Table (6) reveal that, P4 treatment gave 4.69, 4.44 and 5.03% higher in protein content in grains during the three experimental seasons. These results are might be due to the remarkable positive responses induced by intensive bio fertilizer with respect to nutrient content and grain protein content suggest the possibility of the promoting effect on photosynthetic products. In addition, phosphorus bacteria and humic acid plays an important role in increasing the amino acid content in plants [3], [6], and [19], gave this explanation.

The interaction effect between wheat varieties x P fertilizer packages showed insignificant differences on grain protein content during the two seasons of the pot experiment as well as the field experiment. The insignificant effect between the two studied factors showed that each of these two factors acted independently on these traits

Third experiment
Potassium fertilizer packages

Although K is not a constituent of any plant structures or compounds, it is essential in nearly all process needed to sustain plant life. Potassium is known to play a vital role in photosynthesis, translocation of photosynthetic, regulation of plant pores (stomata) activation of plant catalysts (enzymes) and many other processes. In addition the efficient hormonal effect of the bacterial inoculation.

Effect of some potassium fertilizer packages on grain protein content of Sakha-93, Masr-1 and Banisweif-6 wheat varieties as shown in Table 16 to 21

Grain protein content:

Results recorded in Table (6) show the effect of some potassium fertilizer packages on grain protein content of three wheat varieties and their interaction during 2011/2012, 2012/2013 and 2013/2014 seasons. Results revealed that the studied varieties and potassium fertilizer packages were differed significantly due to affect their grain protein content during the three experimental seasons of the pot and field experiments. As for the variance between the tested wheat varieties, the results cleared that Banysweif-6 wheat variety surpassed significantly Sakha-93 and Masr-1 wheat varieties without significant varietal differences between the later tested wheat varieties in the three experimental seasons under pot and field experiments. It's clear from the results that grain protein content of Banysweif-6 variety exceeded Sakha-93 wheat varieties by 9.95, 10.52 and 10.18% during 2011/2012, 2012/2013 and 2013/2014 seasons, respectively. The superiority of Banisweif-6 Masr-1 and Sakha-93 is might be ascribed to fact that the photosynthesis accumulated from the source to the sink were great enough to full all grains of Banysweif-6 as compared to Sakha-93 wheat variety and this was reflected on protein content in grains. Similar results were reported by [22], and [24].

Respecting potassium fertilizer packages, results in the pot experiment during 2011/2012 and 2012/2013 seasons, revealed that the application of potassiumag bacteria + banana ash(K4) gave the highest mean values for grain protein content 13.6 and 13.3%, respectively. The same results was found under the condition of the field experiment (13.18%). However, K1 treatment gave the lowest mean values of grain protein content. Other treatments recorded intermediate estimates for this trait in the three seasons. It worthy to mentioned that the difference between K2, F3 and K4 did not reach to the significant level

in the three seasons. In this respect K4 treatment recorded 5.43, 5.97 and 6.2 % higher than K1 treatment. This result could be attributed to the important role of potassium in photosynthesis, translocation of photosynthetic, regulation of plant pores
(stomata), activation of plant catalysis (enzymes). Also, potash is known as the quality nutrient because of its important effect on such factors as protein synthesis in plan as advocated by [25], and [19].

The interaction effect between wheat varieties x potassium fertilizer packages showed insignificant effect on grain protein during the three pot and field experimental seasons. This insignificant effect showed that each of the two studied factors acted independently on grain protein content in the three experimental seasons. The results are in agreement with those obtained by [7].

Table (6) Effect of some potassium fertilizer packages on grain protein content (%) of the three wheat varieties in 2011/2012, 2012/2013 and 2013/2014 seasons.

character	Protein%														
season	2011/2012(pot exp.)					2012/2013(pot exp.)					2013/2014(field exp.)				
K.fert packge / Varieties	K1	K2	K3	K4	Mean	K1	K2	K3	K4	Mean	K1	K2	K3	K4	Mean
Sakha-93	11.26	11.79	11.90	12.07	11.76	11.21	11.67	11.85	12.03	11.69	11.29	11.80	11.92	12.14	11.79
Masr-1	11.37	11.85	11.97	12.17	11.84	11.28	11.87	12.04	12.21	11.85	11.40	11.86	12.02	12.23	11.88
Banisweif-6	12.72	12.90	13.03	13.06	12.93	12.69	12.93	13.03	13.03	12.92	12.70	12.92	13.15	13.18	12.99
Mean	11.79	12.18	12.30	12.43	12.17	11.72	12.16	12.31	12.42	12.15	11.80	12.19	12.36	12.51	12.22
LSD at 5 %															
Varieties (V)		0.32					0.30					0.51			
k.fertilizer(K)		0.37					0.35					0.38			
V x K		NS					NS					NS			
K fertilizer package.		k1=control k0					k2=potassiumag bactria								
		k3=banana ash					k4=potassiumag bactria+banana ash								

V. Conclusion

According to the foregoing results, it concluded the effect of the studied bio fertilizers on wheat plant was fluctuated during the three successive growing seasons under the condition of either pot experiment or field experiment. Under the condition of the present study for maximizing the productivity and quality of weight crop and minimizing the coast of mineral fertilizers and environmental pollution, it can be recommended to cultivate Masr-1 and Banysweif-6 wheat varieties in the newly reclaimed land and treating their plant with 50% of recommended dose of N rate in addition to bio N,P and K fertilizers such as Cerealein, biogen, phosphorien, potassiumag in addition amino acid such as cysteine as well as organic acid like humic acid for their good ability to response to the foregoing this bio fertilizers as compared with Sakha-93 wheat variety. It could be concluded that bio fertilization approach and using of natural mineral amendments like cerealein, biogen, phosphorien, Potassiumag, amino acid like cysteine as well as organic acid like humic acid are consider an effective strategy for saving chemical fertilizer use and diminishing the risks of environmental pollution particularly with implying wheat production as an important cereals crops sustainable agriculture system.

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