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EFFECT OF AGRICULTURAL MANAGEMENT PRACTICES AND BIO & N-FERTILIZERS ON MAIZE GROWTH AND YIELD

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Abstract

Two field experiments were conducted at the Experimental farm of Sids Research Station, ARC, in Beni Suief Governorate, during 2001 and 2002 summer seasons. The experiments included three winter preceding crops (faba bean, berseem and wheat) and three hill spaces (20, 25 and 30 cm) as well as four fertilizer treatments, i.e. (70 kg N/fed, microbin (1g/ 100 gm seeds) + 70 kg N/fed, 105 kg N/fed and microbin + 105 kg N/fed.

The main results of this work could be summarized as follows: The preceding faba bean gave the greatest effect on growth characters as well as yield and its components followed by berseem and wheat. Regarding hill spacing, decreasing distance to 20 cm increased the values of plant height, ear height and barren plants. Increasing distance to 30 cm between hills gave higher values of leaf area of topmost ear, stem diameter and prolific plants and also yield components of ear weight, ear length, ear diameter, number of grains/row, weight of grains /ear and shelling percentage. The 25 cm between hills increased maize yield than the other treatments. Concerning nitrogen and bio fertilizers the highest values of growth characters, agronomic traits and yield were obtained with microbin + 105 kg N/fed, while the lowest values were recorded with 70 kg N/fed. The interaction between preceding crops and bio N levels indicated that faba bean with microbin + 105 kg N/fed gave the highest values of maize grain yield, whereas the lowest values were recorded with wheat and 70 kg N/fed. The interaction of hill spaces with bio-N fertilizer showed that the highest values were obtained with 25 cm hill space and microbin + 105 kg N/fed for maize grain yield. The interaction of hill spaces with preceding crops showed that the highest values recorded with 25 cm hill space and faba bean. As for interaction effects among preceding crops with hill spaces and bio- N fertilizer, the results indicated that legume crops with 25 cm apart and bio + 105 kg N fertilizer gave the highest grains yield.

It could be stated that planting maize at 25 cm between hills and applied microbin + 105 kg N/fed and followed legume crops could be recommended for growing maize (S.C10) under the conditions of Sids district.

INTRODUCTION

Maize is one of the most important food and feed crops in Egypt. Increasing maize production can be achieved through some agricultural management practices such as preceding crops, spacing between hills and nitrogen fertilizer. So, growing maize after nitrogen fixing and using bio-fertilizer with N fertilizer may, increase maize productivity and reduce the use of nitrogenous fertilizers.

Yield of maize grains grown after legume crops surpassed that grown after non-leguminous crops (Shafshak *et al.*; 1982 and Sherif *et al.*; 1995). Cereals yield superiority after legume crops have been attributed to less N-uptake by the legume and increasing residual organic matter, in addition to N carrying from legume residue to the subsequent non-legume crop (MacCall, 1991). Seif El- Nasr *et al.* (1993) found that the values of maize traits grown after faba bean were higher than when grown after wheat. El- Douby (2002) recorded that maize sown after Egyptian clover gave the highest values of yield and its components, compared with maize grown after wheat or sugar beet.

Ali *et al.* (1994) indicated that the competition between maize plants for light, soil fertility and other environmental factors was markedly increased with increasing population density. Mosalem and Shady (1996) showed that increased plant population, signifgicantly increased barren plants percentage and grain yield/fed.

Nitrogen fertilizer is very important for maize growth and grain yield. Some growth and agronomic characters of maize i.e., plant and ear height, stem diameter, percentage of barren, lodged and broken, plants carried two ears and surviving plants were significantly affected by increasing nitrogen fertilizer levels up to 150 kg N/fed (Matta *et al.*, 1990).

Recently, many investigators have used some bio-fertilizers from bacterial origin successfully to reduce the dose of nitrogenous fertilizers. Organic matter as an amendment of maize plants inoculated with *Azospirillum* or *Azotobacter* led to considerable improvement in growth and grain yield, (El-Borollosy *et al.*, 1986). When maize fertilized with bio-fertilizer and complete fertilizers (N, P, K, Zn and Ca), grain yield increased by 20 % (Marriel *et al.* , 1986). Adding bio-fertilizer to some fields and vegeta-

tive crops increased yield by 15.5 % (El-Komy *et al.* 1993 and El Douby 2002).

The aim of the present work is to study the effect of preceding crops, distance between hills as well as nitrogen and biofertilizer on some agronomic traits and maize yield.

MATERIALS AND METHODS

Two field experiments were conducted at Sids Experimental Farm, Agricultural Research Station, ARC, Beni-Suief Governorate during 2001 and 2002 seasons to study the effect of some preceding winter crops, three plant distances, and four nitrogenous fertilizer treatments on the performance of maize crop.

A split-split plot design with three replications was used. The main plots were allocated for the three preceding crops mainely: (i) faba bean (cv. Giza 429), (ii) berseem (cv. Meskawy) and (iii) wheat (cv. Sids 4). The subplots were devoted for three plant distances namely: (i) 20 cm, (ii) 25 cm and (iii) 30 cm between hills. The sub-sub plots were for fertilizers treatments: (i) 70 kg N/ fed, (ii) microbin + 70 kg N/fed, (iii) 105 kg N/ fed and (iv) microbin + 105 kg N/fed.

Biofertilizer used was Microbin, (*Azospirilium sp., Azotobacter sp., Bacillus* megatheruim var. phosphaticum, Pseudomonas sp and Mycorriza sp.); which produced and distributed commercially by the General Organization for Agricultural Equalization Fund (GOAEF), Ministry of Agriculture, Egypt. Inoculation with biofertilizers was performed by mixing seeds with the appropriate amount of the (1 g/ 100 gm seeds). There by each inoculated seed received approximately 10 millions bacteria on its surface. Mineral fertilizer was ammonium nitrate (33.5 N %).

The soil texture is clay which 7.6 pH and 2.1 % organic matter. Some of soil chemical analysis before and after preceding winter crops under study are shown in Table (1).

The sub-sub-plot area was 10.5 m^2 containing 5 ridges each of 3.0 m length and 70.0 cm width (1/400 fed.). Hybrid maize cultivar S.C. 10 was sown on 7^{th} and 5^{th} June in the first and second seasons, respectively.

Table 1. Chemical analysis and NPK before and after preceding crops under study.

Chemical analysis	Before preceding crops	After preceding crops		
		Faba bean	Berseem	Wheat
N ppm	42.0	54.0	50.0	40.0
P ppm	13.0	15.2	14.5	12.2
K ppm	300.0	350.0	340.0	310.0
E.C. (ds/m)	0.48	0.45	0.46	0.40
% $CaCO_3$	1.50	1.40	1.40	1.36

• Available N, P and K were determined according to Black (1965).

Nitrogen fertilizer was applied in two equal doses just before the first and second irrigation of maize. Half-hour before culture, maize grains were inoculated by Microbin at the rate of 1 g/ 100 gm seeds.

The studied characters were recorded as follows: plant height (cm), ear height (cm), leaf area of topmost/ ear (cm^2), stem diameter (cm) (data were recorded as average of 10 guarded plants from each sub-plot), barren plant %, plants carried two ears %, surviving % (data were recorded on the whole sub-plot basis), ear character; ear length and diameter, number of rows/ear and 100-grain weight and shelling % (data were estimated as the mean value of 10 ears samples). And grain yield of maize/ fed was determined from the three rows.

Data were statistically analyzed according to the procedures outlined by Gomez and Gomez (1984) and L.S.D test was used to compare between means.

RESULTS AND DISCUSSIONS

I-Preceding crops

Growth and agronomic characters as affected by the different preceding crops are presented in Table (2). Data revealed that maize growth was significantly affected by preceding crops. Plant height, ear height, leaf area of topmost ear, stem diameter, plants carried two ears and surviving plants, except barren plants gave the highest values when faba bean was the preceding crop followed by berseem, while the lowest values were recorded after wheat.

Table 2. Effect of preceding crops on growth and agronomic characters of maize in 2001 and 2002 seasons.

Characters / Treatments	Plant height (cm)	Ear height (cm)	Leaf area of top most ear (cm)	Stem diameter (mm)	Barren plants %	Prolafic plant	Surviving plants %
Preceding Crops			2001				
Faba bean	259.03	120.07	640.81	19.55	11.73	20.61	87.40
Berseem	255.91	119.62	616.83	18.41	13.56	18.13	85.61
Wheat	240.11	115.67	588.30	17.93	15.71	16.11	80.32
L.S.D at 5 %	3.03	2.41	8.15	0.51	1.28	1.32	0.39
			2002				
Faba bean	271.85	124.28	680.33	19.33	10.63	21.57	88.16
Berseem	267.79	122.33	646.16	18.46	12.51	19.23	86.23
Wheat	245.64	117.74	628.51	17.88	14.42	17.19	81.15
L.S.D at 5 %	2.11	2.06	18.50	0.56	1.47	2.01	1.13

The results could be attributed to the influence of leguminous crops (faba bean and berseem) on soil fertility and physiochemical properties. Therefore considerable amount of residual nitrogen after faba bean and berseem (legume crops) is highly effective on maize growth characteristics than the other preceding crop. Similar trend was obtained by Shafshak *et al.* (1982) and MacCall (1991). Data indicated also that the increase in growth characters could be attributed to the increase in intercellular meristem activity and subsequently increase in internode elongation. These findings are in agreement with those reported by El-Komy *et al.* (1993).

Regarding yield and its components data presented in Table (3) showed that the preceding crops had significant effects on all studied maize characteristics, except no. of rows/ ear. Ear characteristics (ear length, ear diameter, ear weight and weight of grains/ear) were also significantly affected by preceding crops. The values were great when maize was grown after faba bean or berseem compared to that grown after wheat. In general, results were expected because of nitrogen carrying over from faba bean or berseem to maize as shown in Table (1). This result is in agreement with those obtained by Seif El- Nasr *et al.*; (1993) and El Douby (2002)

Grain yield of maize was significantly affected by preceding crops in both seasons as shown in Table (3) and Fig (1). High yield was obtained when faba bean was the preceding crop. Grain yields of maize showed similar trend of growth and yield com-

ponents. The reduction in grain yields planted after wheat were 23.60, 19.81 % in the first season and 25.14 and 18.86 % in the second season, compared to planting after faba bean and berseem, respectively. Similar trend was obtained by Shafshak *et al.* (1982) and Sherif *et al.* (1995).

Table 3. Effect of preceding crops on grain yield of maize and its components in 2001 and 2002 seasons.

Characters / Treatments	Ear weight (g)	Ear length (cm)	Ear diameter (mm)	No. of rows/ear	No. of grains/ Row	Shelling percentae	Weight of 100 grains (g)	Wt. Of grain/ear (g)	Yield/fed (Ardab)
Preceding Crops				2001					
Faba bean	216.01	20.06	42.80	13.54	43.21	81.12	29.91	175.22	20.08
Berseem	208.68	19.71	40.20	13.33	41.15	76.88	28.55	160.44	19.13
Wheat	200.86	16.13	36.20	13.08	38.23	71.69	27.23	144.00	15.34
L.S.D at 5 %	4.15	0.89	1.76	N.S	1.36	2.30	0.81	2.20	1.03
				2002					
Faba bean	223.37	20.57	45.00	13.32	44.56	81.02	31.16	180.98	21.44
Berseem	211.94	19.83	43.00	13.12	42.92	78.71	29.70	166.82	19.78
Wheat	205.98	16.91	40.00	12.92	40.43	73.25	28.04	150.88	16.05
L.S.D at 5 %	2.06	0.83	1.08	N.S	0.92	2.60	0.65	3.10	1.96

II- Hill spacing:

Data presented in Table (4) indicated that 20 cm spacing between hills recorded the highest values of plant height, ear height, and barren plants %. While, stem diameter, plants carried two ears, leaf area of topmost ear and surviving plants percentage recorded the highest values at 30 cm spacing between hills in both seasons. These results are true due to competition between maize plants for light and nutrients soil fertility in case of the highest population density, Ali *et al.*, (1994) reported similar findings.

Concerning yield and yield components (Table, 5) the data showed that ear component, i.e. ear weight, ear length, ear diameter and grain weight of ear were significantly affected by hill spacing. Spacing of 30 cm between hills recorded the highest values of previous ear characters in both seasons.

With respect to number of grains/row, shelling percentage and weight of 100 grains, data showed that values of these traits significantly increased with increasing

spacing between hill. The inter specific competition among maize plants in thin planting for edaphic and climatic environmental condition might owe much to this finding.

Table 4. Effect of hill spaces on growth and agronomic characters of maize in 2001 and 2002 seasons.

Characters / Treatments	Plant height (cm)	Ear height (cm)	Leaf area of topmost ear $(cm)^2$	Stem diameter (mm)	Barren plants %	Plants carried two ears %	Surviving plants %
Hill spaces	2001 season						
20 cm	260.80	120.22	557.87	17.78	16.55	17.26	82.07
25 cm	247.78	119.09	627.47	18.76	13.20	18.28	83.68
30 cm	246.47	116.04	660.60	19.25	11.25	19.31	87.58
L.S.D at 5 %	2.73	0.83	21.31	0.23	1.03	0.18	0.60
	2002 season						
20 cm	265.68	123.18	618.30	17.72	15.80	18.30	82.83
25 cm	261.20	121.62	656.12	18.76	14.90	19.33	84.33
30 cm	258.41	119.55	680.56	19.20	10.30	20.36	88.38
L.S.D at 5 %	1.44	1.05	18.05	0.20	0.83	0.23	0.53

The highest yield/fed was realized at 25 cm apart compared to 20 and 30 cm apart (Table 5) and Fig (2). At narrow space (20 cm), the yield/ fed was reduced due to reducing yield components, as well as increase inter specific competition among plants compared with the other two spaces. The yield components of 30 cm apart was higher than 25 cm apart, but the final yield/ fed was higher with 25 cm space. These results might be attributed to the increase in the number of plants per unit area. The reasonable percentage of light energy accepted by plants and the greater amounts of nutrient absorbed per unit area at 25 cm spacing than narrow spacing might account for the superiority of yield. The increase in grain yield due to increasing plant spacing is in accordance with the results obtained by Mosalem and Shady (1996).

III- Bio-mineral fertilizers:

Data presented in Table (6) showed that all maize characteristics were significantly affected by nitrogen and bio-N fertilizers. The results revealed that maize plants fertilized with microbin + 105 kg N/fed. gave the highest values followed by those receiving 105 kg N/fed. and microbin + 70 kg N/fed. Respectively. This was true in each of plant growth compared with 70 kg N/ fed fertilizer. The increase in these characters might be due to the increase in nitrogen application may be attributed to the increase

in meristematic activity, stimulation of cell elongation and auxin production in maize plants. These results are in agreement with those obtained by Matta *et al.*; (1990). Barren plants % was significantly reduced by increasing level from 70 to 105 kg N/ fed. Adding microbin to nitrogen caused significant reduction that mean microbin increased the fertilizer effeciency. Similar trend was reported by El- Douby (2002).

Table 5. Effect of hill spaces on grain yield of maize and its components in 2001and 2002 seasons.

Characters / Treatments	Ear weight (g)	Ear length (cm)	Ear diameter (mm)	No. of rows/ ear	No. of grains/ Row	Shelling percentage	Weight of 100 grains (g)	Wt. of grain/ear (g)	Yield/fed (Ardab)
Hill spaces					2001				
20 cm	198.45	17.94	37.37	13.13	39.33	74.90	26.48	145.64	17.19
25 cm	209.09	18.31	39.27	13.46	40.53	76.53	29.08	160.01	18.98
30 cm	218.01	19.65	42.56	13.36	42.73	78.44	30.14	171.01	18.38
L.S.D at 5 %	2.13	0.11	0.20	N.S	0.36	0.81	0.09	2.50	0.15
					2002				
20 cm	204.86	18.92	40.20	12.95	36.70	71.97	27.38	147.44	18.06
25 cm	212.62	18.46	42.20	13.11	43.45	79.05	29.88	168.08	20.13
30 cm	223.81	19.93	45.60	13.30	47.76	81.39	31.63	182.16	19.08
L.S.D at 5 %	3.06	0.14	0.30	N.S	0.48	0.75	0.10	2.20	0.21

Table 6. Effect of bio-mineral fertilizer on growth and agronomic characters of maize in 2001 and 2002 seasons.

Characters / Treatments	Plant height (cm)	Ear height (cm)	Leaf area of topmost ear (cm)	Stem diameter (mm)	Barren plants %	Plants carried two ears %	Surviving plants %
Bio-mineral N Fertilizer			2001				
70 kg/N fed fertilizer	243.86	115.70	586.14	17.11	17.02	14.74	80.10
Bio+70 kg N/fed.	252.92	117.46	593.80	18.13	15.25	16.86	82.14
105 kg N/fed.	254.08	119.32	630.12	19.15	12.10	19.84	86.22
Bio + 105 kg N/fed.	255.85	121.71	651.20	20.00	10.30	21.69	89.32
L.S.D at 5 %	0.81	1.13	5.30	0.28	0.83	1.15	1.03
			2002				
70 kg/N fed fertilizer	253.68	117.12	630.60	17.04	15.34	16.50	80.86
Bio+70 kg N/fed.	260.78	120.28	642.78	18.04	14.25	18.43	82.93
105 kg N/fed.	263.56	123.10	647.65	19.03	11.27	19.60	86.98
Bio + 105 kg N/fed.	269.03	125.30	685.65	20.12	9.23	22.78	89.95
L.S.D at 5 %	1.15	1.63	3.60	0.18	0.74	1.03	1.09

Concerning number of rows/ear, (Table 7) data indicated no significant effect of these treatments on this character which is rarely influenced by cultural practices compared with other characters. This mainly because it is genetically controlled.El- Douby (2002) showed that nitrogen fertilizer up to 120 kg N/fed did not show any significant affect on number of rows/ear in two seasons.

Regarding yield and yield traits i.e. plants carried two ears, ear length, ear diameter, number. of grains/row and ear weight were significantly affected by N-fertilizer treatments. The highest values of yield component characters and grain yields were obtained when microbin + 105 kg N/fed. was used. Results could be attributed to the fact that nitrogen fertilizer enhanced plant growth concequently increased yield components. The application of microbin +70 kg N, 105 kg N and microbin + 105 kg N/fed increased grain yield over 70 kg N/fed fertilizer by 41.33, 56.28 and 80.52 % in the first season and 36.96, 50.72 and 65.65% in the second season, respectively (Table 6) and Fig (3). These results are in agreement with those showed by Marreil *et al.*; (1986) and El-Komy *et al.*; (1993).

Table 7. Effect of bio-mineral fertilizer on grain yield of maize and its components in 2001 and 2002 seasons.

Characters / Treatments	Ear weight (g)	Ear length (cm)	Ear diameter (mm)	No. of rows/ear	No. of grains/ row	Shelling percentage	Weight of 100 grains (g)	Wt. Of grain/ear (g)	Yield/fed (Ardab)
Bio-mineral N fertilizer					2001				
70 kg N/ fed	170.72	15.96	33.24	12.86	36.09	70.55	26.16	120.44	12.58
Bio+70 kg N/fed.	203.38	17.61	37.82	13.35	39.56	73.95	27.81	150.40	17.78
105 kg N /fed.	220.56	19.30	41.64	13.46	43.06	76.53	29.66	168.81	19.66
Bio +105KgN/fed.	239.39	21.65	46.23	13.60	44.74	79.33	30.62	189.91	22.71
L.S.D at 5 %	2.30	1.21	3.08	N.S	0.68	2.03	0.48	5.30	1.08
					2002				
70 kg N/ fed	186.12	16.60	35.84	12.82	37.75	74.62	26.76	138.88	13.80
Bio+70 kg N/fed.	205.40	18.90	39.84	13.14	40.98	77.36	28.54	158.89	18.90
105 kg N /fed.	222.70	20.00	45.94	13.20	41.78	78.79	30.60	175.46	20.80
Bio +105KgN/fed.	240.84	21.00	49.05	13.32	42.94	79.56	32.63	191.68	22.86
L.S.D at 5 %	3.60	0.86	2.16	N.S	0.48	0.88	0.56	7.12	1.13

D- Interaction effects:

The reactions among the experimental treatments are presented in Tables (8 , 9, 10 and 11). Generally, the interaction effects among the preceding crops and bio & N mineral fertilizer (Table, 8) indicated that no significant effects between faba bean or berseem with bio & N mineral fertilizer at the low rates (70 kg N/fed.), whereas higher significant effects were observed at the higher fertilizer rates (105 or microbin + 105 kg N/fed.) in both seasons. On the other hand, wheat as a preceding crop resulted in the lowest value of yield. Using microbin + 70 kg N/fed after legumes crops increased maize yield/ fed by about 0.48 in the first season and 2.39 ardab in the second season, compared with adding microbin + 105 kg N/ fed after cereal crops. These data are due to that cereals yields superiority after legume crops have been attributed to high nitrogen residuals after legume and high residual of organic matter MacCall (1991), Seif El-Nasr *et al.* (1993) and El-Douby (2002).

Generally, using bio fertilizer could reduce N- mineral fertilization by 35 N kg/ fed and accompanied with lower environmental pollution

The interaction effects between hill spacing and bio & N mineral fertilizer are presented in Table (9). The highest values of maize yields recorded with 25 cm apart un-

der the same N level while, 20 cm apart gave the lowest values in both seasons. Mosalem and Shady (1996) and El-Douby (2002) are in agreement with the obtain results.

Table 8. Effect of the interaction between preceding crops and bio N-fertilizer on grain yield (ardab/fed.) during 2001 and 2002 seasons.

Bio N fertilizer	2001 season				2002 season			
Preceding crops	70 kg N/fed	Bio + 70 kg N/fed	105 kg N/fed	Bio + 105 kg N/fed	70 kg N/fed	Bio + 70 kg N/fed	105 kg N/fed	Bio + 105 kg N/fed
Faba bean	13.58	18.80	20.66	23.32	14.42	20.44	22.44	23.46
Berseem	12.56	17.78	19.70	21.48	13.28	19.28	20.28	21.28
Wheat	11.60	16.76	18.62	18.32	12.05	15.55	16.55	18.05
L.S.D. 5 %	1.33				1.46			

Table 9. Effect of the interaction between hill spaces and bio N-fertilizer on grain yield (ardab/fed.) during 2001 and 2002 seasons.

Bio N fertilizer	2001 season				2002 season			
Hill spaces	70 kg N/ fed	Bio + 70 kg N/fed	105 kg N/fed	Bio + 105 kg N/fed	70 kg N/ fed	Bio + 70 kg N/fed	105 kg N/fed	Bio + 105 kg N/fed
20 cm	11.60	16.76	18.64	21.76	12.82	17.88	19.79	21.75
25 cm	13.56	18.80	20.68	23.50	14.78	19.92	21.81	24.01
30 cm	12.58	17.78	19.66	22.68	13.80	18.90	20.80	22.82
L.S.D. 5 %	0.66				0.83			

Table 10. Effect of the interaction between preceding crops X hill spaces on grain yield (ardab/fed.) during 2001 and 2002 seasons.

Seasons	2001 season			2002 season		
Preceding crops / Hill spaces	Faba bean	Berseem	Wheat	Faba bean	Berseem	Wheat
20 cm	18.20	17.19	16.18	19.08	18.06	13.05
25 cm	22.64	21.82	18.48	25.14	22.20	18.06
30 cm	19.40	18.82	17.48	20.10	19.08	17.04
L.S.D. at (0. 05)	1.08			1.42		

The interaction effects between hill spaces and preceding crops are presented in Table (10). The highest values showed with 25 cm apart X faba bean as the preceding crop; 22.64 and 25.14 ardab/ fed in both seasons, respectively. Whereas, the lowest values recorded with 20 cm apart X wheat as the preceding crop; 16.18 and 13.05 ardab/ fed in two seasons, respectively.

Table 11. Effect of the interaction among preceding crops X hill spaces X bio-N fertilizer on grain yield (ardab/fed.) during 2001 and 2002 seasons.

Seasons		2001			2002		
Hill spaces	Preceding crops	Faba bean	Berseem	Wheat	Faba bean	Berseem	Wheat
20 cm	70 kg N	12.40	12.11	10.73	13.39	12.80	11.80
	Bio + 70 kg N	17.30	16.66	15.73	19.51	18.58	12.64
	105 kg N	20.20	19.00	17.73	20.19	19.48	13.33
	Bio + 105 kg N	22.90	20.99	20.53	23.13	21.68	14.34
25 cm	70 kg N	17.12	16.68	14.42	19.34	16.17	12.50
	Bio + 70 kg N	22.78	21.82	18.82	25.98	24.18	19.10
	105 kg N	23.46	23.22	20.50	26.96	24.82	19.90
	Bio + 105 kg N	27.18	25.56	20.18	28.28	25.63	20.68
30 cm	70 kg N	14.18	13.08	12.54	15.00	13.75	12.05
	Bio + 70 kg N	19.28	18.99	18.62	19.82	19.64	19.20
	105 kg N	21.28	21.09	18.92	22.30	20.87	20.00
	Bio + 105 kg N	22.84	22..11	19.84	23.12	22.07	20.80
L.S.D. at (0.05)		1.75			1.50		

The interaction effects among hill spaces X preceding crops X bio- N fertilizer are presented in Table (11).The results revealed that faba bean as the preceding crop X 25 cm apart X bio + 105 kg N fertilizer gave the highest yield 24.90 and 24.60 ardab/ fed in both seasons, respectively. Whereas, the lowest values recorded with wheat as the preceding crop X 20 cm apart X 70 kg N fertilizer; 10.00 and 11.05 ardab/ fed in two seasons, respectively.

With regard to the other yield components such as ear weight, ear diameter and weight of grains/ ear that were not showed in the interaction tables, since the grains yield reflects the trend of these components and express for its final results

It could be recommended that 25 cm between hills with microbin + 105 kg N/ fed after legume crops is the optimum combination for higher yield.

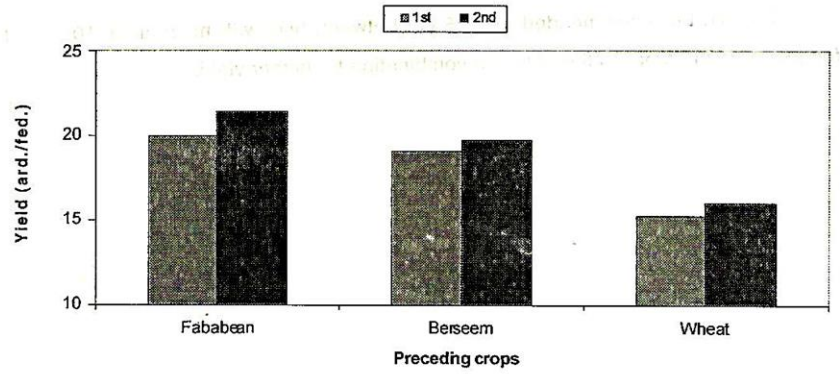

Fig. 1. Relation between maize grain yield and preceding crops.

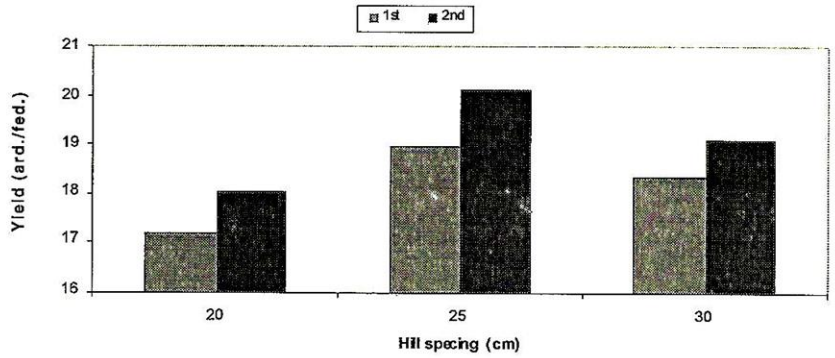

Fig. 2. Relation between maize grain yield and hill specing.

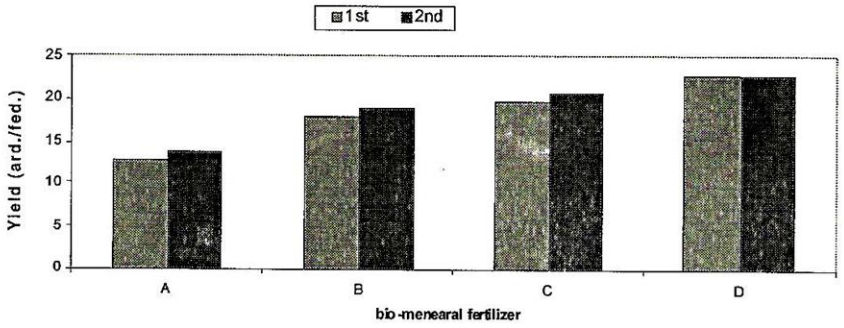

Fig. 3. Relation between maize grain yield and Bio-mineral fertilizers .

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تأثير العمليات الزراعية والتسميد الحيوى والمعدني على نمو ومحصول الذرة الشامية

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أقيمت تجربتان حقليتان بمحطة البحوث الزراعية-بسدس-محافظة بنى سويف-مصر خلال موسمي الزراعة ٢٠٠١، ٢٠٠٢ لدراسة تأثير المحصول السابق (فول بلدى-برسيم-قمح) وثلاث مسافات للزراعة (٢٠، ٢٥، ٣٠سم) والتسميد الحيوي والمعدني (٧٠ كجم نيتروجين للفدان و حيوي (١جم/ ١٠٠ جم بذرة) + ٧٠ كجم نيتروجين للفدان و١٠٥ كجم نيتروجين/للفدان، حيوى + ١٠٥ كجم نيتروجين لفدان)، على النمو والمحصول ومكوناته للذرة الشامية (صنف هجين فردى ١). وكان التصميم التجريبي المستخدم هو تصميم القطع المنشقة مرتين فى ثلاث مكررات. **وقد أوضحت أهم النتائج أن:**

آثرت المحاصيل السابقة معنويا على كل صفات الذرة الشامية تحت الدراسة خلال موسمى الزراعة وكانت أعلى النتائج المتحصل عليها بعد زراعة الفول البلدى ثم البرسيم بينما سجلت الزراعة بعد القمح اقل النتائج. أدى زيادة التسميد الآزوتي الحيوي + ١٠٥ كجم نيتروجين معدنى للفدان إلى الحصول على أعلى إنتاجية لمعظم صفات الريادة وكذلك كمية الإنتاج بينما أقل القيم تم الحصول عليها عند التسميد بمستوى ٧٠كجم نيتروجين للفدان. أدت الزراعة علي مسافة ٢٠سم إلى زيادة ارتفاع النبات ، ارتفاع الكوز ونسبة النباتات المذكرة. بينما أدت زيادة المسافات بين الجور إلي ٢٥ أو ٣٠ سم إلى ارتفاع قيمة قطر الساق، مساحة ورقة الكوز والنباتات الحاملة لكوزين. وأيضا كانت مكونات المحصول مثل وزن الكوز، طول الكوز، قطر الكوز، عدد الحبوب/الصف، وزن حبوب الكوز ونسبة التصافى أعلى عند الزراعة على مسافة ٣٠ سم مقارنة بـ ٢٠، ٢٥ سم. وسجلت الزراعة على مسافة ٢٥ سم أعلى قيمة لإنتاجية المحصول/للفدان. أدى التفاعل بين المحصول السابق والتسميد الحيوى-المعدنى ان محصول الفول البلدى مع ١٠٥ كجم ازوت للفدان + تسميد حيوي أعطى أعلى إنتاجية للفدان يليه البرسيم بينما سجل القمح مع التسميد ب ٧٠ كجم نيتروجين للفدان اقل القيم. أدى التفاعل بين مسافات الزراعة والتسميد الحيوى-المعدنى الى الحصول على أعلا انتاجية للفدان عند الزراعة على مسافات ٢٥ سم بين الجور والتسميد بـ ١٠٥ كجم ازوت للفدان + الحيوى. أدى التفاعل بين مسافات الزراعة والمحصول السابق الى الحصول على أعلا انتاجية للفدان عند الزراعة على مسافات ٢٥ سم بين الجور والفول البلدى.

أدى التفاعل الثلاثى بين مسافات الزراعة والمحصول السابق والتسميد الى الحصول على أعلى انتاجية للفدان عند الزراعة على مسافات ٢٥ سم بين الجور والتسميد بـ ١٠٥ كجم ازوت للفدان + الحيوى والفول البلدى أو البرسيم كمحصول سابق.

هذا ويمكن التوصية بزراعة الذرة الشامية (الصنف هـ ف ١٠) على مسافة ٢٥ سم بين الجور والتسميد بـ ١٠٥ كجم ازوت للفدان + الحيوى والزراعة بعد المحاصيل البقولية تحت ظروف منطقة سدس بمحافظة بنى سويف.