EFFECT OF PRECEDING CROP AND NITROGEN RATE ON GRAIN YIELD AND YIELD COMPONENTS OF MAIZE (*ZEA MAYS* L.)

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Abstract

The experiment was conducted at the Experimental Farm of El Gemmeiza, Agricultural Research Station, El-Gharbia Governorate, Egypt, during 2012/2013 and 2013/2014 growing seasons. The experimental design was strip plot with three replications. Main plots were devoted to preceding crops, faba bean, sugar beet and wheat .Maize cultivar S.C. 128 was grown after three winter crops. While nitrogen fertilizer rates (60, 75, 90 and 105 kg N /fed) were allocater sup plots. Results showed that All characters of maize were significantly affected by preceding winter crops and nitrogen levels in both seasons . Results indicated that preceding crops significantly affect on maize yield. The highest yield (18.41 and18.10 ardab/fed) in both seasons ,res,and yield components were obtained after faba bean as preseding crop and 105 kgN/fed. Whereas, the lower yield of maize (14.46 and 14.95) were obtained after wheat as preseding crop and 60 kg N/fed. In both seasons, The interaction between preceding crop x nitrogen rates not significant on all traits of maize crop in both seasons. The highest values of cereal units were observed by sugar beet as preceding crop. Generally, it can be concluded that fertilizing with 105% kg N/fed with faba bean as preceding crop to maize may be to improve the productivity of maize crop under the conditions of the present study .

Key words: Preceding crop, Nitrogen rate, Maize Yield and Yield components .

Introduction

Maize (Zea mays, L.) is the world's widely grown highland cereal and primary staple food crop in many developing countries. It is the third most important staple food crop both in terms of area and production after wheat and rice in Egypt. Total area under cultivation of maize in Egypt is 888329 hacter which is about 25.17 % of the total cultivated agricultural land while average yield is 7.80 ton/ ha. It is about 21.90 % of the total cereals production **(FAO, 2011**). Maize is used as a food for human diet, feed poultry and animals. It is used as raw materials for preparation of starch, corn, dextrose, corn syrup and

corn flakes industries (**Khaliq et al.(2004)** .Maize ranks 3rd in world's cereals crops after wheat and rice as food crop (**Chaudary, 1994**). The main objective now in Egypt is to increase the production of grain crops , maintain soil fertility. reduce environmental pollution and the rotation is done planting Preceding winter crops as first crops with summer grain crops maize as second crops that suit climatic and environmental conditions in Egypt , it uses light effectively and has the ability to produce a large amount of dry matter in a short time so farmers prefer to use maize as a second crop with the Preceding winter crops (**Cesurer, 1995**). When nitrogen is deficient in the soil, then addition of N fertilizer from outer source increased the grain yield of maize (**Wienhold et al., 1995**). Using waste and remnants of previous crops to improve the natural qualities. biological and chemical characteristics of the soil and thus increase the production of the next crop (**Calderon, 2000**) Some researchers demonstrated the benefits of crop rotation compared to a monoculture of maize, such as higher yield when cereals follow a legume as this saves nitrogen and breaks the disease cycle of grains. Nitrogen is the key element in increasing grain yield and quality of maize. In recent years emphasis has been given to increase fertilizers use efficiency by top dressing and split applications of nitrogenous fertilizers at critical growth stages of maize (Singh, 1985). Application of N increases soil fertility and crop productivity. About 43-68% increase in yield and 25-42% increase in biomass were observed with the addition of nitrogen fertilizer (Ogola et al., 2002).. Some researchers demonstrated the benefits of crop rotation compared to a monoculture of maize. Planting second crops a big need for rotation between leguminous plants and cereal plants because it contributes to increase soil fertility and increase crop production (**Leyla and Sevim, 2011). Kamran et al. (2014)** suggested that addition of N and appropriate nitrogen level affect yield and yield components of maize considerably. Nitrogen sources and nitrogen levels significantly affect the agronomic performance of maize.

Khan et al. (2012) showed that increase of nitrogen levels enhanced final seed yield due to increase of seed number in each ear, also, nitrogen levels had, significantly affected the maize plant height and the tallest plants were recorded under 120 and 150 kg/ ha N levels and the greatest grain yield of maize (1.5 t/ ha) was found under the 160 kg/ ha N level

The objectives of this research were to evaluate the effects of preceding winter crops (i.e., faba bean, sugar beet and wheat) as previous crops and N fertilization rates on maize yield and yield components.

Materials and Methods

Field experiments were carried out in a clay soil at the Experimental Farm of El- Gemmeiza Agricultural Research Station, El-Gharbia Governorate, during two growing seasons 2012 -2013 and 2013- 2014, to study the effect of three preceding winter crops and four nitrogen fertilizer rates on maize(cultivar S.C. 128) as a summer crop**. The experimental design was strip-plots design with three replication, where the preceding winter crops were** faba bean (Sakha 11 cv.), sugar beet (Beta ploy cv.) and wheat (Gemmeiza 11 cv. allotted to main plot, while nitrogen levels (60kg/fed, 75 kg/fed ,90 kg /fed and105 kgN /fed) were allotted to the sub plot**.** Each sub-plot was 19.60 m^2 in area, consisting of 8 ridges (each, 3.5 m long and 0.7 m wide for ridges) of presiding crop. Data for the site climatic conditions were taken from El-Gharbia meteorological station according to the formal data from the ministry of agriculture during the two growing seasons are presented in table (1).

Table (1): The average of temperature and relative humidity in 2012 -2013 and 2013- 2014seasons and physicochemical of the experiments soil

Month	First season2012-2013		Second season2013-2014	
	Temperature (^oC)	Relative humidity(%)	Temperature (^oC)	Relative humidity (%)
May	28.46	61.35	27.66	63.62
June	29.45	68.1	28.56	66.48
July	31.84	71.06	30.91	70.89
August	32.52	69.75	33.71	71.57
Sept	26.58	66.25	26.88	68.53

Table 2:

Determination Mechanical	First season 2012/2013		Second season 2013/2014	
	0-30	30-60	0-30	30-60
Clay %	57.24	55.21	55.47	54.00
Silt %	22.29	21.94	23.68	22.80
Sand %	20.57	22.85	20.85	23.20
Texture	Clay			
Chemical analysis:				
Available N (ppm)	22.9	21.8	24.0	22.0
Available P_2O_5 (ppm)	9.0	8.5	11.0	10.0
Available K_2O (ppm)	350	335	360	400
Ec (mmhos/cm^3)	0.8	0.8	0.9	0.9
pH	7.40	7.3	7.3	7.2
$CaCo_3$ %	2.71	3.10	3.0	3.0
Organic matter %	1.0	1.1	1.2	1.2
Cations (meq/100 g.soil)				
Na^+	0.36	0.37	0.37	0.37
K^+	0.01	0.01	0.03	0.04
Ca^{++}	0.25	0.27	0.24	0.24
Mg^{++}	0.26	0.28	0.22	0.22
Anions (meq/100 g. soil)				
HCO^3	0.32	0.48	0.36	0.40
Cl^-	0.38	0.39	0.28	0.30
SO_4	0.20	0.06	0.22	0.12

Faba bean was sown on the upper and one side of ridges in hills(2 plants /hill)spaced at 20 cm. sugar beet was sown on side of ridges in hills (one plant/hill) at a distance of 20 cm between hills. While wheat were sown in two rows on the top of ridges according to the recommendations for optimal plant density.Maize was sown on one side of ridge in hills (one plant/hill) at 25cm among plants. Preceding crops and maize sowing and harvesting dates are presented in Table (3).
Nitrogen,as ammonium nitrate(33.5% N)was added to maize in two equal doses,at the first and second irrigation.All other cultural practices were uniformaly applied according to recommendations.

Table 3 : Planting and harvesting dates of preceding crop and summer crop in 2012/2013 and2013/2014 seasons

Crop	First season (2012 / 2013)		Second season (2013 /2014)	
	Planting date	Harvesting date	Planting date	Harvesting date
Faba bean(A1)	15/10/2012	20/4/2013	18/10/2013	23/4/2014
Sugar beet(A2)	15/10/2012	9/5/2013	18/10/2013	12/5/2014
Wheat(A3)	15/11/2012	3/5/2013	25/11/2013	9/5/2014
Maize	15/05/2013	15/9/2013	18/05/2014	15/9/2014

Table 4: The average yield of preceding winter crops in both seasons

Crop	Root (t./fed)	Top (t./fed)	Seed yield (ardab/fed)	Straw yield(kg/fed)	Root (t./fed)	Top (t./fed)	Seed yield (ardab./fed)	Straw yield (kg/fed)
. Faba bean	.....	.....	10.48	1100	.....	.....	9.85	988
sugar beet	24.63	12.89	.....	.....	26.17	12.75	.....	.....
Wheat			21.25	1350			20.65	1250

Field sampling and data collection

At harvest time, a sample of 10 plants was randomly collected from each sub plot to measure. -Maize yield and its components
1- Plant height (cm) 2-Ear height 3- Ear lengh 4-Eardiameter
5-Number of grains/ ear 6- 100- grain weight (g). 7- Ear grain weight(g) 8- Leaf area index
9-Grain yield (ardab/fed.)..– (ardab=140kg)

***Plant height*:** Plant heights (cm) of five randomly selected plants were measured from the ground level to the top of tassel in each sub plot and then their means were calculated.
Leaf area indexes (LAI) :were recorded. Leaf area was measured according to the method described by Radford (1967) according to the

equation, LA = K (Lx B), where: LA= leaf area (cm^2), K= constant (0.75), L= leaf length (cm), B = maximum leaf width (cm) and LAI= LA/GA; where GA= ground area which occupied by plant.

100- grains weight (g)

A random sample of thousand grains were taken from the grain yield of each sub plot and weighed with an electronic balance to record weight for 100- grains.

Number of grains/ ear

To record the number of grains /ear, grains of ten randomly selected ears in each plot were counted and then averaged.

Grain yield (ardab/fed)

For recording grain yield data, three central rows were harvested in each sub plot with the help of a sickle. Ears were removed from the harvested plants, dried threshed and weighed with the help of an electronic balance and the data will then be converted in to ardab /fed.

Cereal unit:

The yield of all crops were changed to units of cereal according by **Brockaus(1962**)for judicious comparison between 100kg for each crops as follow:maize=1 unit,faba bean=1.20 units, sugar beet=0.25unit,wheat=1unit , straw yield for fababean=0.25unit, straw yield for wheat=0.15unit, maize=0.15unit and Top yield for sugar beet=0.10unit.

Table (5): Cereal units to preceding crops and maize of both season

Preceding crops	Cropping system	Cereal units		
		First season	Second season	Mean
Faba bean	Maize + faba bean	60.35	61.94	61.14
Sugar beet	Maize + sugar beet	116.55	104.06	110.30
Wheat	Maize + wheat	70.68	69.24	69.96

Statistical analysis:

Data statistically analyzed as the technique analysis of variance (ANOVA) of strip- plot design as mentioned by Gomez and Gomez (1984). Treatment means were compared using the Least Significant Difference (LSD at 5%) test as outlined by **Waller and Duncan (1969**).

Results and discussion

Effect of preceding winter crops on maize yield and its components

Data in Tables (6 and 7) indicate significant effect for preceding crop on ,plant height, ear length, ear height, ear diameter,100 grains weight, number of grains/ear, grain yield /plant, leaf area index and

grain yield / fed in 2013/2013 and2013/2014 seasons , as well as number of rows / ear only in the second season .

Mean value of Table (6) show that plant height, ear height, ear length, ear diameter of maize plants were significantly affected by preceding crops. Data indicated that maize plants after faba bean produced the highest values of these characters in plants were(plant height250.91, 249.91(ear height,140.08,139.25), (ear length 20.45, 20.42) and (ear diameter 47.85,47.75)after faba bean in both seasons respectively ,compared to maize plants after the two other preceding winter crops. These might be attributed to the more availability of N and less N uptake as faba bean the preceding crop. Consequently, maize did uptake greater N amount and had taller plants **(Nawar, 2004 and Khalil *et al.,* 2011**).The increases in these characters after faba bean compared to that after sugar beat and wheat plants might be attributed to the higher soil organic matter and N content that largely enhanced the maize vegetative growth in terms of plant height and other characters(**El-Sdodany and Abou-Elela, 2010 and Khalil et al.2011.**

Also, data in table (6) indicated that 100-grain weight and number of grains /ear was influenced significantly by preceding crops . The highest 100-grain weight (31.72 and31.57) and number of grains/ear(552.50 and549.80),were obtained when maize planting after faba bean compared sugar beet and wheat in both seasons, respectively . Increasing soil organic N and carrying over of N from faba bean residues to the subsequent maize might be responsible for such increase in grain number/ear. Physiologically ,the greater N uptake of maize plants after faba bean increased photosynthetic rate and photo assimilates translocation to ear ,which caused the number of grains /ear and the other characters to be higher for maize ear after faba bean than did after the other preceding crops(**Rizvi and Rizvi,1992, Khalil et al. 2011 and Abou-Keriasha and Nadia Eissa (2014).**

Mean value of Table (7) shows that weight of grains/ear , leaf area index and grain yield (ardab/fed.) was significantly affected by preceding crops. Among the preceding crops plots grown with faba bean had higher weight of grains /ear (174.35 and174.29), leaf area index(5.21 and5.18) and grain yield (22.98 and 22.87 ardab/fed) in first and second seasons, respectively . Faba bean was superior to both sugar beet and wheat regarding all studied characters of maize. That was in an agreement with the results **of Nawar (2004) , Khalil et al.(2011) and Arif *et al.,* (2011** found that leguminous crops caused maize to produce higher values of grain yield attributes such as number of grains/ear ear grain weight and grain yield /fed .In addition,

Drinkwater *et al.* (2000) observed that legume based cropping patterns increase the organic matter content consequently result in sustainable yields of crops. **Ali et al(2015**) reported that This increase might be due to the liter and leaf biomass on the soil in leguminous crops plots. The leaf biomass is of high quality, it decompose more rapidly and supply more nitrogen.

Effect of Nitrogen rates on maize yield and its components

Data of analysis of Table(6 and7) indicated that plant height , ear length , ear height, ear diameter ,100 grains weight , number of grains/ear grain yield /plant , leaf area index and grain yield / fed were significantly responded to the effect of the nitrogen rates in both seasons.

Data presented in Table(6)shows that plant height, ear height, ear length and ear diameter,100-grains weight and number of grains /ear of maize plants were significantly affected by nitrogen (N) fertilizer rates in both seasons .The plant height and other characters significantly increased with increase in N from 60 to 105 kg N/ fed.. Data indicated that maize plants produced the highest values of these characters in plants were(plant height261.12 , 260. 49 cm)(ear height,,140.08,139.25 cm),(ear length 22.10,21.80 cm),(ear diameter 48.98,48.89 mm) (100-grains weight :33.27 and 33.14 g) and (number of grains /ear :604.0 and 598.0)with 105kgN/fed in both seasons , respectively. The increment in plant height and other characters with the rise in N dose indicated that plants used N during active cell division to form building blocks (protein) for cell elongation. The performance of maize plant might be the result of residual soil fertility improved. These results are in line with those of **Balasbramaniyan and Palaniappan (2001**). The data pertaining to 100-grains weight and number of grains/ear influenced by nitrogen are presented in table (6). It is revealed from the data that nitrogen rates had significant effects on these characters in both seasons. The highest values of 100 –grain weight 33.27 and33.14) and number of grains/ear(604.0 and598.0)were recorded from105 kg N/fed in the first and second seasons , respectively . The more number of grains/ ear might be due to more photo-assimilates production translocation into ears in leguminous crops, hence increased both number of fertile grains/ear and individual grain weight (Wallach, 1995 ,and **Ali et al(2015.** Whereas, **Muhammad and Khan Saeed (2005) and khalil et al ,2011),** they reported that yield contributing characters such as thousand grain weight, number of grains/ ear with higher doses of inorganic fertilizer in combination with manure resulting in higher yield.

Mean value of Table (7) shows that weight of grains/ear, leaf area index and grain yield /fed.were significantly affected by nitrogen

(N) applied. The grain weight and other characters slightly increased with increasing in nitrogen application from 60 to 105 kg /fed . Weight of grains/ear, leaf area index and grain yield were observed to be higher in the plots where nitrogen was applied at the rate of 105 kg N /fed (184.12and183.59),(5.99 and5.98 and(24.22 and 24.09)in the first and second seasons, respectively . whereas the lower grain yield was noted at rate 60 kg N/fed(16.99 and 16.91)in both seasons, respectively . Gardener et al.,1985 found that the increase in N supply and greater N uptake by maize might have increased the leaf length and width dimensions ,leading to increases in leaf eare. The increase in grain yield was probably might be due to the more number of grains/row, number of row/ear and 100-grain weight. These results are supported by the finding of **Muhammad and Khan Saeed (2005) and Khalil et al.2011.** Plant as well as plant height is an important yield component as more green area more will be share to grain yield.

Effect of interaction between preceding crop and nitrogen levels on maize :

Results indicate that the interaction between preceding crop and N-level had no significant effect on all studied traits of maize plants in both seasons, Table (6 and7).

Effect of preceding crop and nitrogen fertilizer on cereal unitsl

Data presented in table (5) show that the average of cereal unit varied by different of preceding crops and nitrogen fertilizer. The results indicated that the sugar beet as preceding crop gave the highest values of cereal units (116.55 and 104.06) in the first and second seasons, respectively. While the lowest values was observed with faba bean (60.35 and 61.94) in both seasons, respectively.The results are in agreement with those of Abou-Keriassha and Eissa (2014).

Available N, P and K after maize harvested

Data presented in Table (8) show the effect of preceding winter crop and nitrogen fertilizer rate on N, P and K availability in soil after maize harvesting and show that sowing faba been gave the highest mean values of soil available N, P and K in soil where they reached 39.07 and 36.84 ppm for available N, 13.95 and 13.31 ppm for available P and 409.10 and 407.40 ppm for available K at the end of the first and second years respectively. Wheat as preceding winter crop gave the lowest mean values of available N, which reached to 36.50 to 34.48 ppm for available N; 12.75 and 12.1 ppm for available P and 399.4 and 397.4 ppm for available K at the end of the first and second season , respectively. These results revealed that faba been, as a preceding winter crop enriched the soil with N, P and K and its

residues had beneficial effects on improving soil chemical properties (**Farghly, 2001**). Similar results was obtained by **El-Sodany and Abou-Elela, (2010**) ,Who reported that, the preceding winter crops had a significant effect on soil nutrient changes and increasing N, P and K status of the soil.

Also, data in Table (8) show that increasing nitrogen fertilizer rate from 60 to 105 kg N/ fed. significantly increased soil available from N, P and K in the two seasons. The mean values of available N, P and K ranged from 25.18 to 32.22, 22.10 to30.62 ppm for available N; from 11.23 to 14.08 to 10.81 to 12.92 ppm for available P and from 288.4 to344.3; 286.4 to 342.2 ppm for available K in the first and second seasons respectively. In general, results show that available N, P and K were increased with increasing nitrogen fertilizer rate and macronutrients were high in the first years compared to the second years. These results are agreement with obtained with **Sodany and Abou-Elela, (2010**). This may be due to that the higher nitrogen level led to slightly change in soil pH and/ or increased cation exchange which ,led to increased K released.

Data presented in Table (9) show the interaction effect between the preceding winter crop and nitrogen fertilizer rate on N, P and K availability in soil after maize harvesting and show that, sowing faba been as preceding crop and adding 105 kgN/fed. for maize plants gave the highest mean values of soil available from N, P and K, where they reached to 38.48 and 36.59 ppm for available N, 13.01 and 12.59 ppm for available P and 407.5 and 406.4 ppm for available K at the end of the first and second seasons respectively. But growing maize plants after wheat with 60 kg N /fed recorded the lowest mean values of available N, which reached to 30.62 to 28.45 ppm for available N, 10.62 and 10.27 ppm for available P and 327.7 and 326.1 ppm for available K at the end of the first and second years respectively. These results revealed that the interaction effect between faba been as a preceding winter crop with the different rates of N enriched the soil with N, P and K compared to the two other winter crops.

Conclusion

It can be concluded that faba bean as preceding winter crop with 105 kg N /fed for maize plants was the best combination to nmaximizing grain yield of maize and its components as well as soil fertility under the same agro-climatic conditions of thes research at the Experimental Farm of El Gemmeiza Agricultural Research Station, El-Gharbia Governorate .

Table (6) Means of plant height(cm), ear height(cm), ear length (cm), ear diameter(mm) ,100-grain weight and Number of grains/ear of maize as affected by different preceding crops and N levels during 2013 and 2014 seasons.

Treatment	plant height(cm)		Ear height		Ear length		Ear diameter		100-grain weight(g))		Number of grains/ear	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Faba bean(A1)	250.91	249.91	140.08	139.25	20.45	20.24	47.85	47.75	31.72	31.57	552.50	549.80
Sugar beet(A2)	246.66	246.25	135.41	135.16	19.76	19.16	43.35	43.25	30.44	30.33	535.50	537.60
Wheat(A3)	225	224.33	122.75	121.75	19.25	19.08	41.62	41.56	29.25	29.16	501.50	496.80
F-test5%	*	*	*	*	*	*	*	*	*	*	*	*
LSD5%	8.42	9.68	8.45	7.67	0.435	0.343	0.896	1.30	0.676	0.694	24.25	19.70
B1(60kg kgN/fed)	217.44	216.32	119.13	118.48	17.644	17.54	36.65	36.57	27.83	27.7	426.0	425.11
B2(75kg N/fed.)	234.33	234.15	127.22	125.32	18.95	18.81	43.76	43.68	29.19	29.09	504.0	504.0
B3(90kgN/fed.)	250.53	249.68	138.88	138.74	20.78	20.62	47.69	47.58	31.61	31.49	585.33	585.33
B4(105 kgN/fed.)	261.12	260.49	145.77	145.66	22.10	21.80	48.98	48.89	33.14	33.14	604.0	598.0
F-test5%	*	*	*	*	*	*	*	*	*	*	*	*
LSD 5%	7.57	5.59	8.32	7.18	0.27	0.25	2.09	2.18	0.54	0.53	50.70	52.58
A x B	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Whereas :Faba been(A1),SUGAR BEET(a2) AND Wheat(A3)
B1(60kgN/fed.),B2(75kgN),B3(90kgN)andB4(105kgN)
NS indicate not significant.
* indicate significant at 5% level.

Table (7) Means weight of grain /ear, leaf area index and grain yield/fed for maize as affected by different preceding crops and N levels during 2013 and 2014 seasons

Treat	**W.grain/ear (g)**		**Leaf area index (LAI)**		**Grainyield (Ardab/fed.)**	
	First year	**Sec Year**	**First year**	**Sec Year**	**First year**	**Sec Year**
A1	174.35	174.29	5.21	5.18	22.98	22.87
A2	158.38	158.26	4.95	4.85	20.88	20.76
A3	144.83	144.39	3.94	3.59	19.11	18.95
F-test5%	*	*	*	*	*	*
LSD5%	10.58	7.62	0.08	0.23	3.06	2.08
B1	128.19	128.09	3.07	3.04	16.99	16.91
B2	146.55	146.53	3.95	3.89	19.38	19.23
B3	177.84	177.72	5.48	5.35	23.39	23.22
B4	184.17	183.59	5.99	5.89	24.22	24.09
F-test5%	*	*	*	*	*	*
LSD5%	13.77	10.96	0.301	0.31	2.31	2.27
AXB	NS	NS	NS	NS	NS	NS

Whereas :Faba been(A1),SUGAR BEET(a2) AND Wheat(A3)
B1(60kgN/fed.),B2(75kgN),B3(90kgN)andB4(105kgN)
NS indicate not significant.
*indicate significant at 5% le

Table 8: The effects of preceding winter crops and N fertilization rate on available macronutrients in the two seasons(2013 and 2014)

Treatment	Available N (ppm)		Mean	Available P (ppm)		Mean	Available K (ppm)		Mean
	First year	Sec Year		First year	Sec Year		First Year	Sec year	
	Effects of preceding winter crops								
(A1) F. bean	39.07	36.84	37.95	13.95	13.31	13.63	409.1	407.4	408.25
(A2) S. beet	37.94	35.0	36.47	13.01	12.31	12.66	405.6	404.0	404.8
(A3) wheat	36.50	34.48	35.49	12.75	12.1	12.42	399.4	397.4	398.4
F-test 5%	**	**		*	*		**	**	
LSD5%	0.577	1.446		0.781	0.7919		15.23	15.36	
	Effects of N fertilization rates								
B1 (60kgN)	25.18	22.10	23.94	11.23	10.81	11.02	288.4	286.9	287.65
B2 (75kgN)	27.65	25.51	26.58	12.16	11.58	11.87	290.3	288.7	289.5
B3(90kgN)	28.49	26.64	27.56	13.06	12.5	12.78	291.8	291	291.4
B4(105kgN)	32.22	30.62	31.42	14.08	12.92	13.50	344.3	342.2	343.25
Ftest5%	**	**		*	*		**	**	
LSD5%	0.471	0.883		0.895	1.043		19.97	20.03	

Whereas :Faba been(A1),SUGAR BEET(a2) AND Wheat(A3)
B1(60kgN/fed.),B2(75kgN),B3(90kgN)andB4(105kgN)
NS indicate not significant.
* indicate significant at 5% level.

Table 9: Effect of interaction between preceding winter crops and N fertilization rates on available macronutrients

Treatment		Available N (ppm)		Mean	Available P (ppm)		Mean	Available K (ppm)		Mean
		First year	Sec Year		First year	Sec Year		First year	Sec Year	
A1	**B1**	34.88	33.2	34.04	12.54	11.60	12.07	349.4	347.7	348.6
	B2	35.30	33.56	34.43	12.86	11.68	12.27	402.9	400.9	401.9
	B3	36.87	34.67	35.77	12.98	11.71	12.35	407.4	405.6	406.5
	B4	38.48	36.59	37.54	13.01	12.59	12.80	407.5	406.4	407
A2	**B1**	33.00	30.48	31.74	11.30	10.75	11.03	332.0	330.8	331.4
	B2	33.03	30.56	31.80	12.09	11.48	11.79	334.1	332.2	333.2
	B3	34.24	31.34	32.79	12.10	11.58	11.84	347.8	346.5	347.2
	B4	34.57	31.66	33.12	12.23	11.60	11.92	348.2	346.6	347.4
A3	**B1**	30.62	28.49	29.56	10.62	10.27	10.45	327.7	326.1	326.9
	B2	30.94	29.05	30.00	10.79	10.30	10.55	328.3	326.3	327.3
	B3	31.35	29.08	30.22	10.85	10.49	10.67	329.8	328.2	329
	B4	31.73	29.98	30.86	11.12	10.66	10.89	331.8	330.6	331.2
Ftest 5%		**	**		NS	NS		*	*	
LSD 5%		1.125	2.819		1.522	1.5435		29.68	29.94	

Whereas :Faba been(A1),SUGAR BEET(a2) AND Wheat(A3)
B1(60kgN/fed.),B2(75kgN),B3(90kgN)andB4(105kgN)
NS indicate not significant.
* indicate significant at 5% level.

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الملخص العربى

تأثير المحصول السابق ومعدل التسميد الازوتى على محصول الحبوب ومكوناتة للذرة الشامية

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أقيمت تجربتان حقليتان بالمزرعة البحثية بمحطة البحوث الزراعية بالجميزة بمحافظة الغربية خلال الموسمين الزراعيين2012/ 2013 و2013 / 2014لدراسة اثر االمحصول السابق(فول بلدى-بنجر سكر-قمح) و التسميد الازوتى(60-75-90-105كجم ن/ف)على محصول الذرة وقد نفذت التجربة فى تصميم القطع المنشقة مرة واحدة فى ثلاث مكررات.حيث وزعت المحاصيل السابقة فى القطع الرئيسية بينما وزعت معدلات التسميد الازوتى فى القطع الشقية

واظهرت النتائج:-

1-تاثرت جميع صفات الذرة تحت الدراسة معنويا بالمحاصيل السابقة والتسميد الازوتى وكانت اعلى قيمة محصول حبوب الذرة 18.41 و 18.10 اردب/ ف عقب الفول البلدى كمحصول سابق مع أعلى معدل تسميد ازوت(105كجم نيتروجين/فدان) (ن4) بينما اقل قيمة لمصول حبوب الذرة كانت 14.46 و 14.95 اردب/ف عقب قمح كمحصول سابق مع اقل معدل للتسميد الازوت(ن1)(60كجم نتروجين/فدان)

2- لم يكن للتفاعل بين المحصول السابق والتسميد الازوتناى تاثير معنوى على كل صفات الذرة تحت الدراسة.

3- اتضح من الدراسة بحساب عائد الفدان بوحدات الحبوب تفوق محصول الذرة عقب بنجر سكرعن المحاصيل السابقة الاخرى

وقداوضحت الدراسة طبقا لظروف التجربة ان افضل نتيجة كانت بزراعة الذرة الشامية عقب الفول البلدى كمحصول سابق مع معدل التسميد الازوتى(105كجم ازوت/فدان (ن4).