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EFFECT OF BIO AND CHEMICAL NITROGEN FERTILIZERS WITH FOLIAR OF HUMIC AND AMINO ACID ON WHEAT

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ABSTRACT

Two field experiments were carried out at Manshaat Abdel-Rahman Dakahlia Governorate during winter seasons of 2004/2005 and 2005/2006 to study the effect of biofertilizer (Nitrobein), Chemical fertilizer as soluble (urea and ammonium nitrate) and slow release urea formaldehyde coated urea (UFCU) with foliar humic and amino acid on yield (grain and straw), uptake (N, P andK) and content of micronutrients (Fe, Zn, Mn and Cu) on wheat plants in clay soil. The experiment consists of 32 treatments which replicated 4 times. The experiment was factorial in complete randomized block design. The three studied effects of biofertilization, chemical N fertilizers (urea, AN and UFCU) and foliar of humic and amino acid as well as interaction between them exhibited a significantly positive effect and also:

- Inoculation of wheat grain by nitrobein as a biofertilizer under chemical N forms (Urea, AN and slow release UFCU) superposed chemical N fertilizers only.
- Used of slow release N fertilizer (UFCU) superiority chemical N fertilizer (urea and AN).
- The interactions of biofertilizer, chemical N and foliar humic and amino acids.

The study under the present conditions recommended nitrobein as biofertilization with slow release (UFCU) at rate 75 kg N/fed and foliar humic and amino acids, where it can give high production of grain yield of wheat and can lower environmental pollution.

Keywords: Urea formaldehyde coated urea, wheat, slow release, urea, ammonium nitrate, humic acid, amino acid.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the main cereal crops all over the world and one of the most important winter cereal crop in Egypt as well fertilization is an important limiting factor affecting wheat production. Numerous investigators proved various effect for both N, P and K fertilizers application on wheat yield and yield components.

Egypt is known to be a heavy user of fertilizers favoring N (over 300 kg N/ha/year) and usually neglecting K and micronutrients, while P use is fairly moderate. Such nutrient imbalance led to low yield, low efficiency of N use and high nitrate pollution in drainage and shallow ground water used for village drinking (El-Fouly and Fawzi, 1996).

Slow release nitrogen fertilizers were compared with another soluble and scientists emphasized their superiority in increasing the traits of wheat or other crops (Awad, *et al.* 1990, Singh and Singh 1991, El-Aila (1998).

El-Aila *et al.*., (1998) Showed that application of hydroquinone bentonite coated urea (HQCU) and bentonite coated urea (BCU) under two different levels of moisture content (60 and 40%) of water holding capacity (WHC) in two types of soils (clay and sandy) resulted in a highly significantly

increase in both grain and straw yields of wheat as compared with urea alone.

Slow release nitrogen fertilizers are addressed through two main processes 1) nutrient availability in the plant-soil system as affected by the interaction competition between: plant roots, soil microorganisms, chemical reactions and pathways for loss and 2): matching nutrient release with plant demand (Shavir and Mikkelsen 1993).

Some researches hance reported that humates (granular and liquid forms) can reduce plant stress as well as enhance plant nutrient uptake, decreasing the need for inorganic fertilizer for plant growth (Russo and Berlyn 1990).

John *et al.*., (1998), Webb and Bings (1998) found that the application of humic acids with a major component of leonardite to the root systems bfore planting enhance the root growth, fruit set, growth flushes, bark thickness and production of citrus trees.

Root uptake of amino acids is an energy driven process whereby the outwardly directed plasma membraine H^+-ATPase generates the proton-motive gradient to drive inwardly directed amino acid H^+-cotransport (Fischer *et al.*., 1998). Following uptake into the root cytoplasm, amino acid are used both for the production of new cell biomass and to produce energy, following deamination and introduction of the keto acids into the TCA cycle (Bush, 1993). Following uptake, amino acid can also be exported to the shoot via the xylem while some amino acids may also be returned back to the root via the phloem (Schenk, 1996, Caputo and Barneix, 1997).

Therefore, the present work was conducted to study the effect of bio and chemical nitrogen fertilizers with foliar of humic and amino acid on wheat.

MATERIALS AND METHODS

Two field experiments were carried out at Manshaat Abdel-Rahman, Dekerns District, Dakahlia Governorate, Egypt during two winter seasons of 2004/2005 and 2005/2006 to study the effect of N fertilizers forms (chemical and slow release" with and without biofertilizers (Nitrobein, and/or foliar application of humic and amino acids) on wheat yield grown in a clayey soil.
The experiment consists of 32 treatments representing the combinations between N forms, biofertilizers, and foliar application with humic and amino acid as shown in the following:

- Control
- Ammonium nitrate (AN)
- Urea
- Urea formaldehyde coated urea (UFCU) as slow release
- Bio fertilizer (Nitrobeine) – the commercial name of biofertilizer in Egypt which contained *Azospirillum* and *Azotobacter chrooccum*.
- AN+Bio
- Urea + Bio
- UFCU + Bio

8 treatments without foliar, 8 treatments with foliar humic acid, 8 treatments with foliar amino acid and 8 treatments with foliar humic and amino acid.

The experiment was factorial as split plot design which arranged in complete randomized block design with 4 replicates.

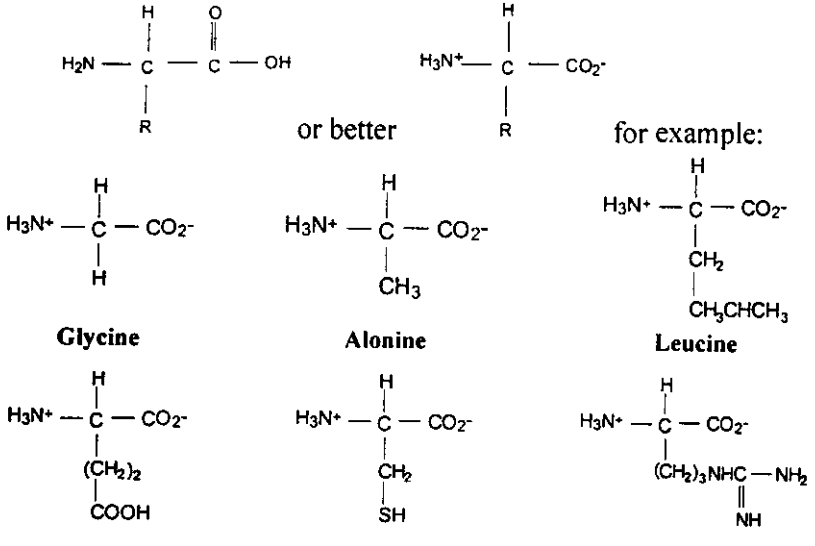
The experimented plot area was 4x5m. the filed was ploughed, leveled and plots of 20 m^2 were buildup. Uninoculated and inoculated with nitrobein wheat grains of Giza 168 variety at the rats of 70 kg/fed were sown and irrigated immediately.

Three sources of chemical nitrogen fertilizers were used, two sources soluble as ammonium nitrate (33.5%N) and urea (46.5%N) and one source slow release as urea formaldehyde coated urea (UFCU) total N 37.5% (Product by EFDC-El-Dlta Ferti, Egypt).

The addition of chemical N fertilizers at rate 75 kg N/fed in two doses, 1st dose was applied after 25 days from sowing, while the 2nd dose was applied after one month from the 1st dose, P_2O_5 as single super phosphate (15 kg/fed) in one dose was applied after 25 days from sowing and K as potassium sulfate (48% K_2O) was added after 45 days from sowing.

Foliar application of humic acid [(Hammr), contain 86% humic acid + 6% K_2O], amino acid [(pepton), contain 6% free amino acid LJ + 12% organic nitrogen + 3.5% K_2O] and mixture of humic + amino acid was at rate 3000 ppm for both humic and amino acid in two doses, (the 1st foliar after 40 days, 2nd foliar after 60 days from sowing) while mixed humic + amino acid was at rate 1500 ppm HA + 1500 ppm AA

All but one of amino acids can be considered to have the general formula derived from glycine (Sienko and Plane, 1983).



At booting stage, samples of whole plants were taken to determine micronutrients concentrations (Fe, Zn, Mn, and Cu) and at harvest stage grain and straw yield were measured for each plot (kg/20m^2) and samples from each were taken to determine macronutrient content (N, P and K).
Soil mechanical and chemical analyses were determined according to Jackson (1967), as shown in Table (1)

Table (1) Mechanical and chemicla analyses of the experimental soil

Parameter		1st Season	2nd Season
C. Sand %		3.4	3.5
F. Sand %		9.7	9.5
Silt %		38.6	37.8
Clay %		48.3	49.2
Texture		clayey	clayey
CaCO3 %		2.98	3.1
OM %		2.1	2.4
SP %		81.6	82.9
pH [Soil suspension 1:2.5 (soil:water)]		8.1	8
EC dS/m [Soil extraction 1:5 (soil:water)]		1.4	1.3
CEC (c mol/kg)		50.3	53.4
Available mg/kg	N	50	57
	P	8	8.3
	K	820	825
	Fe	8.3	7.2
	Mn	4.2	5.6
	Zn	0.46	0.5
	Cu	0.23	0.3
Total P (mg/kg)		517	593

Analyses of variance with LSD test were used to compare the effect of the studied treatments on the obtained data according to Gravetter and Wallnau (1985)

RESULTS AND DISCUSSION

Grain and straw yield:

Data illustrated in Table 2 show the effect of N forms, chemical (soluble and slow release) and bio N fertilizers and foliar humic and amino acids application and their interactions on grain and straw yield of wheat plant during two seasons.

As shown from the table, inoculation of wheat grain at sowing with nitrobein as a biofertilizer under both chemical soluble (AN, urea) and slow release (UFCU) nitrogen fertilization high significantly increase grain and straw yield of wheat plant, in two seasons of experiment than both chemical N fertilizers only. The mean value of wheat yield which calculated on the averages of all N treatments are 17.44, 16.56, 17.93 and 18.18, 17.10, 18.73 Ardb/fed for grain and 6.05, 5.86, 6.20 and 6.08, 5.96, 6.25 ton/fed for straw in the 1st season and 17.36, 16.65, 16.89 and 18.24, 18.46, 19.34 Ardb/fed for grain, 6.08, 5.91, 6.28 and 6.25, 6.09, 6.40 ton/fed for straw in the 2nd season due to uninoculation (AN, urea, UFCU) and inoculation with biofertilizer + (AN, urea, UFCU), respectively.

Table (2): Effect of bio, chemical fertilizers and foliar application of humic and amino acids on grain and straw yield of wheat in two seasons.

Treatments		Grain Yield (Ardab/fed)		Straw Yield (ton/fed)	
		1st season	2nd season	1st season	2nd season
Effect of bio and chemical fertilizers application					
Control		10.62	10.72	4.15	4.14
AN		17.44	17.36	6.05	6.08
Urea		16.56	16.65	5.86	5.91
S.R.		17.93	16.89	6.20	6.28
Bio		11.77	12.02	4.31	4.41
AN+Bio		18.18	18.24	6.08	6.25
Urea+Bio		17.10	18.46	5.96	6.09
SR+Bio		18.73	19.34	6.25	6.40
F test		**	**	**	**
LSD 5%		0.102	0.094	0.178	0.327
Effect of foliar application					
NO Foliar		15.64	15.98	5.56	5.62
Humic		16.00	16.13	5.60	5.67
Amino		16.16	16.29	5.63	5.71
Humic + Amino		16.36	16.45	5.66	5.79
F test		**	**	**	**
LSD 5%		0.077	0.089	0.202	0.414
Interaction Effect between bio and chemical fertilizers and foliar application					
NO Foliar	Control	10.40	10.53	4.10	4.12
	AN	17.09	17.20	6.01	6.05
	Urea	16.35	16.57	5.83	5.86
	S.R.	16.59	16.66	6.15	6.22
	Bio	11.51	11.77	4.28	4.33
	AN+Bio	17.89	17.95	6.05	6.11
	Urea+Bio	16.83	18.10	5.90	6.03
	SR+Bio	18.45	19.04	6.13	6.23
Humic	Control	10.53	10.68	4.14	4.12
	AN	17.33	17.36	6.05	6.08
	Urea	16.51	16.65	5.86	5.88
	S.R.	18.17	16.83	6.19	6.25
	Bio	11.69	11.94	4.31	4.37
	AN+Bio	18.07	18.10	6.07	6.22
	Urea+Bio	17.07	18.27	5.94	6.05
	SR+Bio	18.65	19.21	6.26	6.37
Amino	Control	10.68	10.79	4.16	4.15
	AN	17.58	17.40	6.07	6.08
	Urea	16.59	16.66	5.87	5.89
	S.R.	18.34	16.94	6.22	6.31
	Bio	11.89	12.14	4.32	4.45
	AN+Bio	18.27	18.37	6.08	6.31
	Urea+Bio	17.19	18.52	6.00	6.10
	SR+Bio	18.77	19.48	6.29	6.38
Humic + Amino	Control	10.88	10.89	4.22	4.17
	AN	17.75	17.50	6.09	6.11
	Urea	16.80	16.74	5.90	6.03
	S.R.	18.63	17.12	6.24	6.36
	Bio	12.01	12.22	4.33	4.50
	AN+Bio	18.48	18.52	6.12	6.38
	Urea+Bio	17.30	18.93	6.01	6.18
	SR+Bio	19.05	19.65	6.33	6.62
F test		**	Ns	Ns	Ns
LSD 5%		0.204	--	--	--

Regarding to the comparison between the effect of N soluble (AN and urea) and slow release (UFCU) on yield of wheat plants. It is noticed that application of UFCU for wheat plants increases grain and straw yield than soluble (AN and urea) with or without biofertilizers in two seasons. All treatments used give high significantly differ than control for both N chemical or bio fertilizer.

The present results are in agreement with the results El-Aila *et al.*., (1998); El-Ghamry (2003) and El-Naggar (2003)..

As shown in the same table the comparison between the effect of foliar application of humic and amino acids and bio and chemical soluble and slow release N fertilizers on yield of wheat plants. It is showed that foliar application of humic and amino acids for wheat plant increases grain and straw yield than no foliar, while treatments humic + amino give the high yield (grain and straw) of wheat than foliar amino acid and humic acid only in two seasons.

The mean values of wheat yield are (16.36, 16.16, 16.01) Ardb/fed for grain, (5.66, 5.63, 5.6 ton/fed) for straw in 1st season while (16.45, 16.29, 16.13) Ardb/fed for grain and (5.79, 5.71, 5.67 ton/fed) fro straw in 2nd season at foliar Hu+Am, Am and Hu, respectively.

The results in agreement with results Moussa (2004) on tomato and Kauser and Azam., (1985) on wheat.

Focus on the effect of interactions as a combination between foliar application (humic and amino acids) and both bio and chemical (soluble and slow release) fertilizers on grain and straw yield of wheat, there are highly significant for all treatments than control in two seasons.

Generally, it is noticed that foliar with Hu+Am under all treatments (chemical fertilizer, soluble or slow release and bio fertilizers) gives higher yield (grain and straw) of wheat plant than foliar amino acid, humic acid and no foliar in two seasons.

The highest grain yields of wheat plants are 19.05 and 19.65 Ardb/fed for grain and 6.33 and 6.62 ton/fed for straw in 1st and 2nd seasons, respectively due to inoculation with biofertilizers, slow release and foliar Hu+Am acids and are followed by 18.77, 19.48 Ardab/fed for grain and 6.29, 6.38 ton/fed for straw in both seasons, respectively due to foliar amino acid under application of slow release and inoculation wheat grain at sowing.

However the foliar with humic acid give 18.65, 19.21 Ardb/fed for grain and 6.26, 6.37 ton/fed for straw in both sesons under inoculation with Nitrobein and application of UFCU as slow release.

The best results obtaining from using UFCU with foliar both humic and amino acids under inoculation by nitrobein can be attributed to the slow release of N to meet wheat plant requirement, where coated by urea formaldehyde can low the dissolution rate of urea than urea.

The positive interaction effect between bio and slow release N fertilizer than soluble N fertilizer can be attributed to:

1- Saving the bacteria of biofertilizer (Nitrobein) to N by fixing process and avoiding N losses of soluble chemical N fertilizer. This N help in increasing plant growth and yield component of wheat plant, Sonbol *et al.* (2000).

2- Fixer bacteria for N as Azotobacter and Azospirillum can be secrete hormones. Which encourage plant growth and increase nutrient uptake (Dobbelaere *et al.*., 2003).
3- The slow release of N from UFCU can meet wheat plant requirement where the coat of urea formaldehyde can lower the dissolution rate of urea than AN.

N, P and K uptake:

Data presented in Tables 3, 4, and 5 show the effect of chemical and bio N fertilization, foliar application of humic and amino acids and their interactions on N, P and K uptake in grain and straw of wheat plants during two seasons.

As shown in the Tables, wheat inoculation at sowing with nitrobein as a bio fertilizer under chemical nitrogen fertilization (AN, urea and SR) gives high significantly increases N, P and K uptake in grain and straw in kg/fed.

The N uptake in kg/fed were 49.45, 43.80, 51.03, 55.24, 54.47, 62.19 in grain at 1st season, 51.59, 47.97, 50.24, 57.81, 56.73, 65.73, 65.32 in grain at 2nd season, 57.11, 56.90, 62.65, 65.99, 65.80, 72.13 in straw at 1st season, 56.85, 57.40, 63.03, 63.56, 65.82, 73.18 in straw at 2nd season.

While, P uptake in kg/fed were, 8.05, 8.14, 9.79, 9.21, 10.0, 12.1 in grain at 1st season, 8.34, 8.03, 8.68, 9.86, 10.05, 11.26 in grain at 2nd season, 8.47, 8.07, 9.30, 9.43, 9.40, 10.07 in straw in 1st season, 8.74, 7.99, 9.75, 9.12, 9.30, 11.07 in straw at 2nd season.

On the other hand, K uptake in kg/fed were, 35.19, 33.85, 37.61, 36.62, 35.33, 39.97, in grain at 1st season, 34.91, 34.16, 34.83, 37.0, 37.86, 40.32 in grain in 2nd season, 116.0, 113.64, 125.43, 124.95, 129.03, 142.36 in straw at 1st season, 115.06, 115.04, 127.09, 122.68, 126.17, 137.84 in straw in 2nd season.

Data in same tables also show a comparison between the effect of soluble (AN and urea) an slow release (UFCU) nitrogen fertilizer on N, P and K uptake by grain and straw of wheat plants. It is obvious that slow release N fertilizer (UFCU) with or without bio fertilizer increases all N, P and K uptake than soluble N fertilizers (AN and urea) and both are highly significant increased than control treatments.

Generally, it is noticed that highest values of all N, P and K parameters are at (UFCU) with bio fertilizers in two seasons. Also most values in two seasons significantly increase at (AN) than urea. This results are in agreement with El-Aila (1998) and El-Naggar (1999).

Data from the same Tables illustrate that the effect of foliar application of humic and amino acids under chemical N fertilizers (soluble and slow release) and bio fertilizers on N, P and K uptake. It is showed that the foliar of Hu+Am acids gives the highest value at all parameters than humic, amino and no foliar in two seasons. This increases are high significantly compared with control.

The highest value of N, P and K uptake are at foliar Hu+Am acids under bio and chemical fertilizers and the values are, 48.16, 50.30 for N uptake in grain, 61.2, 62.27 for N uptake in straw, 9.08, 8.94 for P uptake in grain, 8.89, 9.46 for P uptake in straw, 33.18, 32.85 for K uptake in grain, 116.97, 116.71 for K uptake in straw in 1st and 2nd seasons, respectively.

Table (3): Effect of bio, chemical fertilizers and foliar application of humic and amino acids on grain and straw N uptake (kg/fed) of wheat in two seasons.

Treatments		Grain N uptake (kg/fed)		Straw N uptake (kg/fed)	
		1st season	2nd season	1st season	2nd season
Effect of bio and chemical fertilizers application					
Control		20.44	20.90	32.20	32.66
AN		49.45	51.59	57.11	56.85
Urea		43.80	47.97	56.90	57.40
S.R.		51.03	50.24	62.65	63.03
Bio		25.43	25.80	34.59	35.64
AN+Bio		55.24	57.81	65.99	63.56
Urea+Bio		54.47	56.73	65.80	65.82
SR+Bio		62.19	65.32	72.13	73.18
F test		**	**	**	**
LSD 5%		0.053	0.066	0.020	0.013
Effect of foliar application					
NO Foliar		42.05	44.15	52.30	50.73
Humic		44.20	45.91	54.02	53.31
Amino		46.62	47.82	56.17	57.76
Humic + Amino		48.16	50.30	61.20	62.27
F test		**	**	**	**
LSD 5%		0.052	0.072	0.016	0.013
Interaction Effect between bio and chemical fertilizers and foliar application					
NO Foliar	Control	19.35	20.85	30.74	31.69
	AN	46.93	49.01	54.04	53.83
	Urea	43.52	45.22	53.03	52.74
	S.R.	44.80	47.23	59.07	57.19
	Bio	23.74	24.39	33.43	34.18
	AN+Bio	52.33	53.85	63.51	56.84
	Urea+Bio	48.72	52.41	60.19	57.10
	SR+Bio	57.02	60.25	64.37	62.24
Humic	Control	19.90	21.47	31.85	31.95
	AN	48.61	50.79	56.25	54.68
	Urea	42.82	47.44	55.67	54.64
	S.R.	50.70	48.72	60.63	59.38
	Bio	24.55	25.26	34.47	34.98
	AN+Bio	54.50	55.66	61.93	59.72
	Urea+Bio	50.69	54.26	62.41	62.36
	SR+Bio	61.82	63.67	68.93	68.75
Amino	Control	20.82	18.08	32.43	33.23
	AN	50.36	51.95	57.66	58.39
	Urea	43.43	48.74	58.12	58.92
	S.R.	53.11	50.83	62.20	64.96
	Bio	26.03	26.41	34.96	36.08
	AN+Bio	55.63	60.07	66.29	66.26
	Urea+Bio	58.79	58.36	66.63	67.13
	SR+Bio	64.77	68.10	71.08	77.14
Humic + Amino	Control	21.71	23.18	33.77	33.78
	AN	51.92	54.62	60.46	60.52
	Urea	45.41	50.47	60.79	63.30
	S.R.	55.50	54.20	68.69	70.57
	Bio	27.39	27.14	35.51	37.30
	AN+Bio	58.49	61.68	72.24	71.43
	Urea+Bio	59.69	61.90	73.96	76.68
	SR+Bio	65.16	69.26	84.15	84.59
F test		**	*	**	**
LSD 5%		0.106	0.133	0.041	0.026

Table (4): Effect of bio, chemical fertilizers and foliar application of humic and amino acids on grain and straw P uptake (kg/fed) of wheat in two seasons.

Treatments		Grain P uptake (kg/fed)		Straw P uptake (kg/fed)	
		1st season	2nd season	1st season	2nd season
Effect of bio and chemical fertilizers application					
Control		4.23	3.94	4.76	4.35
AN		8.05	8.34	8.47	8.74
Urea		8.14	8.03	8.07	7.99
S.R.		9.79	8.67	9.30	9.75
Bio		4.85	4.60	5.17	4.97
AN+Bio		9.21	9.86	9.43	9.12
Urea+Bio		10.00	10.05	9.40	9.30
SR+Bio		12.14	11.26	10.72	11.07
F test		**	**	**	**
LSD 5%		0.010	0.244	0.007	0.006
Effect of foliar application					
NO Foliar		7.38	7.09	7.16	7.07
Humic		8.13	7.81	8.03	7.73
Amino		8.61	8.54	8.58	8.38
Humic + Amino		9.08	8.94	8.89	9.46
F test		**	**	**	**
LSD 5%		0.007	0.315	0.004	0.006
Interaction Effect between bio and chemical fertilizers and foliar application					
NO Foliar	Control	3.90	3.63	4.10	3.70
	AN	7.18	7.74	7.81	7.56
	Urea	7.36	7.21	7.00	7.03
	S.R.	7.96	7.69	8.61	8.70
	Bio	4.44	4.24	4.72	4.32
	AN+Bio	8.32	8.34	8.47	8.09
	Urea+Bio	8.83	8.42	7.67	7.83
	SR+Bio	11.00	9.42	8.90	9.34
Humic	Control	4.11	3.85	4.45	4.12
	AN	7.80	8.07	8.47	8.51
	Urea	8.17	7.99	7.62	7.64
	S.R.	9.54	8.33	9.28	9.38
	Bio	4.74	4.48	5.17	4.81
	AN+Bio	8.95	9.78	9.11	8.71
	Urea+Bio	9.73	9.59	9.51	8.48
	SR+Bio	12.03	10.37	10.65	10.18
Amino	Control	4.32	4.05	4.99	4.57
	AN	8.44	8.62	9.10	9.12
	Urea	8.21	8.49	8.80	8.25
	S.R.	10.46	9.15	9.95	10.09
	Bio	4.99	4.73	5.18	4.90
	AN+Bio	9.59	10.47	9.73	9.48
	Urea+Bio	10.51	10.84	9.60	9.76
	SR+Bio	12.39	11.98	11.32	10.84
Humic + Amino	Control	4.57	4.25	5.49	5.00
	AN	8.79	8.93	8.52	9.78
	Urea	8.82	8.41	8.85	9.04
	S.R.	11.18	9.50	9.36	10.82
	Bio	5.23	4.95	5.63	5.84
	AN+Bio	9.98	10.83	10.41	10.20
	Urea+Bio	10.91	11.36	10.82	11.13
	SR+Bio	13.15	13.26	12.02	13.91
F test		Ns	**	*	**
LSD 5%		--	0.488	0.014	0.011

Table (5): Effect of bio, chemical fertilizers and foliar application of humic and amino acids on grain and straw K uptake (kg/fed) of wheat in two seasons.

Treatments		Grain K uptake (kg/fed)		Straw K uptake (kg/fed)	
		1st season	2nd season	1st season	2nd season
Effect of bio and chemical fertilizers application					
Control		17.81	18.18	62.67	60.26
AN		35.19	34.91	116.00	115.06
Urea		33.85	34.16	113.64	115.04
S.R.		37.61	34.83	125.43	127.09
Bio		19.96	20.38	66.30	65.03
AN+Bio		36.62	37.00	124.95	122.68
Urea+Bio		35.33	37.86	129.03	126.17
SR+Bio		39.97	40.32	142.36	137.84
F test		**	**	**	**
LSD 5%		0.017	0.024	0.026	0.030
Effect of foliar application					
NO Foliar		30.79	31.64	102.77	103.24
Humic		31.91	32.10	108.96	105.60
Amino		32.30	32.23	111.49	109.63
Humic + Amino		33.18	32.85	116.97	116.11
F test		**	Ns	**	**
LSD 5%		0.009	--	0.022	0.029
Interaction Effect between bio and chemical fertilizers and foliar application					
NO Foliar	Control	17.16	17.53	60.61	58.87
	AN	33.85	34.30	110.79	113.10
	Urea	33.10	34.81	104.90	111.34
	S.R.	34.34	34.24	118.75	121.84
	Bio	19.33	19.78	64.39	62.61
	AN+Bio	35.43	36.07	115.36	115.50
	Urea+Bio	34.33	36.92	118.61	117.54
	SR+Bio	38.75	39.42	128.76	125.14
Humic	Control	17.69	18.62	61.44	59.77
	AN	35.10	34.89	114.91	109.34
	Urea	33.68	33.96	114.24	113.41
	S.R.	37.89	34.83	126.83	125.03
	Bio	19.81	20.24	65.95	64.27
	AN+Bio	36.06	36.93	121.43	118.19
	Urea+Bio	35.07	37.55	127.79	121.10
	SR+Bio	40.00	39.76	139.08	133.68
Amino	Control	17.95	18.13	63.20	60.65
	AN	35.61	34.99	117.11	116.79
	Urea	33.84	33.74	115.04	114.89
	S.R.	38.52	34.81	126.27	128.02
	Bio	20.15	20.57	66.46	65.81
	AN+Bio	36.72	37.19	128.32	123.10
	Urea+Bio	35.59	37.78	130.85	128.83
	SR+Bio	39.99	40.62	144.66	138.97
Humic + Amino	Control	18.44	18.46	65.42	61.73
	AN	36.21	35.44	121.18	121.02
	Urea	34.78	34.14	120.38	120.53
	S.R.	39.69	35.44	129.86	133.46
	Bio	20.54	20.90	68.42	67.44
	AN+Bio	38.25	37.79	134.67	133.92
	Urea+Bio	36.34	39.18	138.88	137.23
	SR+Bio	41.16	41.48	156.92	153.59
F test		Ns	Ns	**	**
LSD 5%		--	--	0.053	0.060

Same Tables also, illustrated that the interactions effect between chemical N (soluble and slow release), bio fertilizer and foliar application of Hu and Am acids had sometimes highly significantly effects on N, P and K uptake by grain and straw yield of wheat plants in two seasons.

Generally, it is revealed that wheat inoculation by nitrobein as a biofertilizer under chemical (AN, urea, UFCU) and foliar application of Hu+Am acid gives more values for N, P and K uptake than chemcial N fertilizers only or with humic and amino acid as foliar in both seasons. Also, it is noticed that highest values of N, P and K parameters are at the biofertilization under slow release (UFCU) with foliar Hu+Am acids.

The present results are in agreement with those obtained by El-Mancy (1998) who found that inoculation grain wheat under chemical N, P and K gives high N, ,P and K uptake by wheat plants at booting flowering and maturity stages than chemical N, P and K fertilizer only.

Micronutrients content:

Data in Table 6 illustrated that the effect of bio, chemical fertilizers and foliar application of humic and amino acids on micronutrients (Fe, Zn, Mn, Cu) content in grain and straw yield of wheat plants at booting stage during two seasons.

As shown in the Table 6 inoculation of wheat by biofertilizer (Nitrobein) under chemical N (AN, urea and UFCU) fertilizers give high significantly increases for micronutrients content of whole wheat plants than uninoculated treatments (chemical N fertilizer only) at booting stage in both seasons. The means value of micronutrients (Fe, Mn, Zn and Cu) parameters (ppm) in wheat plants which calculated on the averages of all nitrogen treatments of (AN, urea and UFCU) with biofertilization in both seasons were, 115.8, 118.5, 126.0 for Fe content at 1^{st} season, 117.3, 119.3, 125.6 for Fe content at 2^{nd} season, while Zn were, 31.5, 30.3, 34.6 at 1^{st} season, 34.3, 35.3, 39.6 at 2^{nd} season, whereas, Mn were 25.3, 24.8, 27.5 at 1^{st} season, 24.8, 26.8, 30.3 at 2^{nd} season, and Cu were 8.8, 10.6, 12.5 at 1^{st} season, and 9.6, 11.1, 12.9 in 2^{nd} season.

Data in same table show the comparison between the effect of chemical (AN, urea and UFCU), biofertilizer and foliar humic and amino acid on micronutrients parameters at booting stage in two seasons. It is obvious that foliar humic, amino acid and Hu+Am for wheat plants increases micronutrients parameters than no foliar application.

All foliar gave micronutrent parameters which were high significantly differed than control. The present results show also that the highest values of micronutrients content (ppm) were at foliar Hu+Am acid which were amounted to 115.8, 117.1 for Fe, 29.4, 34.4 for Zn, 25.3, 25.6 for Mn, 10.1, 10.8 for Cu (ppm) in 1^{st} and 2^{nd} seasons, respectively.

As shown from the same table, interactions effect between N (chemical and bio fertilization) and foliar application of humic and amino acids on micronutrients content of whole wheat plants at booting stage are resulted in high values at biofertilizers under both chemical (AN, urea, UFCU) and foliar application.

Table (6): Effect of bio, chemical fertilizers and foliar application of humic and amino acids on grain and straw micronutrients content (ppm) in wheat at booting stage in two seasons.

Treatments		Fe		Zn		Mn		Cu	
		1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Effect of bio and chemical fertilizers application									
Control		100.5	102.3	16.3	18.8	17.7	19.0	5.4	6.1
AN		107.6	112.3	27.0	31.0	22.0	23.3	7.8	8.3
Urea		108.8	114.5	26.5	32.0	21.8	23.3	8.1	8.5
S.R.		111.0	118.3	29.0	34.9	24.5	25.3	9.9	10.0
Bio		104.8	106.3	17.0	19.8	19.5	20.3	6.3	7.3
AN+Bio		115.8	117.3	31.5	34.3	25.3	24.8	8.8	9.6
Urea+Bio		118.5	119.3	30.3	35.3	24.8	26.8	10.6	11.1
SR+Bio		126.0	125.6	34.6	39.6	27.5	30.3	12.5	12.9
F test		**	**	**	**	**	**	**	**
LSD 5%		1.845	1.406	0.614	0.610	0.627	0.622	0.179	0.206
Effect of foliar application									
NO Foliar		107.0	111.3	23.8	26.7	20.8	22.5	7.1	7.9
Humic		110.9	113.6	25.5	29.8	22.1	23.9	8.3	8.9
Amino		112.8	115.8	27.4	31.9	23.3	24.4	9.2	9.2
Humic + Amino		115.8	117.1	29.4	34.4	25.3	25.6	10.1	10.8
F test		**	**	**	**	**	**	**	**
LSD 5%		1.189	1.681	0.369	0.675	0.523	0.496	0.100	0.233
Interaction Effect between bio and chemical fertilizers and foliar application									
NO Foliar	Control	98	100	14	16	15.75	18	4.5	5.1
	AN	105.3	110	25	28	21	22	6.3	7.625
	Urea	103	112	24	27	20	21	6.5	7.3
	S.R.	108	115	26	30	23	23	8.3	8.5
	Bio	100	103	15	17	18	19	5.2	6.5
	AN+Bio	110	113	28	30	23	24	7.1	8.6
	Urea+Bio	112	116	27	31	22	26	8.3	9.4
	SR+Bio	120	121.25	31	34.5	24	27	10.5	10
Humic	Control	100	102	16	18	18	19	5.2	6.1
	AN	107	111	26	30	22	23	7.075	8.2
	Urea	108	114	25	31	21	23	8	8.3
	S.R.	112	117	28	35	24	25	9.3	9
	Bio	105	106	16	19	19	20	6.1	7
	AN+Bio	114	118	30	34	24	24	8.15	9.2
	Urea+Bio	116	117	29	33	23	27	10.5	11.1
	SR+Bio	125	124	34	38	26	30	12	12.3
Amino	Control	101	103	17	20	18	19	5.3	6.2
	AN	108	113	28	32	22	23	8.55	8.3
	Urea	110	115	27	34	22	24	8.3	8.5
	S.R.	111	120	30	35.5	25	26	10.7	10.3
	Bio	106	107	18	21	20	21	6.3	7.2
	AN+Bio	118	120	33	35	26	25	9.5	9.5
	Urea+Bio	120	121	31	37	25	26	11.6	10.6
	SR+Bio	128	127	35.5	41	28	31	13.1	13.2
Humic + Amino	Control	103	104	18	21	19	20	6.5	7
	AN	110	115	29	34	23	25	9.3	9.1
	Urea	114	117	30	36	24	25	9.7	10
	S.R.	113	121	32	39	26	27	11.2	12
	Bio	108	109	19	22	21	21	7.6	8.3
	AN+Bio	121	118	35	38	28	26	10.3	10.95
	Urea+Bio	126	123	34	40	29	28	12.1	13.2
	SR+Bio	131	130	38	45	32	33	14.3	16
F test		Ns	Ns	**	**	**	**	**	**
LSD 5%		--	--	1.228	1.220	1.255	1.244	0.359	0.414

In general, the differences from increase were highly significantly except for Fe content in two seasons. The highest values of micronutrients parameters were at interactions between biofertilizer under slow release fertilizers and foliar Hu+Am acids. The values are 131, 1 30 Fe, 83, 45 for Zn, 32, 33 for Mn and 14.3, 16 for Cu in 1st and 2nd respectively. This results are in agreement with El-Aila (1998).

The study under the present conditions recommended nitrobein as biofertilization with slow release (UFCU) at rate 75 kg N/fed and foliar humic and amino acids, where it can give high production of grain yield of wheat and can lower environmental pollution.

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تأثير الأسمدة النيتروجينية الحيوية والكيمائية والرش بالأحماض الهيومية والأمينية على القمح

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تم إقامة تجربتين حقليتين بقرية منشأة عبد الرحمن مركز دكرنس محافظة الدقهلية خلال موسمى ٢٠٠٤/٢٠٠٥ ، ٢٠٠٥/٢٠٠٦ لدراسة تأثير استخدام الأسمدة الحيوية (النيتروبين) والكيمائية الذائبة مثل (اليوريا ونترات النشادر) والبطيئة الزوبان مثل اليوريا المغلفة باليوريا فورمالدهيد وكذلك الرش بحمض الهيوميك والأحماض الأمينية على نبات القمح من حيث محصول الحبوب والقش وامتصاص العناصر الكبرى (النيتروجين ، الفوسفور، والبوتاسيوم) كذلك المحتوى من العناصر الصغرى في مرحلة التفريع مثل (الحديد - الزنك - المنجنيز - النحاس).

واحتوت التجربة على ٣٢ معاملة كررت كل منها ٤ مرات شملت على ٤ معاملات بدون تسميد حيوى وهي (الكنترول - اليوريا - نترات النشادر) والأسمدة بطيئة الزوبان وكررت مع التسميد الحيوى.

تم الرش بحامض الهيوميك لـ ٨ معاملات فقط وكذلك الأحماض الأمينية لـ ٨ معاملات أخرى ثم الهيوميك + الأحماض الأمينية لـ ٨ معاملات أخرى.

تم تسميد جميع المعاملات بمعدل ٧٥ كجم نيتروجين/فدان فيما عدا الكنترول وكذلك تم إضافة المعدل الموصى به من الأسمدة الفوسفاتية والبوتاسية.

وكانت التجربة عاملية في تصميم قطاعات كاملة العشوائية. واشتملت الدراسة على ثلاث عوامل هي تأثير التسميد الحيوى مقارنة بالسماد النيتروجينى المعدنى والبطئ الذوبان وتأثير التفاعل بين المعاملات والرش بالأحماض الهيومية والأمينية.

وقد أظهرت النتائج تأثيرا معنويا موجبا على المقاييس تحت الدراسة.

- تفوق التسميد الحيوى مع الكيماوى على الكيماوى منفرردا.
- تفوق معاملات نترات الأمونيوم عن معاملات اليوريا سواء بمفردها أو مع الحيوى.
- تفوق معاملات السماد بطئ الذوبان (اليوريا المغلفة باليوريا فورمالدهيد) على الأسمدة الذائبة سواء مع أو بدون حيوى.
- تفوق معاملات السماد البطئ الذوبان مع الحيوى والرش بكل من الأحماض الأمينية والهيوميه عن باقي المعاملات.

وقد أوصت الدراسة باستخدام الأسمدة الحيوية مع البطيئة الذوبان والرش بالأحماض الأمينية والهيومية في مراحل النمو قبل الطرد بمعدل مرتين أو ثلاثة. حيث أن هذه المعاملات تعطى أعلى إنتاجية كما أنها تقلل من تلوث البيئة.