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EFFECT OF PRECEDING CROPS, ORGANIC AND MINERAL NITROGEN AND PLANT DENSITY ON PRODUCTIVITY OF MAIZE PLANT

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ABSTRACT

Two field experiments were conducted at El-Serw Agricultural Research Station, Agric. Research Center (ARC) during the two summer seasons of 1999 and 2000. The study aimed to find out the effect of different winter preceding crops, i.e. faba bean, wheat and sugar beet and different sources of nitrogen fertilization at rate of 120 kg N/fad (100 % mineral N, 100 % organic N, 25 % mineral N + 75 % organic N, 75 % mineral N + 25 % organic N) and three plant densities (20000, 24000 and 30000 plants/fad) as well as their interactions on growth yield and yield components of maize cv. TWC 321. A split-split plot design with three replications was used. The main findings could be summarized as follows:

1- Faba bean markedly surpassed in both seasons wheat and sugar beet in all characters studies except 50 % silking in both seasons. However, sugar beet was the earliest follow by wheat and faba bean using number of days from planting date to 50 % silking.
2- Different sources of nitrogen significantly affected on maize yield and its components. The highest grain yield/fad was obtained from 75 % mineral + 25 % N organic (23.8 ard/fad). While the lowest yield was to 100 % organic (18.76 ard/fad). Whereas, the fertilizer of 100 N mineral was delayed at number of days from planting to 50 % silking.
3- Increasing plant density from 20000 to 30000 plants/fad significantly increased all the characters except 100-kernel weight and Ear length in the second season. On the other hand, kernels weight/ear, 100-kernel weight , ear diameter and ear leaf area were markedly decreased by increasing plant density.
4- Grain yield ard/fad was significantly increased and affected by the interaction between preceding crops and source of nitrogen in second season and between plant density and source of nitrogen in the first season.
5- Maximum maize grain yield ard/fad was produced from planting faba bean as preceding crop interacted with 120 kg N/fad as (75 % mineral nitrogen + 25 % organic nitrogen) and with density of 30000 plants/fad.

This is the recommendation for raising maize productivity under the conditions of El-Serw district.

INTRODUCTION

Maize (*Zea mays,* L.) is one of the most important cereal crops in the world. It ranks third of the world cereal crops, surpassed only by wheat and rice. In Egypt, the amount of maize needed for human consumption and animal and poultry feeding is greater than that local producing. Therefore, great attention has been taken in conceder to increase the productivity by using height yielding varieties and improving the agronomic practices, such as evaluation the previous crops, the application of organic and mineral fertilizer regimes, as well as plant density/fad residual nitrogen in the soil when using leguminace crops as preceding crops, was increased as a result of nitrogen

fixation by bacteria. Seif El-Nasr *et al.* (1993), Metwally *et al.* (1994), Selim and El-Sergany (1995) and Sharief *et al.* (1995) they found that the values of maize characters grown after faba bean or berseem were higher than obtained after wheat.

Fertilization is among the vital factor affecting growth, yield and yield components of maize plants. With respect to the effect of nitrogen element have been taken out to increase the efficiency of nutrients uptake and their uses by the plants. Increased efficiency can be achieved by reducing nutrient losses from the root zone and/or by regulating nutrient uses by the plant. Organic play an important role in respect of this point these results was favorable with Sabry (1990). Faisal and Shalaby (1998) found that, increasing organic rate up to 40 m^3 as well as nitrogen level up to 180 kg N/fad, significantly increased both of plant and ear height and grain yield ard/fad. Zohry *et al.* (1998) found that the maximum yield was obtained from nitrogen fertilizer added a rate of 50% mineral + 50% organic. Haikel *et al.* (2000) found that different source of nitrogen significantly affected maize yield and its components, the highest grain yield (24.57 ard/fad) was obtained from bio-treasure organic.

Regarding the influence of plant density, Galal and El-Zeir (1990) found that increasing plant density were increased plant height, ear height and grain yield/fad. However, kernels weight/ear, 100-kernel weight, ear diameter and ear leaf area were decreased. Bedeer *et al.* (1992) reported that planting maize at density of 24000 plants/fad produced the maximum grain yield/fad, however, increasing plant density from 24 to 30 thousand plant/fad significantly decreased grain yield/plant. Badr *et al.* (1993) and Gouda (1993) showed that increasing plant density markedly decreased stem diameter, ear length, ear diameter, shelling % and grain yield/plant. However, increasing plant population density significantly increased grain yield/fad. Ali *et al.* (1994) pointed out that increasing plant density from 20 to 30 thousand plants/fad markedly increased number of days from planting to 50 % silking. Abd El-Maksoud (1995) and Soliman *et al.* (1995) concluded that increasing plant density significantly increased number of days from planting to 50 % tasseling, but decreased ear leaf area, ear length, ear diameter, 100-grain weight and grain yield per plant. Aly *et al.* (1996) showed that increasing plant density from 15 to 20 and 30 thousand plant/fad significantly increased grain yield/fad. However, ear leaf area, ear size, stem diameter, 100-grain weight, shelling % and grain yield/plant were decreased by increasing plant density. Finally, El-Zeir *et al.* (1998) found that increasing plant density from 24 to 30 thousand plants/fad significantly increased grain yield/fad, however grain yield/plant was decreased by increasing plant density over the two years.

Thus the aim of the present investigation was to study the effected of three winter preceding crops (faba bean, wheat and sugar beet), different sources of nitrogen (mineral and organic) and three plant densities (2000, 24000 and 30000 plants/fad) as well as their interactions on the growth, yield and yield components of maize crop (namely TWC 321).

MATERIALS AND METHODS

The present investigation was performed at El-Serw Agricultural Research Station, Demiatta Governorate during the two growing seasons of 1999 and 2000 to study the effect of preceding winter crops, different sources of N and plant population density on maize plants (*Zea mays,* L.) cv TWC 321. The grains were sowing on 25th and 27th May in the first and second seasons, respectively. Split-split plot design with three replicates were done during the two growing seasons. Plot area was 42 m^2 (6.0 x 7.0 m) included 10 ridges, 6.0 m long. Thinning at one plant/hill was took place after 21 days from planting. Plant distance was (20, 25 and 30 cm) and 70.0 cm between ridges expressed (20000, 24000 and 30000 plants/fad). One hundred and twenty units of N was added randomly as; 1/3 amount before manual mixing, 1/3 at 30 days and 1/3 at 60 days from planting.

Mechanical ploughing was done for all the experimental area with chesile plow. The dimensions of each plot was marked, rate of each sources of N was calculated for plot area (42 m^2) and was distributed as following Table, then different sources of N were mixed in the soil very well manually with hoe.

Sources of nitrogen (120 kg N/fad)	**Org. N m^3/fad**	**Application time and amount of fertilizer**
100 % mineral N	-	1/3 at mixing with the soil, 1/3 at 30 days and 1/3 at 60 days from planting
100 % organic N	52.74	All the amount added before the manual mixing
25% N(mineral)+75% organic	39.56	All the amount added before the manual mixing
75% N(mineral)+25% organic	13.19	All the amount added before the manual mixing

The main plots were used for preceding winter crop (faba bean, wheat and sugar beet), sub-plots were occupied with the nitrogen sources and sub-sub plots were occupied with plant population.

The applied treatments were:

1- Mineral N, 120 kg N/fad.
2- Organic N, cow organic 52.74 m^3/fad = 120 kg N.
3- 25 % mineral N, (30 kg N) + 75 % organic (90 kg N, i.e. 39.56 m^3) = 120 kg N.
4- 75 % mineral N, (90 kg N) + 25 % organic (30 kg N, i.e. 13.19 m^3) = 120 kg N.

The nitrogen percentage in organic is 0.35 % N with density 0.65 g/cm^3.

The mineral N was added as ammonium nitrate (33.5 % N) in three equal doses. All organic was added before ploughing.

Phosphorus was applied as calcium superphosphate (15.5 % P_2O_5) at rate of 200 kg/fad in one dose after plowing and before manual mixing and

potassium was applied as potassium sulphate (50 % K_2O) at rate of 50 kg/fad in two split doses, 1/2 with superphosphate and 1/2 at grain formation.

The following characters were studied:

At flowering, number of days from planting date to 50% silking was counted. At 90 days from sowing, planting samples were taken at random to ten plants from each plot to estimate ear leaf area. At harvest, a random sample of ten guarded plants were taken from each plot to determine plant height (cm), ear height (cm), ear length (cm) ear diameter (cm), 100-kernel weight (g) and kernels weight/ear (g). Grain yield /fad was determined from the weight of grains adjusted to 15.5% moisture of the four central ridges of each plot and converted to ardab/fad.

Chemical analysis of the soil sample were determined (Bouyoucos, 1951 and Jackons, 1973) calcium carbonate was determined (Collin's calcimeter) (Black, 1965). Available potassium in soil sample was extracted by ammonium acetate (pH 7.0) and determined by flame photometer as described by Eppendorf and Hinz (1970). Organic matter was determined according to Hess (1971). Available phosphorus in the soil was extracted by sodium carbonate and determined (Olsen *et al.,* 1954). Available nitrogen was determined according to Jackson (1973).

Data were statistically analysed according to the technique of analysis of variance (ANOVA) for split–split plot design and the least significant difference (LSD) method was used to test the differences between the treatment means as published by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Table 1 presented the average values of the two seasons for available N, P, K (ppm), organic matter %, pH and $CaCO_3$ content in the soil after harvesting winter crops (1) and after planting maize crop (2). As seen in Table 1 soil had low organic matter content without alkalinity problems. Low organic matter content in the soil considerably reduce the availability of most nutrients to plants (Mengel and Kirkby, 1982). After application of 120 kg N as organic nitrogen, soil showed higher value of organic matter (O.M). In general, the soil analysis after the addition of organic matter had high content of available N, P and K after harvest comparing with the values before maize planting.

1- Effect of preceding crops on growth and yield components of maize plants:

As seen in Table 2, 50 % silking and 100-kernel weight were affected with preceding crop in both seasons. Whereas, the plant height and ear height were not affected in both seasons. Faba bean had the superiority of growth and yield of maize plants. These results are in agreement with those obtained by Shafshak *et al.* (1982), Aly *et al.* (1993), Seif El-Nasr *et al.* (1993), Metwally *et al.* (1994). They studied the effect of wheat and faba bean on growth and yield of rice. Selim and El-Sergany (1995) and Sharief *et al.*

(1995) they found that maize grown after legume crops gave higher yield than after gramine crops. This due to the increase of soil content from nitrogen fixation legume crops.

Table 1: Average of the two seasons of available NPK (ppm), organic matter %, pH and $CaCO_3$ content in the soil after preceding a winter crops and after maize planting.

	After preceding winter crops (1)			After maize planting (2)			
	Faba bean	Wheat	Sugar beet	100 % M	100 % O	25% M 75% O	75%M 25%O
N ppm	55.1	27.3	36.8	44.2	67.0	58.3	52.2
P ppm	5.7	15.6	12.2	16.1	16.8	16.2	16.4
K ppm	368	479	458	468	593	568	525
OM %	1.89	1.66	1.73	1.9	2.4	2.2	2.0
PH	7.7	7.9	7.4	7.3	8.2	7.9	7.7
$CaCO_3$	2.13	2.25	2.32	2.35	1.60	2.0	2.12

M = mineral nitrogen, O = organic nitrogen

2- Effect of the different sources of nitrogen on growth and yield components of maize plants:

Its clearly apparent from data listed in Table 2 that all characters were significantly affected by different sources of nitrogen.

It was noticed that maximum values were obtained from the treatment of 75 % mineral N + 25 % organic N except number of days to 50 % silking. These results may be due to (1) when all N was added as a mineral, leaching was in the maximum, however when all N was added as organic, nitrogen release was very slow and not enough to the growth and development of the plants but when N was added from both sources, organic and mineral, cations were adsorbed and less leaching occurred. It is well known that organic matter improves soil structure, beside its role increasing water holding capacity and exchange capacity. It also decreases susceptibility to erosion and led to an increase in the availability of nutrients. In addition, it enhances reclamation of alkalin soil and increase the activity of macro and micro elements. Haikle *et al.* (2000) also, organic has a role in stimulating cell division and encouraging the meristimatic activity of plant. The obtained results are in good agreement with those reported by Mourad *et al.* (1986), Sabry (1990), Younis *et al.* (1990), Faisal and Shalaby (1998), Zohry *et al.* (1998) and Haikel *et al.* (2000).

Results indicated that increasing organic rate as well as mineral nitrogen decreased number of days to 50 % silking significantly in both seasons. These results are in coincidence with those reported by were Kemper (1972), Faisal and Shalaby (1998) and Haikel *et al.* (2000).

Increasing organic rate were significantly affected all characters. Similar results were obtained by Sabry (1990) and Haikel *et al.* (2000). They reported that increasing organic rates significantly increased plant growth and grain yield of maize plants. These results indicated clearly that nitrogen is necessary for protoplasm formation in cell division, photosynthetic and merestimec activity in plant organs which contributed to an increase were obtained by Abdel-Maksoud (1995), Aly *et al.* (1996), El-Zeir *et al.* (1998) and Said and Gaber (1999).

On the other hand Matta *et al.* (1990) and Younis *et al.* (1990) found that plant height had not significant affected by nitrogen fertilizer.

3- Effect of plant population density:

As shown from data presented in Table 2 increasing plant population density was increased significantly number of days to 50 % silking, plant height, ear height and grain yield in both seasons. From the other side kernels weight/ear and ear diameter were decreased significantly with increasing plant density, in both seasons, however ear leaf area and ear length in the first season only. These results are in harmony with those obtained by Kemper (1972), Moursi *et al.* (1983), Mourad *et al.* (1986), Gouda *et al.* (1993), Soliman *et al.* (1995) and Faisal *et al.* (1996).

This increment may be attributed to the competition between plants for light within the dense plant population. Also high plant density might have reduced light intensity within plants canopy. These results are in harmony with those reported by Galal and El-Zeir (1990), Ali *et al.* (1994) and Abdel-Maksoud (1995).

On the contrary, ear leaf area, ear diameter, 100-kernels weight and kernels weight/ear were markedly decreased by increasing plant density up to 30000 plants/fad as shown in Table 2 in both seasons. This could be attributed to good utilization of light, nutrients and water in case of lower densities than the highest one. Similar results were obtained by Badr *et al.* (1993), Abdel-Maksoud (1995), Aly *et al.* (1996) and El-Zeir *etal.* (1998).

Concerning to grain yield/fad, data in Table 2 showed that increasing plant density from 20000 to 24000 and 30000 plants/fad significantly increased grain yield/fad from 20.58 to 21.52 and 22.89 ard/fad as an average the two seasons. This increase may be due to greater number of plants per unit area in case of the thick planting and consequently increased grain yield/fad. Our findings are good agreement with those obtained of Bedeer *et al.* (1992), Abdel-Maksoud (1995), Aly *et al.* (1996) and El-Zeir *et al.* (1998).

Use of high number of plants per fad such as 240000 or 30000 plants should be taken into account in maize production.

4- Interaction effects:

Data presented in Table 3 revealed that the interaction between preceding crops and sources of nitrogen had significant effect on ear diameter (in the first season), 100-kernel weight and grain yield (in the second season). Planting maize after faba bean and fertilized by 75% mineral N +25 % organic N was the favorable which recorded the highest means of ear diameter (6.18 cm), 100-kernel weight (42.90 g) and grain yield (25.07

ardab/fad). It was followed by faba bean as a preceding crop and fertilized by 25% mineral N and 75 % organic N without significant differences aforenamed character.

Table 3: Averages of ear diameter, 100-kernel weight and grain yield of maize as affected by interaction between preceding crops and sources of nitrogen during 2000 season.

Characters / Preceding crops	Ear diameter (cm)			100-kernel weight (g)			Grain yield (ardab/fad)		
	Faba bean	Wheat	Sugar beet	Faba bean	Wheat	Sugar beet	Faba bean	Wheat	Sugar beet
Plant density:									
100% mineral N (120 kg N/fad)	5.21	4.81	4.53	40.03	39.12	37.61	22.44	21.14	20.69
100% organic (52.74 m^3/fad)	4.17	4.19	4.03	38.44	37.57	36.70	19.29	18.90	17.54
25% mineral N+ 75% organic (39.56 m^3/fad)	5.56	5.46	4.83	41.41	40.68	38.98	23.92	23.01	20.73
75% mineral N+ 25% organic (13.19 m^3/fad)	6.18	5.86	5.83	42.90	41.32	40.36	25.07	23.43	21.57
F-test	*			*			*		
LSD at 5%	0.68			1.83			1.93		

Table 4 revealed that the interaction between preceding crops and plant population had significant effect on ear leaf area, ear diameter and kernels weight/ear in the second season only. Planting maize after faba bean and fertilized by 75% mineral N +25 % organic N was the favorable which recorded the highest means of ear leaf area (763.04 cm^2), ear diameter (5.7 cm) and kernels weight/ear (214.98 g) in the second season only. It was followed by faba bean as a preceding crop and fertilized by 25% mineral N and 75% organic N without significant differences in aforementioned character.

In addition, a significant effect on kernels weight/ear (in the second season) and grain yield (in the first season) due to the interaction as presented in Table 5 showed that planting maize after faba bean and fertilized by 75% mineral N + 25% organic N was the favorable which recorded the highest means of kernels weight/ear (238.94 g) and grain yield (25.18 ard/fad). It was followed by faba bean as a preceding crop and fertilized by 25% mineral N and 75% organic N, without significant differences in aforenamed character.

Table 4: Averages of ear leaf area, ear diameter and kernels weight/ear of maize as affected by interaction between preceding crops and plant density during 2000 season.

Characters	Ear leaf area (cm^2)			Ear diameter (cm)			Kernels weight/ ear (g)		
Preceding crops	Faba bean	Wheat	Sugar beet	Faba bean	Wheat	Sugar beet	Faba bean	Wheat	Sugar beet
Plant density:									
20000 plants/fad	763.04	737.59	705.81	5.70	5.52	4.96	214.98	208.16	205.53
24000 plants/fad	742.08	713.53	633.83	5.32	5.15	4.65	215.86	204.93	196.37
30000 plants/fad	708.98	684.12	654.13	4.82	4.57	4.34	200.93	187.47	184.22
F-test	*			*			*		
LSD at 5%	41.12			0.41			16.42		

Table 5: Averages of kernel weights/ear and grain yield of maize as affected by interaction between preceding crops and sources of nitrogen during 1999 and 2000 seasons.

Characters	Kernels weight/ear (g) (2000)			Grain yield (ardab/fad) (1999)		
Plant density	20000 plants / fad	24000 plants / fad	30000 plants / fad	20000 plants / fad	24000 plants / fad	30000 plants / fad
Sources of nitrogen:						
100% mineral N (120 kg N/fad)	215.13	202.04	193.26	18.96	20.76	22.28
100% organic (52.74 m^3/fad)	194.27	183.26	163.82	18.27	18.43	20.08
25% mineral N+ 75% organic (39.56 m^3/fad)	229.71	215.51	199.91	21.52	22.30	23.97
75% mineral N+ 25% organic (13.19 m^3/fad)	238.94	222.06	206.50	23.48	23.99	25.18
F-test	*			*		
LSD at 5%	19.03			1.74		

Economical evaluation:

As for the economical evaluation of maize interacted with use organic and mineral nitrogen, (Tables 6 and 7) shows that the maximum yield of maize was obtained from the treatment (75 % mineral N + 25 % organic N) with average of two seasons 23.8 ard/fad, whereas the lowest grain yield was the treatment of 100 % organic N with average of two seasons 18.8/fad. From the same table also after calculated the prices of organic and mineral nitrogen and calculated the final economical evaluation become clear that the treatment (75 % organic N + 25 % mineral N) was given the economical yield which has the highest net return (2027.1 L.E) comparing with the other treatments, whereas the lowest net return come from the treatment of 100 % organic nitrogen (1092.0 L.E), but must not forget the effect of organic in the improvement soil structure.

Table 6: Economical evaluation of maize yield.

Sources of nitrogen	Yield ard/fad average of the two seasons	Income return L.E/fad	Fertilizer price L.E/fad	Net return L.E/fad
100 % mineral N (120 kg N/fad)	21.1	2110.0	210.0	1900.0
100 % Organic N(52.74 m^3/fad) = 120 kg N.	18.8	1880.0	787.1	1092.0
25 % N (M 30 kg/fad) + 75 % N O. (39.56 m^3) .	22.6	2260.0	648.4	1611.6
75 % N (M 90 kg N) + 25 % N O. (13.19 m^3).	23.8	2380.0	352.9	2027.1

M = mineral, O = organic

Table 7: Final economical evaluation of organic and mineral nitrogen on maize and order of yield and income return.

Sources of nitrogen	Yield ard/fad	Order for yield	N-fertilizer price L.E/fad	Income return L.E/fad	Order for net income
100 % mineral N (120 kg N/fad).	21.1	3	210.0	1900.0	2
100 % Organic N(52.74 m^3/fad) = 120 kg N.	18.8	4	787.1	1092.0	4
25 % N (M 30 kg/fad) + 75 % N O. (39.56 m^3).	22.6	2	648.4	1611.6	3
75 % N (M 90 kg N) + 25 % N O. (13.19 m^3).	23.8	1	352.9	2027.1	1

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تـأثير المحاصـيل السـابقة والنيتـروجين العضـوى والمعـدنى والكثافـة النباتيـة علـى انتاجية محصول الذرة الشامية.

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أقيمت تجربتـان حقليتـان بمحطـة البحـوث الزراعيـة بالسرو خـلال موسمى ١٩٩٩ و ٢٠٠٠ بغرض دراسـة تـأثير المحاصـيل الشتوية السـابقة (فول بلـدى ، قمـح و بنجـر السكر) ومصـادر مختلفـة من النيتـروجين العضـوى والمعدنى وبمعدل ١٢٠ كجم ن/فدان وهى ١٠٠ % نيتروجين معدنى نترات أمونيوم ٣٣,٥ % ن و ١٠٠ % نيتروجين عضوى (سماد بقرى محلل كامل) و ٢٥ % سماد معدنى + ٧٥ % سماد عضـوى و ٧٥ % سـماد معـدنى + ٢٥ % سـماد عضـوى مـع ثلاثـة كثافـات نباتيـة وهـى ٢٠٠٠٠ و ٢٤٠٠٠ و ٣٠٠٠٠ نبات/فدان، أجريت التجربة فى تصميم القطع المنشقة مرتين فى ثلاث مكررات.

ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى:

١ـ تأثرت جميع الصفات المدروسة معنويا بالمحصول السابق ماعدا صفة طول النبات وارتفاع الكوز خلال موسمى النمو . وقد أعطت زراعة الذرة الشامية بعد الفول البلدى أعلى القيم بالنسبة لجميع الصفات تحت الدراسة وصفة محصول الحبوب / فدان بالمقارنة بزراعة الذرة الشامية بعد كل من القمح وبنجر السكر خلال موسمى النمو. كذلك أدى زراعة الذرة الشامية بعد الفول إلى التبكير فى طرد ٥٠% من الحريرة بالمقارنة بالقمح وبنجر السكر.

٢ـ أثرت معاملات التسميد العضوى والمعدنى معنويا على جميع الصفات تحت الدراسة خلال موسمى النمو. وقد أعطت معاملة التسميد بـ ٧٥% ن معدنى + ٢٥% سماد عضوى أعلى قيم للصفات وأعلى قيم لمحصول الحبوب بالمقارنة بباقى المعاملات خلال موسمى النمو ، بينما أدى إضافة ١٠٠% نتروجين عضوى إلى إعطاء أقل القيم للصفات تحت الدراسة. فإن للتسميد العضوى أثر كبير فى إطالة فترة طرد ٥٠% من الحريرة بينما كانت أقل باستخدام ٧٥% ن سماد معدنى + ٢٥% ن سماد عضوى.

٣ـ أدت زيادة الكثافة النباتية من ٢٠٠٠٠ إلى ٣٠٠٠٠ نبات/فدان إلى زيادة معنوية فى كل الصفات تحت الدراسة ما عدا وزن الـ ١٠٠ حبة بالجرام وطول الكوز بالسم فى الموسم الأول فقط. وأيضا وزن حبوب الكوز والـ ١٠٠ حبة وقطر الكوز ومساحة ورقة الكوز أحدثت نقص بزيادة الكثافة النباتية.

٤ـ كان هناك تأثيرا معنويا على محصول الحبوب بالأردب/فدان نتيجة التفاعل بين المحاصيل السابقة ومصادر النيتروجين فى الموسم الثانى والتفاعل بين الكثافة النباتية ومصادر النيتروجين فى الموسم الأول وأيضا نتيجة التفاعل بين المحاصيل السابقة والكثافة النباتية على وزن الحبوب للكوز وقطر الكوز فى الموسم الثانى فقط فضلا عن ذاك التفاعل بين الكثافة ومصادر النيتروجين على وزن حبوب الكوز فى الموسم الثانى.

٥ـ أظهرت النتائج أن أعلى محصول حبوب نتج عندما زرع الذرة الشامية عقب الفول البدى وبكثافة نباتية ٣٠٠٠٠ نبات/فدان من المعاملة ٧٥ % نيتروجين معدنى + ٢٥ % نيتروجين عضوى بمعدل ١٢٠ كجم نيتروجين للفدان وبالتالى يمكن التوصية بهذه المعاملة لرفع انتاجية الذرة الشامية تحت ظروف منطقة السرو.

Table (2): Averages of days from planting date to 50% silking, plant height, ear leaf area, ear height, ear diameter, ear length, 100-kernel weight, kernels weight/ear and grain yield of maize as affected by preceding crops, sources of nitrogen and plant density during 1999 and 2000 seasons.

Characters / Treatments	50% silking		Plant height (cm)		Ear leaf area (cm^2)		Ear height (cm)		Ear diameter (cm)		Ear length (cm)		100-kernel weight (g)		Kernels weight/ear (g)		Grain yield (ardab/fad)	
	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000
A- Preceding crops:																		
Faba bean	66.00	66.18	248.34	241.03	787.86	738.03	155.04	166.68	5.20	5.28	21.78	21.62	40.70	42.03	211.13	217.22	22.54	22.68
Wheat	67.12	67.03	245.41	221.76	783.35	711.75	156.98	146.31	5.01	5.08	21.39	21.07	39.68	39.09	198.89	203.52	21.44	21.62
Sugar beet	68.12	68.29	241.67	216.56	752.63	664.59	151.48	137.24	4.77	4.65	21.26	20.22	38.41	37.69	187.93	195.37	20.83	20.13
F-test	*	*	NS	NS	NS	*	NS	NS	NS	**	NS	*	**	*	NS	*	NS	**
LSD at 5%	1.28	0.41	--	--	--	46.89	--	--	--	0.22	--	0.87	0.57	2.19	--	9.19	--	0.82
B- Sources of nitrogen:																		
100% mineral N (120 kg N/fad)	68.37	67.96	240.05	225.79	762.81	706.81	157.14	147.19	4.89	4.85	21.31	20.73	38.92	39.08	195.32	203.48	20.66	21.43
100% organic (52.74 m^3/fad)	68.70	68.10	227.32	203.91	684.14	591.04	138.05	132.59	4.46	4.13	20.37	19.50	37.58	37.82	172.82	180.45	18.95	18.56
25% mineral N+ 75% organic (39.56 m^3/fad)	66.53	66.89	252.59	234.06	812.30	748.54	158.51	156.56	5.28	5.28	21.91	21.45	40.36	40.26	207.32	215.04	22.59	22.56
75% mineral N+ 25% organic (13.19 m^3/fad)	64.72	65.71	260.59	242.03	839.20	772.76	164.29	163.99	5.34	5.74	22.33	22.21	41.53	41.25	221.82	222.51	24.21	23.36
F-test	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
LSD at 5%	0.57	1.01	15.33	7.10	19.21	40.34	9.32	9.42	0.34	0.23	1.19	1.43	0.90	2.49	13.53	10.69	0.63	0.84
C- Plant density:																		
20000 plants/fad	66.34	66.18	231.02	218.40	798.67	735.48	142.38	139.66	5.45	5.39	22.69	21.58	40.58	40.09	217.90	219.52	20.56	20.60
24000 plants/fad	66.55	67.19	247.21	224.58	783.38	696.48	158.11	148.99	4.98	5.04	21.11	21.00	39.64	39.18	199.09	205.72	21.37	21.66
30000 plants/fad	68.33	68.13	257.19	236.37	741.79	682.41	163.01	161.58	4.55	4.58	20.63	20.33	38.56	39.53	180.97	190.87	22.88	22.17
F-test	**	**	**	**	**	*	**	**	**	**	**	NS	**	NS	**	**	**	**
LSD at 5%	0.88	1.11	11.88	10.44	27.46	35.35	9.89	12.25	0.35	0.30	0.97	--	0.82	--	9.94	11.73	0.71	0.74