J. Agric. Sci. Mansoura Univ., 27(8): 5449 – 5460, 2002

INFLUENCE OF MICROBEIN (BIOFERTILIZER) AND DIFFERENT RATES OF NITROGEN AND PHOSPHORUS ON GROWTH, YIELD AND QUALITY OF POTATO PLANT.

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ABSTRACT

This investigation was carried out during the two Fall (Nili) seasons of 1998/1999 and 1999/2000 on potato cv. Diamont at Baramoon Experimental Farm, Dakahlia Governorate, Egypt, to study the influence of Microbein as biofertilizer and four different rates of nitrogenous and phosphorous as mineral fertilizers, i.e., 25 % N + 25 % P_2O_5, 50 % N + 50 % P_2O_5, 75 % N + 75 % P_2O_5 and 100 % N + 100 % P_2O_5 of the recommended dose of N+P (180 kg N + 75 kg P_2O_5/fed.) as well as their interactions on growth, tuber yield and contents of NPK in foliage and tubers as well as starch and Nitrate content in tubers.

Results showed that treating potato seed tubers with Microbein before planting, increased significantly plants stand (%) in the first season, vegetative growth, i.e., plant height, foliage fresh weight/plant (in the first season), number of main stems/plant (in the second season), foliage dry weight (%), and yield parameters i.e., total tuber yield (ton/fed.), number of tubers/plant, tuber average weight (g), tuber dry matter (%), NP content in foliage, N (in the second season), P in the two seasons), K (in the first season) in tubers and starch content in tubers as compared to the untreated seed tubers. On the other hand, nitrate concentration (ppm) was not significantly affected in both seasons.

Increasing nitrogen and phosphorus rates up to 75 % N + 75 % P_2O_5 of the recommended dose/fed., increased significantly in foliage dry weight (%), yield parameters and starch content in tubers in the two seasons, while plant stand (%), plant height, foliage fresh weight (in first season), number of main stems/plant (in the second season), NPK in foliage and tubers as well as nitrate concentration increased by increasing (N+P) rates up to the recommended full doses (100 % N + 100 % P_2O_5) in two seasons.

The interaction between Microbein and (N+ P_2O_5) rates showed also significant effects on foliage dry weight, yield parameters, N content in foliage in both seasons and K content in foliage in the second season.

Generally, treating seed potato tubers with Microbein (biofertilizer) at rate of 10.67 kg/ton before planting in addition to 75 % N + 75 % P_2O_5/fed.) of the recommended doses gave the maximum yield and quality of tubers. Moreover, treating seed tubers with Microbein before planting will save about 25 % of the required amounts of NP fertilizer/fed, particularly in the clayey loam soil and consequent will decrease the total cost of production per fed. in addition to the environmental pollution with the high rates of chemical fertilizers will also be decreased.

INTRODUCTION

Potato (*Solanum tuberosum* L.) is considered as one of the most important vegetable crops in Egypt. There is a continuous big demand on potatoes for both local market, processing and exportation. Which requires

much more nutrients, specially, N, P and K as compared with other vegetable crops.

There are many beneficial effects for using biofertilizers in agriculture such as, quick supplying of plant nutrients and increasing crop productivity.

Several investigators, reported that biofertilization of potato plants lead to significant increase of vegetative growth parameters, i.e., plant height, number of main stems per plant and both foliage fresh and dry weight per plant Panigrahi and Behera (1993), Sidarenko *et al.* (1996).

Abdel-Ati *et al.* (1996) reported that inoculation potato tuber seeds with P-solubilizing bacteria; *Bacillus megaterium* combined with N_2-fixing bacteria, *Azospirillum* increased potato plant height, number of branches/plant and fresh and dry matter content/plant. Moreover, number of tubers/plant and the total tubers yield/fed. were also increased. Similarly, El-Gamal (1996) and Hammad and Abdel-Ati (1998) indicated that using biofertilizers with or without nitrogen fertilizer increased plant height, number of branches/plant, number and weight of tubers/plant, dry matter content of tubers and total tuber yield/fed., as well as N and P content in foliage and tubers. Zahir and Muhammed (1996); Ashour *et al.* (1997); Zahir *et al.* (1997); Ashour (1998); Javed and Arshad (1998); Mahendran and Kumar (1998) and Muhammed *et al.* (1999) found that biofertilization of potato plants significantly, increased tuber DM (%) and total tuber yield. Javed and Arshad (1998) reported that inoculating potato tubers with rhizobacteria isolates increased tuber yield.

Fayez *et al.* (1985), El-Dahtory *et al.* (1989) and Hammad and Abdel-Ati (1998) reported that *Azospirillum* has the ability not only to fix nitrogen, but also to release certain phytohormones of gibberellins and indolic nature, which could stimulate plant growth, absorption of nutrients and photosynthesis process. Hammad and Abdel-Ati (1998), Abd El-Naem *et al.* (1999) and Tawfik (2001) found that inoculation biofertilizers led to potato plants, significantly reduced NO_3-N content in tuber.

Many investigators reported that vegetative growth parameters, i.e. (plant height, number of main stems/plant, fresh and dry weight of plant and yield parameters (number of tubers/plant, total tuber yield, dry matter content of tubers, tuber average weight) and NPK content increased by increasing NPK levels Ali (1994); Singh and Sharma (1994); Shehata and Abdo-Sedera (1994); Joern and Vitosh (1995); Sharma and Arora (1987); Awad (1997); Ashour and Sarhan (1998); Deka and Dutta (1998) and Arisha and Bardisi (1999).

Nitrogenous chemical fertilizer is commonly added to soil to produce high tuber yield. Ashour and Sarhan (1998), Hammad and Abdel-Ati (1998), Abd El-Naem *et al.* (1999) and Tawfik (2001) found that increasing nitrogen levels led to an increase in nitrate and nitrite content tuber.

Generally, using biofertilizers might reduce, partly; the total amounts of chemical fertilizers applied and consequently, will reduce the total cost of potato production. Moreover, biofertilization has become an appropriate tool for reducing environmental pollution and, in the mean that, earning good economic return.

This study was conducted with the aim of determining the effect of Microbien (biofertilizer) together with different rates of mineral fertilizers

($N+P_2O_5$) fertilizers on the growth, yield and quality of potato tubers. Moreover, it was essential also to investigate the effect of biofertilizers on the nitrate concentration in potato tubers.

MATERIALS AND METHODS

This study was carried out during the two successive fall (Nili) seasons of 1998/99 and 1999/2000 at the Barramon Experimental Farm (Dakahlia Governorate) to investigate the response of potato plants cv. Diamont to biofertizers and different rates of nitrogen and phosphorus on growth, yield and quality.

Potato seed tubers were planted on the 10th and 12th of October in the two seasons, respectively. Some physical and chemical analysis of the experimental soil are shown in Table (1)

Table (1):Some physical and chemical properties of the experimental soil.

Texture	Sand	Silt	Clay	$CaCO_3$	pH	Available nutrients (ppm)		
	(%)	(%)	(%)	%		N	P	K
Clayey loam	24.0	31.3	40.5	3.4	7.9	28.5	12.5	309

The source of biofertilizer

Microbein as biofertilizer obtained from the General Organization Equalization Food (GOEF), Ministry of Agriculture, Egypt. Microbein is a mixture of N_2-fixing (*Azospirillum spp.* and *Azotobacter spp.)* and P-solubilizing bacteria (*Bacillus spp*). Before planting, the wet seed tubers were well mixed with Microbein at the rate of 10.67 kg/ton of seed tubers.

The experimental design used was a split plots with three replicates and the plot area was estimated 11.25 m^2 (3 ridges each with 5 m long and 0.75 m width). The main plots were occupied by biofertilizer treatments (Microbein) whereas, the subplots were as follows:

1- 25 % N + 25 % P_2O_5/fed. of the recommended dose.
2- 50 % N + 50 % P_2O_5/fed. of the recommended dose.
3- 75 % N + 75 % P_2O_5/fed. of the recommended dose.
4- Control (100 % N + 100 % P_2O_5/fed.), full a recommended dose (180 N + 75 P_2O_5 kg/fed.).

Ammonium nitrate (33.5 % N) as a source of nitrogen was added at three equal portions after 3, 5 and 7 weeks from planting date for all treatments, while phosphorous as a normal superphosphate (15.5 P_2O_5) was added once before planting during soil preparation. Potassium sulphate (48 % K_2O) was added once after 7 weeks from planting date with rate of 96 kg K_2O/fed.

Studied characters

Vegetative growth characters:

5 plants for samples of potato plants were taken after 75 days after planting (DAP) from each plot and the following data were recorded: plant

stand (%) at 45 DAP, plant height, number of main stem/plant, foliage fresh weight/plant and foliage dry weight (%).

Yield parameters:

Total tuber yield (ton/fed.), average of number tubers/plant, average tuber weight, tuber dry matter (%) were determined at the harvest time.

Chemical composition:

The mineral content N, P and K were determined at 75 days from planting at harvest time for foliage and tuber, respectively, in addition to starch content (%) in tubers by using the methods outlined by Jackson (1967). Nitrate concentration (ppm on dry weight basic) was determined according to the description of Singh (1988).

Data were statistically analyzed and means were compared by using L.S.D test as described by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

1- Vegetative growth

a- Effect of Microbein:

Data presented in Table (2) show that plant stand (%) and foliage fresh weight, significantly were increased by treating seed potato tubers with Microbein. This was tree only in the first season, while in the second one; differences between treatments were not significant. Concerning to, number of main stems/plant, was also increased, significantly, by treating seed tubers with Microbein but only in the second season, whereas foliage dry weight was significantly increased by this treatment in the two successive seasons as shown in the same table (Table 2). These results might be attributed to the role of bacteria in producing the phytohormones indole acetic acid (IAA), gibberellins, cytokinins and ethylene which play an important role in plant life during the early stages of growth (Martin *et al.*, 1989; Subba Rao, 1993; Abdel-Ati *et al.*, 1996; Bashan and Holguin, 1997; Hammad and Abdel-Ati, 1998 and Muhammad *et al.*, 1999).

b- Effect of N and P rates:

Data in Table (2) also indicated clearly that plant stand, plant height and both fresh and dry weight/plant were significantly increased with increasing nitrogen and phosphorous rates only in the first season. Similarly, number of main stems per plant was also increased significantly by increasing N+P rates but only in the second season. Such results could be due to the role of the three elements (NPK) in increasing mersitemic activities and consequently the vegetative growth of plants. These results are obtained by Abo-Sedera and Shehata (1994); Arisha and Bardisi (1999); Abdulla (1999); Ali (2002) and El-Kader (2002) who found that increasing NPK levels have an important role in enhancing the vegetative growth of potato plant.

Table (2): Effect of Microbein (biofertilizer), N and P rates and their interactions on plant stand and vegetative growth of potato plant during the two Fall (Nili) seasons of 1998 and 1999.

Characters / Treatments	Plant stand (%)		Plant height (cm)		No. of main stems /plant		Foliage fresh weight /plant (g)		Foliage dry weight (%)	
	1998	1999	1998	1999	1998	1999	1998	1999	1998	1999
Microbein treatment										
With	84.47	82.08	50.08	53.67	2.47	1.87	317.8	257.4	13.31	13.03
Without	81.67	84.40	55.67	56.08	2.67	2.76	293.08	287.6	12.41	12.50
F-test	*	NS	*	NS	N. S	*	*	NS	*	*
N and P rates/fed.										
25 % N + 25 % P_2O_5	81.11	82.20	47.67	52.50	2.27	1.78	255.7	249.2	11.72	11.62
50 % N + 50 % P_2O_5	83.10	82.44	51.67	53.83	2.33	2.17	279.5	227.5	12.06	12.14
75 % N + 75 % P_2O_5	83.22	83.61	54.50	56.00	2.58	2.37	332.7	271.4	13.98	13.86
100 % N + 100 % P_2O_5	84.84	84.72	57.67	57.17	3.08	2.93	353.8	342.0	13.66	13.46
L.S.D at 5 %	2.32	NS	2.78	NS	NS	0.51	13.9	NS	0.62	0.40
Interactions										
With Microbein										
25 % N + 25 % P_2O_5	80.33	81.22	46.00	51.00	2.20	1.57	268.7	260.7	11.96	11.74
50 % N + 50 % P_2O_5	81.99	81.33	47.00	52.00	2.17	1.67	292.7	191.0	12.47	12.18
75 % N + 75 % P_2O_5	81.14	82.22	52.33	54.67	2.50	2.00	342.0	225.8	14.98	14.65
100 % N + 100 % P_2O_5	83.22	83.55	55.00	57.00	3.00	2.23	367.7	352.3	13.81	13.56
Without Microbein										
25 % N + 25 % P_2O_5	81.89	83.17	49.33	54.00	2.33	2.00	242.7	237.7	11.48	11.49
50 % N + 50 % P_2O_5	84.22	83.55	56.33	55.67	2.50	2.67	266.3	264.0	11.65	12.10
75 % N + 75 % P_2O_5	85.29	85.00	56.68	57.33	2.67	2.73	323.3	317.0	12.98	13.06
100 % N + 100 % P_2O_5	86.47	85.84	60.33	57.33	3.17	3.63	340.0	331.7	13.51	13.35
L.S.D at 5 %	NS	NS	NS	NS	NS	NS	NS	NS	0.88	0.26

c- Interaction effect of Microbein and (N+P) rates:

Data in Table (2) also, revealed that the interactions between Microbein and NP rates had no significance effect on all parameters of vegetative growth, except that of the foliage dry weight/plant in the two seasons. The highest significant value was always obtained by treatment treated with Microbein and was applied by 75 % of the recommended doses from nitrogen and phosphorous. These results are similar with those obtained by El-Gamal (1996) and Hammad and Abdel-Ati (1998).

2- Yield parameters:

a- Effect of Microbein:

Results presented in Table (3) reveal that inoculation potato seed tubers with biofertilizer (Microbein) caused significant increases in the yield components i.e. total tuber yield (ton/fed.), number of tubers/plant, tuber average weight and tuber dry weight in the two seasons. In case of total tuber yield/fed. The increases were 20.60 and 30.24 % in two successive seasons, respectively.

Table (3): Effect of Microbein (biofertilizer), N and P rates and their interactions on total tuber yield and its components during the two Fall (Nili) seasons of 1998 and 1999.

Characters / Treatments	Total yield (ton/fed.)		No. of tubers/plant		Aver. tuber weight (g)		Dry weight of tubers (%)	
	1998	1999	1998	1999	1998	1999	1998	1999
Microbein treatment								
With	10.59	10.49	4.46	4.63	94.50	93.53	21.32	21.12
Without	8.78	8.05	4.23	4.68	89.13	86.84	20.64	20.39
F-test	*	*	*	*	*	*	*	NS
N and P rates/fed.								
25 % N + 25 % P_2O_5	6.961	7.11	3.15	3.33	75.18	72.72	19.27	19.33
50 % N + 50 % P_2O_5	8.88	8.81	3.45	3.83	86.18	83.85	20.25	19.97
75 % N + 75 % P_2O_5	11.58	11.89	5.42	5.83	107.16	102.71	22.49	22.06
100 % N + 100 % P_2O_5	11.31	11.29	5.35	5.50	104.75	101.59	22.00	21.69
L.S.D at 5 %	**0.43**	**0.51**	**0.20**	**0.28**	**2.39**	**2.21**	**0.36**	**0.63**
Interactions								
With Microbein								
25 % N + 25 % P_2O_5	7.87	7.39	3.20	3.33	76.75	73.63	19.37	19.41
50 % N + 50 % P_2O_5	9.44	9.29	3.53	3.83	89.57	86.82	20.51	20.14
75 % N + 75 % P_2O_5	13.34	13.57	5.70	5.83	115.32	110.00	23.30	23.16
100 % N + 100 % P_2O_5	11.69	11.70	5.40	5.50	108.36	103.60	22.11	21.78
Without Microbein								
25 % N + 25 % P_2O_5	6.06	6.84	3.10	3.33	73.61	71.63	19.18	19.24
50 % N + 50 % P_2O_5	8.32	8.33	3.37	4.13	82.80	86.82	19.99	19.80
75 % N + 75 % P_2O_5	9.81	10.21	5.13	5.10	99.00	110.00	21.68	20.96
100 % N + 100 % P_2O_5	10.93	10.83	5.30	5.33	101.13	103.68	21.89	21.59
L.S.D at 5 %	**0.61**	**0.72**	**0.29**	**0.40**	**3.39**	**3.13**	**0.50**	**0.90**

This increment might be attributed to the non-symbiotic bacteria present in Microbein which have beneficial effects on plant growth by different mechanisms e.g., enhanced N_2-fixation or increased N assimilation, as well as enhancing mineral uptake, and improving root growth and functions. Similar conclusions were reported by Aggarwal and Chaudhary, 1995, Stancheva *et al.*,1995, and Bashan and Holguin, 1997.

b- Effect of N and P rates:

Data in Table (3) also indicated that total tuber yield (ton/fed.), number of tubers/plant, tuber average weight and tuber dry matter were increased by increasing of (N+P) rates in the two seasons. These increases might be due to the favourable effects of mineral fertilizers on the efficiency of photosynthetic capacity and vegetative growth which in turn resulted in more accumulation of stored food and finally produced large potato tubers. Similar results were reported by Awad (1997); Ali (2002) and El-Kader (2002).

c- Interaction effect of Microbein and (N+P) rates:

Results in Table (3) also, showed that the interactions between Microbein and (N+P) rates as mineral fertilizer had significant effect on total tuber yield/fed., number of tubers/plant, tuber average weight and tuber dry matter (%) in the two seasons. The highest production of potato tubers were obtained with Microbein plus (75 % N+ 75 % P_2O_5 /fed.). These results are line with those obtained by El-Gamal (1996); Hammad and Abdel-Ati (1998) and Hussein and Radwan (2002).

3- Nutrient content

a- Effect of Microbein:

Data in Tables (4 and 5) represent the effect of Microbein on N, P and K content (%) in foliage and tuber, respectively. Microbein application increased, significantly, N and P contents of foliage as shown in Table (4). This was true in the two successive seasons. On the other hand, potassium content in foliage was not affected significantly, by Microbein application in the two seasons. Concerning tuber content, it could be clearly noticed from Table (5) that N content (in the first season), P content (in the two seasons) and K content (in the first season) increased significantly by Microbein application. These results suggest that N-fixing bacteria (*Azotobacter* and *Azotspirillum*) respondent in Microbein have the ability to supply plants with their nitrogen requirements, in addition to the role of phosphate solubilizing bacteria in availability of soil immobilized phosphorus, which in turn reflects on P uptake. These results are in agreement with those reported by El-Gamal (1996); Abdel-Ati (1998) and Tawfik (2001).

Table (4):Effect of Microbein (biofertilizer), N and P rates and their interactions on N, P and K (%) in foliage at 75 DAP during the two Fall (Nili) seasons of 1998 and 1999.

Characters / Treatments	N (%)		P (%)		K (%)	
	1998	1999	1998	1999	1998	1999
Microbein treatment						
With	2.54	2.30	0.28	0.25	2.76	2.64
Without	2.20	2.04	0.23	0.21	2.79	2.72
F-test	*	*	*	*	**NS**	**NS**
N and P rates/fed.						
25 % N + 25 % P_2O_5	1.86	1.81	0.19	0.18	2.52	2.52
50 % N + 50 % P_2O_5	2.20	2.08	0.23	0.20	2.68	2.64
75 % N + 75 % P_2O_5	2.70	2.32	0.31	0.27	2.88	2.56
100 % N + 100 % P_2O_5	2.72	2.47	0.29	0.28	3.01	2.90
L.S.D at 5 %	**0.11**	**0.08**	**0.004**	**0.003**	**0.27**	**0.26**
Interactions						
With Microbein						
25 % N + 25 % P_2O_5	1.92	1.88	0.21	0.17	2.58	2.53
50 % N + 50 % P_2O_5	2.47	2.19	0.25	0.21	2.72	2.66
75 % N + 75 % P_2O_5	2.86	2.47	0.33	0.29	2.75	2.35
100 % N + 100 % P_2O_5	2.90	2.65	0.30	0.30	2.99	3.01
Without Microbein						
25 % N + 25 % P_2O_5	1.79	1.74	0.17	0.17	2.47	2.50
50 % N + 50 % P_2O_5	1.93	1.96	0.21	0.19	2.64	2.62
75 % N + 75 % P_2O_5	2.54	2.17	0.29	0.25	3.02	2.95
100 % N + 100 % P_2O_5	2.54	2.28	0.28	0.25	3.02	2.80
L.S.D at 5 %	**0.15**	**0.11**	**NS**	**NS**	**NS**	**0.38**

b- Effect of N and P rates:

Data in the same Tables (4 and 5) indicated that N, P and K percentage in foliage and tubers increased significantly by increasing N and P rates effect of (N+P) rates. This could be due to the positive effect of nitrogen

on root growth, the absorption sites of plant, which lead to more absorption of nutrients. Similar results were obtained by Awad (1997); Arisha and Bardisi (1999) and El-Kader (2002).

Table (5):Effect of Microbein (biofertilizer), N and P rates and their interactions on N, P, K, starch (%) and nitrate concentration (ppm) in tuber at harvest during the two Fall (Nili) seasons of 1998 and 1999.

Characters	N (%)		P (%)		K (%)		Starch (%)		NO_3 (ppm)	
Treatments	1998	1999	1998	1999	1998	1999	1998	1999	1998	1999
Microbein treatment										
With	2.69	2.38	0.40	0.38	2.35	2.23	12.97	12.71	79.63	73.23
Without	2.45	2.25	0.33	0.32	2.20	2.14	12.06	11.89	86.11	89.90
F-test	NS	*	*	*	*	NS	*	*	NS	NS
N and P rates/fed.										
25 % N + 25 % P_2O_5	1.97	1.89	0.29	0.27	1.93	1.86	11.56	11.37	71.15	69.57
50 % N + 50 % P_2O_5	2.53	2.32	0.34	0.32	2.14	2.11	12.65	12.51	76.65	75.18
75 % N + 75 % P_2O_5	2.85	2.48	0.40	0.37	2.40	2.26	13.75	13.53	82.62	88.93
100 % N + 100 % P_2O_5	2.90	2.57	0.46	0.44	2.62	2.49	12.10	11.80	103.07	92.53
L.S.D at 5 %	0.16	0.08	0.004	0.003	0.09	0.15	0.50	0.32	16.07	14.48
Interactions										
With Microbein										
25 % N + 25 % P_2O_5	2.04	1.95	0.33	0.30	1.96	1.90	11.92	11.81	64.90	63.00
50 % N + 50 % P_2O_5	2.64	2.39	0.37	0.34	2.19	2.09	13.05	12.86	72.03	69.93
75 % N + 75 % P_2O_5	2.94	2.55	0.43	0.41	2.15	2.33	14.22	13.96	83.70	81.37
100 % N + 100 % P_2O_5	3.09	2.63	0.48	0.46	2.72	2.59	12.69	12.20	97.90	78.63
Without Microbein										
25 % N + 25 % P_2O_5	1.91	1.84	0.25	0.24	1.90	1.83	11.23	10.92	77.40	76.13
50 % N + 50 % P_2O_5	2.42	2.24	0.30	0.29	2.09	2.13	12.24	12.15	81.27	80.43
75 % N + 75 % P_2O_5	2.43	2.42	0.36	0.34	2.29	2.19	13.27	13.10	81.53	96.50
100 % N + 100 % P_2O_5	2.72	2.51	0.43	0.41	2.52	2.40	11.51	11.40	108.23	106.53
L.S.D at 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

c- Interaction effect of Microbein and (N+P) rates:

Data in Tables (4 and 5) also revealed that the interactions between Microbein and N+P rates had no significant effect on N, P and K content in both foliage and tubers of potato plant with only two exceptions, N content in foliage in the two seasons, as well as K content in the second season, differences between treatments were significant as shown in Table (4).

4- Tuber quality

a- Effect of Microbein:

Results presented in Table (5) also revealed that application of Microbein gave a significant increasing tuber starch (%) in both seasons. Similar results were reported by Abdulla (1999). On the other hand, concentration of nitrate in tuber did not increase significantly, by Microbein treatment.

b- Effect of N and P rates:

D ata in Table (5) indicated that the effect of (N+P) rates on starch and nitrate concentration in tuber were significantly in both growing seasons.

The highest values of starch and nitrate (ppm) in tuber were obtained when the plants received (75 % N + 75 % P_2O_5/fed.) and (100 % N + 100 % P_2O_5/fed.) of the recommended rates respectively. These results may be due to the positive correlation between application of N fertilizer and accumulation of nitrate in potato tuber. The results as similar those obtained by Ashour and Sarhan (1998); Hammad and Abdel-Ati (1998) and Abd El-Naem *et al.* (1999).

c- Interaction effect of Microbein and (N+P) rates:

Data in the same Table (5) also indicated that the effect of the interaction between Microbein and (N+P) rates had no significant effect on starch and nitrate (ppm) in potato tubers in the two seasons.

CONCLUSION

This investigation suggest that treating seed potato tuber with biofertilizer (Microbein) at the rate of 10.67 kg/ton and applying 75 % of the recommended of N and P is indispensable for optimum potato production and higher tuber quality.

Moreover, the application of Microbein will reduce about 25 % of the required amounts of nitrogenous and phosphorous fertilizers/fed., which will also decrease the pollution of environment.

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تأثير الميكروبين الحيوى ومعدلات مختلفة من النتروجين والفوسفور على نمو ومحصول وجودة درنات البطاطس.

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أجرى هذا البحث خلال موسمى الزراعة النيلى ١٩٩٨/١٩٩٩, ١٩٩٩/٢٠٠٠ على نبات البطاطس صنف ديامونت فى مزرعة بحوث البساتين بالبرامون, محافظة الدقهلية. بغرض دراسة تاثير كل من الميكروبين (مخصب حيوى) واربع معدلات مختلفة من (ن + فو٢ا٥) هى: ٢٥ % ن + ٢٥% فو٢ ا٥, ٥٠ % ن + ٥٠ % فو٢ا٥، ٧٥%ن + ٧٥% فو٢أ٥ ، ١٠٠ % ن + ١٠٠ % فو٢ ا٥ من المعدل الموصى به من ن + فو٢ ا٥ عند ١٨٠ كجم + ٧٥ كجم فو٢ا٥/فدان وكذلك تفاعلات هذه المعدلات السمادية مع المخصب الحيوى (الميكروبين) على النمو الخضرى ومحصول وجودة درنات البطاطس بالاضافة الى محتوى الدرنات من النشا والنترات.

وقد اوضحت النتائج ان معاملة تقاوى البطاطس بالمخصب الحيوى (الميكروبين) قبل الزراعة قد ادت الى زيادة نسبة الانبات فى الحقل عند ٤٥ يوم من الزراعة فى موسم الزراعة الاول, كما أدت الى زيادة ارتفاع النبات, الوزن الطازج للنبات (فى موسم الزراعة الاول), وكذلك عدد السيقان الرئيسية للنبات (فى موسم الزراعة الثانى), والنسبة المئوية للوزن الجاف للنبات فى الموسمين , كما ان محصول الدرنات الكلى (طن/فدان), وكذلك عدد الدرنات/نبات, ومتوسط وزن الدرنات, وايضا نسبة المادة الجافة فى الدرنة, بالاضافة الى محتوى ن, فو فى العرش ومحتوى ن , فو فى الدرنات.قد زادت جميعا فى الموسم الثانى وسجلت النتائج تزايدا ملحوظا للفوسفور فى الموسمين وكذلك لكل من البوتاسيوم ومحتوى الدرنات من النشا فى الموسم الاول وكانت هذه النتائج مقارنة بالنباتات الغير معاملة. ومن ناحية اخرى فقد لوحظ ان محتوى الدرنات من النترات غير معنوى فى كلا الموسمين.

وقد دلت النتائج المتحصل عليها على ان زيادة معدلات التسميد من النيتروجين والفوسفور حتى ٧٥ % من المعدلات الموصى بها/ فدان ادت الى زيادة معنوية فى كل من الوزن الجاف للعرش وصفات المحصول ونسبة النشا فى الدرنات فى كلا الموسمين.

كما اوضحت النتائج نسبة ظهور النبات, ارتفاع النبات, الوزن الطازج للنبات (فى موسم الزراعة الاول), كذلك عدد السيقان الرئيسية للنبات (فى موسم الزراعة الثانى) ومحتوى ن, فو, بو فى العرش والدرنات بالاضافة الى تركيز النترات تزداد بزيادة معدلات (ن + فو٢ا٥) الى الجرعة الموصى بها كاملة (١٠٠ % ن + ١٠٠% فو٢ا٥) فى كلا الموسمين.

وقد ادى التفاعل بين المخصب الحيوى (الميكروبين) والمعدلات من (ن + فو٢ا٥) الى حدوث تاثير معنوى فى الوزن الجاف للنبات وصفات المحصول ومحتوى النيتروجين والبوتاسيوم فى العرش فى كلا الموسمين.

وبصفة عامة اوضحت الدراسة ان معاملة تقاوى البطاطس بالمخصب الحيوى (الميكروبين) بمعدل ١٠,٦٧كجم / طن تقاوى قبل الزراعة بالاضافة الى (٧٥ % ن + ٧٥% فو٢ا٥) من المعدل الموصى به للفدان قد اعطت اعلى محصول من الدرنات للفدان والتى تتصف بارتفاع صفات جودتها.

واخيرا فقد اوضحت النتائج ان معاملة التقاوى بالمخصب الحيوى (الميكروبين) قبل الزراعة قد ادت الى تحفيض كمية الاسمدة الازوتية والفوسفاتية بمعدل ٢٥ % من الكمية المقررة خاصة فى الاراضى الطينية وبالتالى ادت الى قلة تكاليف الانتاج للفدان بالاضافة الى تقليل تلوث البيئة المرتبط بتزايد استخدام الاسمدة الكيماوية.