ISSN 1110-0419

Annals Of Agric. Sc., Moshtohor.
Vol. 41(4): 1521-1533, (2003).

EFFECT OF BIOAGENTS, FUNGICIDES AS WELL AS NITROGEN AND PHOSPHORUS FERTILIZERS ON: B- GREEN POD YIELD, ITS COMPONENTS AND THE NUTRITIVE VALUE OF SNAP BEAN PODS

BY

Wafaa A. Fekry, *; Abou El-Salehein, E. H. * and Faten M. Abdel-Latif**

* Plant wealth Dept., Efficient Productivity Instit., Zagazig Univ., Egypt.

** Agriculture Botany Dept., Plant Path. Branch, Fac. of Agric., Moshtohor, Zagazig Univ., Egypt.

ABSTRACT

Two field experiments were carried out in 2001 and 2002 seasons at the Experimental Farm of the Faculty of Agriculture, Moshtohor, to investigate the effect of two bioagents, i.e. *Tricoderma harzianum* and *Bacillus subtilis*, one fungicide, i.e. Benlate- 50 alone (as seed dressing) before sowing as well as fertilizing with low amounts of some macro-elements (N and P) on green pod yield and its components, as well as pod physical characters and nutritive value of snap bean pods (*Phaseolus vulgaris*, L.) cv. Bronco.

Obtained results show that, inoculated seeds with *Tricoderma* or Benlate-50 were the most effective treatments, which resulted in the highest values of green pod quality and yield and its components (length, diameter and fresh weight of pod, number of pods and green pod yield/plant and total green pod yield/fed.) as well as the nutritive value of green pods or chemical constituents (N, K percentage and uptake and total carbohydrates percentage). Such results were true at both seasons of this study. In addition, *Bacillus* treatment resulted in the highest values of P concentration and its uptake of pods.

Using the levels 20 kg N/fed. combined with 31 kg P_2O_5/fed.produced the highest values of different studied characteristics of green pod quality and yield and its components as well as pod nutritive value.

The interaction effect of *Tricoderma* or *Benlate*-50 within higher used level of NP fertilizers (20 N+ 31 P_2O_5 kg/fed.)resulted in the highest values of most studied characters specially green pod yield per plant and fed.

INTRODUCTION

Snap bean (*Phaseolus vulgaris*. L.) is among the most important vegetable crops grown in Egypt for local consumption and exportation. It is subjected to attack by numerous fungi among them *Sclerotinia sclerotiorum* which cause the white mould disease This infection may be due to the intensive and monoculture practices in modern agriculture in which, the need for chemical fungicides usage critically increased to eliminate fungal pathogens, but it disturbs natural biological balance and can be considered as a factor of pollution for the environment and human health.

Recently, bioagents can be used as biological control (i.e *Tricoderma harzianum* or *Bacillus subtilis*) alone or in combination with chemical fungicides (i.e. *Benlate*-50). To reduce the doses needed to control the diseases and minimize the hazardous effect of these substances. In this respect, Agricultural practices such as fertilization can be affect *S. sclerotiorum* infection. In the same time, some bioagents (i.e. *T. harzianum* or *B. subtilis*) promoting plant growth and subsequently the yield and its quality which supply the plants with hormones, vitamins and minerals. These attempts are carried out to minimize the use of both chemical control (fungicides) and fertilizers for its high cost as well as its environmental pollution problems.

Many investigators reported that inoculation with *Tricoderma harzianum* as a biological seed or soil treatment enhanced the total yield and its quality.

In this respect, Abd-El-Megeed and Khafagi (1998) on watermelon reported that *Tricoderma spp* increased early and total yield per plant and gave the best results compared with bacillus and control. Similar results were obtained by Abada *et al.*(2002) on strawberry who found that *Trichoderma harzianum* increased marketable fruit yield compared with the control treatment.

Regarding the effect of *Bacillus subtilis* application to vegetable crops, it increased green pod yield and its components (Abdallah *et al.*, 1984 on soybean, Ibrahim *et al.*, 1995 on broad bean, Patel *et al.*, 1998 on pea and Mahmoud and Amara, 2000 on tomato) as well as nutritive value of pods (Ibrahim *et al.*, 1995 on broad bean and Patel *et al.*, 1998 and Srivastava *et al.*, 1998 on pea).

Concerning the effect of fungicides, many investigators indicated to the enhancing effect for fungicides on pod yield (Gaafar *et al.*, 1989 on bean and Khafagi *et al.*, 1995 on pea).

Respecting the effect of NP fertilizers, some investigators showed that, it increased leguminous green pod, physical characters and yield and its components (El-Afifi *et al.*, 1995, Abou El-Salehein and Ahmed, 1998 and Ahmed *et al.*, 2003 on bean, Chamberland. 1982 on bean and peas and Hassan *et al.*,1993, Gewailly *et al.*, 1996 and Abd-alla *et al.*, 2002 on pea) as well as the nutritive value of pods (Abou El-Salehein and Ahmed, 1998 and Ahmed *et al.*, 2003 on bean).

The objective of this trial was to study the effect of bioagents, i.e. *Tricoderma harzianum* and *Bacillus subtilis*, fungicides, i.e Benlate-50, seed inoculation, and low amounts of nitrogen and phosphorus fertilizers and their combined effect on green pod yield and its components, pod physical characters. as well as the nutritive value of pods

MATERIALS AND METHODS

The present study was conducted at the Experimental Research Farm of Faculty of Agriculture, Moshtohor, Zagazig University in the two summer successive seasons of 2001 and 2002

Physical and chemical analysis of the investigated soil were carried out according to Black *et al.* (1982) and the values are tabulated in Table (1)

Table (1): Physical and chemical analysis of soil used in the current study.

Characteristics	Values
Physical analysis:	
Coarse sand (%)	3.41
Fine sand (%)	16.47
Silt (%)	34.86
Clay (%)	40.89
Textural class	**Clay loam**
Chemical analysis:	
Organic matter (%)	1.6
Available N ppm	82.55
Available P ppm	20.06
Exchangeable K ppm	291.90
E.C Mmhos/cm at 25^{0}C	4.15
Ph	7.8

The experimental site was prepared and *Tricoderma, Bacillus* and *Benlate*-50 inoculation was done as described in the first part of this study

Treated and untreated seeds were sown on April 5th and, 2nd in 2001 and 2002, respectively.

Treatments were arranged in split-plot system in a randomized complete blocks design with four replicates. The used two bioagents, i.e., *Tricoderma* and *Bacillus* in addition, the fungicide *Benlate*-50 were assigned in the main plots and the six levels of NP fertilizers, i.e., control (Without any NP fertilizers addition), 10 kg N+ 0.0 kg P_2O_5, 20 kg N + 0.0 kg P_2O_5, 0.0 kg N +15.5 kg P_2O_5, 0.0 kg N +31.0 kg P_2O_5, and 20.0 kg N +31.0 kg P_2O_5 per feddan were in sub plots. The fertilizers were applied in the form of ammonium sulphate (20.5 %N) and that of phosphorus in the form of calcium superphosphate (16.0% P_2O_5). In addition, all treatments received potassium fertilizer as 100 kg potassium sulphate (48% K_2O) per feddan The area of sub-plot was 8.4 m^2 (4 ridges of 3.5 m long and 0.6 m width), seeds were sown on one side of ridge at 10 cm a part One guard row was left without planting between each two plots

The different amounts of fertilizers were added at two equal doses, three and eight weeks after sowing.

The other cultural procedures of growing bean were practiced as usually followed in the commercial production of green pod yield.

At harvest time, fresh pod yield of each experimental plot was harvested and following data were recorded:

1-Pod physical characters and green pod yield and its components:

It was calculated from weight and number of all harvested pods through whole harvesting season and number of plants per plot.

Also, twenty pods were taken at random from each treatment in all replicates at the second harvesting in both seasons and mean pod length, diameter (cm) and fresh weight/pod (gm) were recorded.

The average number of pods/plant (gm), total green pod yield/ plant (gm) and per feddan (ton) were calculated.

2- Pod chemical contents (the nutritive value):

a) Total N, P and K percentage and uptake were determined as the methods described by Cottenie *et al.*(1982).
b) Total carbohydrates, as percentage was determined according to the methods of Michel *et al.* (1956).

Statistical analysis:

The obtained data were statistically analyzed according to Snedecor and Cochran (1980) to compare treatments by the least significant differences (L. S. D.) at 5% probability.

RESULTS AND DISCUSSION

Green pod yield and its components:

1-a- Effect of bioagents and fungicides:

Data presented in Table (2) show that application of bioagents i.e., *Tricoderma harzianum* and *Bacillus subtilis* and the fungicide *Benlate*-50 significantly increased the values of studied characters i.e., pod length, pod diameter, fresh weight/pod, number of pods/ plant, green pod yield/plant and total green pod yield/fed. In this respect, the highest values were obtained by application of *T. harzianum* followed by Benlate-50, while *Bacillus* was of the lowest one. On the other hand, the lowest values were obtained by the control treatment. Obtained results are going in the same trend at both growing seasons except pod diameter in the second season which showed insignificant variances. Such results may be due to the enhancing effect of *T. harzianum* on growth by releasing phytohormons as IAA and Vitamin B_6 which control the stem rot disease of leguminous crops by making the plant more healthy and strong.

In addition, *Bacillus subtilis* producing organic acids which reduce the pH and bring about the dissolution of bound forms of phosphate and it had indirect effect on nitrogen fixation. Also, it had a role for inhibiting pathogens by producing antibiotic and fluorescent siderophores.

Table (2) Effect of *Tricoderma harzianum*, *Bacillus subtilis*, Benlate-50 and NP fertilization levels on green pod physical characters and yield and its components of snap bean.

Treatments		Pod length (cm)		Pod diameter (cm)		Pod fresh weight (gm)		No. of pods/plant		Green pod Yield /plant (gm)		Total green pod yield/fed. (ton)	
		2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Control		11.59	11.61	0.69	0.70	3.89	3.84	19.60	19.20	76.24	73.72	5.446	5.225
Tricoderm		12.14	11.89	0.73	0.71	4.24	4.31	22.47	21.28	95.27	91.71	5.860	5.618
Bacillus		11.92	11.81	0.73	0.71	4.16	4.12	21.37	20.62	88.89	84.95	5.607	5.371
Benlate-50		11.99	11.81	0.69	0.71	4.21	4.19	21.89	21.12	92.15	88.49	5.702	5.612
L.S.D (0.05)		0.07	0.19	0.01	N S	0.01	0.02	0.07	0.12	0.38	0.49	0.008	0.003
N	P												
kg/fed.													
0	0	11.28	11.32	0.67	0.68	3.75	3.61	19.13	18.81	71.73	67.90	4.197	3.393
10	0	11.65	11.54	0.69	0.70	4.16	4.09	20.65	20.08	85.90	82.12	5.403	5.168
20	0	11.93	12.04	0.74	0.72	4.28	4.24	22.16	21.16	94.84	89.71	5.957	5.703
0	15.5	11.73	11.58	0.69	0.70	4.25	4.21	20.83	20.33	88.52	85.58	5.522	5.443
0	31	12.13	11.98	0.72	0.72	4.36	4.27	23.60	22.27	102.89	95.09	6.281	6.093
20	31	12.70	12.22	0.75	0.74	4.40	4.31	24.24	23.24	106.65	101.02	6.563	6.350
L.S.D. (0.05)		0.09	0.10	0.01	0.01	0.02	0.01	0.11	0.10	0.41	0.37	0.006	0.005

In this concern, fungicides increased the total yield by improving the vegetative growth and dry weight and this may be due to low disease severity after such treatment.

Obtained results are in harmony with those reported by Gaafar *et al.* (1989) on bean, Khafagi *et al.* (1995) and Patel *et al.* (1998) on pea, Ibrahim *et al.* (1995) on broad bean, Abdallah *et al.* (1984) on soybean, Abd-El-Megeed and Khafagi (1998) on watermelon, Mahmoud and Amara (2000) on tomato and Abada *et al.* (2002) on strawberry.

1-b- Effect of NP fertilization:

Data shown in Table (2) reveal that, most studied characteristics of green pods, yield and its components were significantly affected by the level of nitrogen and phosphorus fertilizer. Such effect was clear and going in the same trend in both seasons. It is evident from such data that increasing level of N-fertilizer from 10 to 20 kg N/fed. and P-fertilizer from 15.5 to 31.0 P_2O_5 kg/fed. was of significant increasing effect in this respect. Moreover, such results showing that higher used level of NP fertilizer, i.e. 20 N+ 31 P_2O_5 kg/fed. produced the highest values of different studied physical characters and those of green pod yield and its components i.e., length, diameter and fresh weight/pod, number of pod/plant and plant green pod yield either per plant or fed.

This may be explained on the base that plants were supplied with adequate N and P fertilizer level for plant growth which led to the highest plants minerals content (refer to Table 6 and 8 in the first part of this study). Hence, such vigorous growth, good nutritional plant status resulted in turn in increasing number of flowers/plant and the amount of metabolites synthesized and dry matter accumulation by the plant. The increase in total green pod yield owe directly to the increase in pods number/plant and the average pod weight.

Obtained results are in conformity with those reported by El-Afifi *et al.* (1995), Abou El-Salehein and Ahmed (1998) and Ahmed *et al.* (2003) on bean, Chamberland (1982) on peas and bean and Hassan *et al.*(1993), Gewailly *et al.*(1996) and Abd-Alla *et al.*(2000) on pea.

1-c- Effect of bioagents, fungicides and NP fertilization interaction:

Data presented in Table (3) demonstrate that inoculated bean seeds by Tricoderma harzianum combined with application of NP fertilizer at 20 N+ 31 P_2O_5 kg/fed. to bean plants resulted in the highest values of all studied parameters of green pod physical characters, pod yield and its components at both seasons of this work In this respect, Benlate-50 followed by Basillus achieved also higher values of all studied characters of green pod yield and its components when combined with the same treatment (20 N+31 P_2O_5 kg/fed.). Furthermore, both bioagents and Benlate-50 combined with P-fertilizer level at 31 kg P_2O_5/fed. led to increase total green pod yield/fed. and some other studied parameters in this concern. The increasing effect of either bioagents, fungicides and NP fertilization on green pod yield of bean and its components has been explained before when the main effect of each was discussed.

Table (4) Effect of *Tricoderma harzianum*, *Bacillus subtilis*, Benlate-50 and NP fertilization levels on nitrogen, phosphorus and potassium concentration and their uptake as well as, carbohydrates percentage of snap bean pods.

Treatments	Minerales of pods (% on D. W. basis)						Minerales uptake (mg/plant pods)						Total carbohydrates (%)	
	N		P		K		N		P		K			
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Control	3 35	3 40	0.694	0 700	4.34	4 39	526 1	520 7	109.4	107.3	687 2	671 6	36.89	36.04
Tricoderm	3 45	3 52	0724	0.730	4 51	4 57	624 2	608.8	134.5	126 3	810 0	786.9	41 99	40 35
Bacillus	3 36	3 46	0 750	0 742	4.34	4 49	567 4	561 7	120.8	118 9	727 1	722.5	39 77	37 45
Benlate-50	3 42	3 47	0 713	0 722	4.44	4 51	587 6	566 5	124.9	120 3	760.7	732 2	40.03	39.45
L S D. (0.05)	0 010	0 010	0 001	0 001	0.010	0.010	1 612	0 686	0.616	1 429	10269	0.634	0.052	0 104
N P kg/fed														
0 0	3 07	3 17	0 638	0.645	4.24	4 35	411 5	409 1	85 5	83 9	571 2	561.2	33.60	33 47
10 0	3 41	3 47	0.693	0 686	4.34	4.42	513 3	496.2	104 1	97.6	653 7	632.2	36.95	36.05
20 0	3 51	3 58	0 706	0.723	4.48	4.58	585.2	562.4	117.8	113.5	746.9	719.6	40.11	39.29
0 15.5	3 35	3 41	0 744	0 743	4.39	4.45	548.2	555.1	120.8	119.7	711 9	715.8	40.99	39 13
0 31	3 46	3 49	0 762	0.764	4.43	4.53	666.9	645 5	146.4	140.8	858.9	834.5	42.69	40 34
20 31	3 58	3 66	0 779	0 781	4.53	4.62	732.8	718.2	159.7	153.4	929.9	906.6	43.69	41 95
L.S.D. (0.05)	0.010	0.010	0.001	0.001	0.01	0.01	1 412	1.395	1.125	1 335	1.061	0.839	0.043	0 928

Table (5). Effect of the interaction between *Tricoderma harzianum*, *Bacillus subtilis*, Benlate-50 and NP fertilization levels on nitrogen, phosphorus and potassium concentration and their uptake as well as, carbohydrates percentage of snap bean pods.

Treatments	N kg/fed.	P_2O_5 kg/fed.	Minerales of pods (% on D. W. basis) N 2001	N 2002	P 2001	P 2002	K 2001	K 2002	Minerales uptake (mg/plant pods) N 2001	N 2002	P 2001	P 2002	K 2001	K 2002	Total carbohydrates (%) 2001	2002
Control	0	0	2.84	3.03	0.611	0.623	4.15	4.27	361.8	361.4	77.8	74.3	528.7	509.2	32.59	31.59
	10	0	3.36	3.39	0.661	0.674	4.34	4.35	495.6	459.8	97.5	89.7	640.2	590.0	33.79	34.18
	20	0	3.44	3.48	0.677	0.698	4.38	4.43	545.9	526.1	107.4	105.5	695.1	669.7	37.16	36.04
	0	15.5	3.31	3.40	0.705	0.702	4.32	4.36	506.7	540.9	107.9	111.7	661.3	693.6	37.69	36.83
	0	31	3.40	3.45	0.726	0.734	4.40	4.40	587.3	590.0	125.4	125.5	760.0	752.5	39.27	37.89
	20	31	3.51	3.58	0.746	0.757	4.46	4.51	659.5	646.7	140.2	136.8	837.9	814.7	40.87	39.09
Tricoderma	0	0	3.19	3.28	0.653	0.656	4.30	4.42	440.9	445.1	90.3	89.0	610.9	599.7	34.38	34.45
	10	0	3.47	3.55	0.755	0.691	4.43	4.46	527.6	539.4	114.8	104.9	673.6	677.7	41.27	38.29
	20	0	3.55	3.62	0.761	0.730	4.60	4.68	625.2	601.5	134.0	121.3	810.1	777.7	43.59	41.94
	0	15.5	3.53	3.50	0.765	0.755	4.51	4.54	582.3	572.6	126.2	123.5	743.9	740.0	42.79	40.48
	0	31	3.56	3.52	0.774	0.766	4.55	4.62	742.7	701.8	161.5	152.7	963.9	921.1	44.84	42.99
	20	31	3.64	3.72	0.795	0.780	4.66	4.72	826.2	792.2	180.4	166.1	1057.7	1005.1	45.05	44.46
Bacillus	0	0	3.11	3.20	0.626	0.666	4.23	4.33	410.5	416.0	82.6	83.1	558.4	562.9	33.52	33.92
	10	0	3.39	3.45	0.672	0.702	4.35	4.42	507.2	488.8	100.5	96.5	650.8	626.3	37.36	36.97
	20	0	3.53	3.62	0.689	0.741	4.42	4.59	570.6	555.8	111.4	113.2	714.4	704.7	40.73	41.93
	0	15.5	3.33	3.46	0.762	0.764	4.33	4.47	540.9	553.2	123.8	121.7	703.4	715.2	41.07	40.87
	0	31	3.45	3.52	0.776	0.781	4.40	4.52	660.1	643.9	148.5	142.3	841.9	826.8	43.32	41.74
	20	31	3.57	3.66	0.788	0.799	4.46	4.62	715.2	712.3	157.9	155.5	893.5	899.2	43.79	42.00
Benlate-50	0	0	3.14	3.16	0.661	0.634	4.26	4.37	432.7	414.1	91.1	87.9	586.9	572.8	33.91	33.92
	10	0	3.44	3.49	0.682	0.678	4.41	4.46	522.8	496.7	103.7	99.5	670.2	634.7	35.78	34.78
	20	0	3.52	3.61	0.696	0.722	4.51	4.63	599.2	566.1	118.5	113.8	767.8	726.1	38.95	37.23
	0	15.5	3.35	3.41	0.746	0.750	4.40	4.41	562.9	553.6	125.3	122.2	739.3	714.4	42.39	38.34
	0	31	3.48	3.52	0.771	0.775	4.47	4.56	677.3	646.3	150.1	142.9	869.9	837.7	43.35	38.75
	20	31	3.58	3.67	0.786	0.790	4.56	4.61	730.4	722.3	160.4	155.5	930.3	907.2	45.05	42.26
L.S.D. (0.05)			0.020	0.020	0.001	0.002	0.002	0.020	2.824	2.289	2.250	2.670	19.458	1.678	0.086	1.856

REFERENCES

Abada, K. A., Wahdan, H. M. and Abdel-Aziz, M. (2002). Fungi associated with fruit rot of fresh strawberry plantations and some trials of their control. Bull. Fac. of Agric., Cairo Univ.. 53: p.309.

Abdallah, A. R.; El-Dahtor, Th.; Abdel-Moneim, A.A. and Safwat, M.S.A. (1984). Effect of inoculation with *Bacillus megatherium* var. phosphaticum and root nodules bacteria on rhizophere microflora and yield of some leguminous plants. Minia J. Agric. Res & Dev., 6(4): 521-540.

Abd-Alla, I.M., Abou Sedera, F. A.,; Abou El-Salehein, E.H. and Mansour, N.T. (2000). Physiological studies on pea. B. Effect of Rizobium, Mycorrhyzae inoculation, nitrogen and phosphorus fertilizers on pea (Pisum sativum L.) yield. J. Production & Dev., 5 (1): 37-56.

Abd-El-Megeed, H.A. and Khafagi, Y.S. (1998). Effect of some plant extracts, bio-agents and fungicides on growth, productivity and resistance of root disease on watermelon cv.Giza-1. Menofiya J. Agric. Rec., 23 (3): 703-723.

Abou El-Salehein, E.H. and Ahmed, M.A. (1998). Effect of some bio and chemical fertilizers on growth, chemical composition and yield of snap bean (*Phaseolus vulgaris* L.). Egypt J. Appl. Sci., 13 (12): 228-246.

Ahmed, A.A.; Abd El-Baky, M M.H. and Faten S. Abd El-Aal (2003). Response of snap bean plants to sulphur element and NPK mineral fertilizer. Egypt J. Appl. Sci., 18 (9): 237-252.

Black, C.A.; Evans, D.D.;. Ensiminger, L.E; White, G.L. and Clark, F.E. (1982). Methods of Soil Analysis. Part 2. American Society of Agronomy, INC., Publisher, Madison, Wisconsin, USA.

Bidwell, R.G.S. (1979). *Plant physiology* 2nd Ed. Mac Millan Publishing Co. INC. New York.

Chamberland, E. (1982). Predicting the N, P and K requirements of legumes grown in a mineral soil: peas and beans. Can. J. of Soil Sci., 62 (4): 663-672.

Cottenie, A., Verloo, M.; Kiekens, L., Velghe, G. and Camerlynek, R. (1982). Chemical analysis of plant and soils. *State Univ. Ghent. Belgium.*

Edmond, J.B.; Senn, T.L.; Znderws, F.S. and Halfacre, R.G. (1981). *Fundamentals of Horticulture* Published by Tata Mc-Grow-Hill Publishing Co. Limited, Indian.

El-Afifi, S.T.; Hamail, A.F.; Abou El-Salehein, E.H. and Abaza, M.E. (1995). Effect of NPK fertilizers and plant spacing on growth and yield of bean (*Phasealus vulgaris* L.). J. Agric. Sci. Mansoura Univ., 20 (2): 819-830.

Gaafar, A.A.; El-Khateeb, R.S.; Khalifa, E.Z. and Mousa, M.M. (1989). Control of bean damping-off and root rot by plant extract, growth regulators and fungicides in relation to root nodules. Menofiya J. Agric. Res., 14 (2): 1329-1343.

Gewailly, E.M., Abd El-Fattah, H.I. and El-Garhi, I.A. (1996). Response of pea plants (*Pisum sativum* L) to irrigation with waste effluent, NPK fertilization and rhizobial inoculation in sandy soil. Zag. J Agric. Res.. 23 (6)1065-1085

Hassan, M. N.M.; Farrag, M. M., Gad El-Hak, S.H. and Gheeth, R.H.M. (1993). Effect of Rizobium, nitrogen and phosphorus application on growth and yield of peas. 1 Fresh yield. Minia first Conference for Horticultural Crops from 19-21 October

Ibrahim, A.N.; Mahmoud, A.H.H. and El-Katkat, M.B. (1995). In vivo, study the effect of phosphate solubilizing bacteria and superphosphate on the productivity of broad bean and wheat plants. Menofiya J Agric. Rec., 20 (6): 2361-2377.

Khafagi, Y.S.; Abo El-Ela, A.M., Ahmed, F.S. and El-Gizy, S.M. (1995). Varietal reaction and chemical control of pea powdery mildew. Egypt. J. Appl. Sci., 10 (5): 146-157

Mahmoud, H.A.F. and Amara, M.A.T. (2000). Response of tomato to biological and mineral fertilizers under calcareous soil conditions. Bull. Fac. Agric., Cairo Univ., 51 151-174

Michel, K.G.; Hamilton, J.K., Robens, P A.and Smith, F (1956) Colorimetric method for determination of sugars and related substances Analytic chemistry, 28:No.3

Patel, T.S.; Katare, D.S., Khosla, H.K and Dubey, S (1998). Effect of biofertilizers and chemical fertilizers on growth and yield of garden pea (*Pisum sativum* L.). *Crop Res. Hisar.* 15(1): 54-56.

Snedecor, G.W. and Cochran, W.G. (1980) Statistical Methods 7th Ed Iowa State Univ., Press, Amer., Iowa, USA

Srivastava, T.K.; Ahlawat, I.P.S and Panwar, J.D.S (1998) Effect of phosphorus, molybdenum and biofertilizers on productivity of pea (*Pisum sativum* L.). Indian J of Plant Physiol.. 3 (3): 237-239

تاثير عوامل المقاومة الحيوية والكيماوية وكذلك التسميد النتروجيني والفوسفاتي علي:
ب- المحصول الأخضر ومكوناته والقيمة الغذائية لقرون الفاصوليا.

وفاء عادل فكري*، عصام حسين أبو الصالحين *، فاتن عبد اللطيف **

* قسم الثروة النباتية - معهد الكفاية الإنتاجية - جامعة الزقازيق

** قسم النبات الزراعي (أمراض النبات) - كلية الزراعة بمشتهر - جامعة الزقازيق.

أجريت تجربتان حقليتان خلال موسمي ٢٠٠١ ، ٢٠٠٢ بمزرعة كلية الزراعة بمشتهر - جامعة الزقازيق لدراسة تأثير وسيلتين من وسائل المقاومة الحيوية هما فطر الترايكودرما هرزينيم والباسلس ستلس و المقاومة الكيماوية مثل البنليت-٥٠ كل بمفرده (كغلاف للبذرة قبل الزراعة) أو مع التسميد بكميات صغيرة من السماد النتروجيني والفوسفاتي علي المحصول الأخضر ومكوناته وكذلك الصفات الطبيعية للقرن والمحتوي الغذائي لقرون الفاصوليا في الصنف برونكو.

اوضحت النتائج ان تلقيح البذور بفطر الترايكودرما أو البنليت-٥٠ كانت هي الأكثر فاعلية . حيث أدت إلي أعلي القيم بالنسبة لجودة القرون الخضراء والمحصول ومكوناته(الطول ، القطر ، الوزن الغض للقرن ،عدد القرون ، محصول القرون الخضراء/نبات و المحصول الأخضر الكلي /فدان) وكذلك القيمة الغذائية للقرون (نسبة

النتروجين والبوتاسيوم وامتصاصهما والكربوهيدرات الكلية). اضافة الي ذلك فقد حققت المعاملة ببكتريا الباسلس اعلي القيم نسبة وامتصاص الفوسفور بالقرون.

أعطي استخدام المعدلات ٢٠ كجم ن مع ٣١ كجم فو٢أ٥ /فدان أعلي القيم لمختلف الصفات التي تم دراستها بالنسبة لجودة القرون الخضراء والمحصول ومكوناته وكذلك القيمة الغذائية للقرون.

أدى التأثير المتداخل بين فطر الترايكودرما أو البنليت-٥٠ مع ٢٠ كجم ن و ٣١ كجم فو٢أ٥ /فدان إلي أعلي القيم لمعظم الصفات المدروسة خاصة المحصول الأخضر للنبات والفدان.