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EFFECT OF PRECEDING CROPS, NITROGEN AND POTASSIUM FERTTIZAITION ON SUGAR BEET PRODUCTIVITY

BY

Hammam, G.Y.M.*; Mehasen, S.A.S.*; El-Naser, F.M.A.S. and El-Mallah, A.A.*****

* Agronomy Dept., Fac. of Agric., Moshtoher, Benha Univ. Egypt .
** Field Crop Inst., ARC, Giza, Egypt
*** Ministry of Agriculture

ABSTRACT

Two field experiments were carried out at Zarzoura Experimental Station during 2005 /2006 and 2006/2007 seasons to investigate the effect of three preceding summer crops (soybean, maize and cotton) and four different levels of nitrogen fertilization (0, 25, 50 and 75 kg N/ fed) and three different levels of potassium fertilization (0, 24 and 48 kg K_2O / fed) on sugar beet productivity cv Kawemeira. The results of the experiments could be summarized as follows:

The preceding crops had significantly effect on plant dry weight, root diameter, root weight, top, biological and sugar yields, sucrose % and T.S.S % in both seasons, while leaf area, leaf area index, number of leaves/plant, root length, and root yield were significantly in one season out. The highest values of all studied characters were taken after soybean while the lowest values were taken after cotton in both seasons.

Nitrogen levels had significantly effect on all studied characters in the two seasons. Increasing N level from zero to 75 kg N/ fed increased significantly all characters in both seasons The highest means were taken at 75 kg N/fed while, the lowest means were taken at check treatment (zero kg N/ fed).

Potassium levels had significantly effect on all studied characters in the 1st and 2nd season. The highest means were recorded at 48 kg K_2O/ fed . While the lowest means were taken from the control treatment.

Data indicated that root length, root diameter, root weight, root, top, biological and sugar yields as well as sucrose % were significantly differed by the interactions between preceding crops × N levels, preceding crops × K . levels and N levels × K levels. The highest values were taken after soybean × 75 kg N/ fed, soybean × 48 kg K_2O /fed and 75 kg N/fed × 48 kg K_2O / fed respectively. Data also cleared that, root weight, root, top, biological and sugar yields and sucrose % were significantly affected by the interaction between preceding crops × N × K levels. The highest values of all mentioned characters sugar beet after soybean preceding crop and fertilized with 75 kg N/ fed and 48 kg K_2O /fed during the two studied seasons . It could be concluded that under the conditions of the experiment .

INTRODUCTION

Sugar beet *(Beta vulgaris L.)* is considered the second important sugar crop after sugar cane in sugar production . It contributes by 40% nearly of total sugar consumption in the world . The researchers work hard to increase the productivity of sugar yield to approximate the gap between the production and consumption . In Egypt the cultivated area was increased from 16.943 feddans in 1982 to184.158 feddans in 2006 .

Maareg and Allam (1999), Said (2000) and John *et al.* (2003) found that root and sugar yield of sugar beet were significantly varied by the preceding summer crops.

Increasing of nitrogen fertilization levels caused a significant increased root, top, biological and sugar yield as reported by El-Maghraby *et al.* (1998), Said (2000), Voronin (2000), Azzazy (2001), Ismail and Abo El–Ghait (2004 & 2005), El-Shafai and Tantawy (2006), Ouda (2007) and Said (2007).

Regarding to potassium fertilizer levels Ibrahim and Attia (1990), Hefazy *et al.* (1992), Agami (2000), Ismail (2002) and Ismail and Abo El –Ghait (2004), cleared that root, top biological and sugar yield were increased by increasing K levels from zero up to 48 kg K_2O / fed .

The present investigation was carried to study the influence of some preceding summer crops, nitrogen and potassium levels and their interactions on yield, yields components and quality of sugar beet .

MATERIAL AND METHODS

Two field experiments were carried out at Zarzoura Research Station, Etay El-Baroud City, Beheira Governorate in the two successive seasons 2005/2006 and 2006/2007 to study the effect of 36 treatments on growth characters . yield, yield components and quality of sugar beet. The treatments represent were 1-Three preceding summer crops, cotton (Giza 89), maize (T.W.C 321) and soybean (Giza 21), 2-Four levels of nitrogen fertilization (0,25,50and 75 kg N/fed), and 3-Three levels of potassium fertilization (0,24and 48kg K_2O/fed).

A split-split plot design with four replicates was used. The three preceding summer crops were allocated in the main plots, N fertilization levels were randomly arranged in the sub plots, while K fertilization levels were distributed in the sub-sub plots. The area of sub sub-plot was 10.5 m^2 (1/400 feddan), 3.5m long and 5 ridges in wide (60cm between ridges). Sugar beet were sown in 20th and 18th Nov. in the first and second seasons, respectively . Sugar beet seeds were cv Kawemeira. Sugar beet was sown on ridges with 20 cm between hills. Both nitrogen fertilization (urea 46%) and potassium fertilization (Potassium sulphate 48%) were added at two equal doses before the first and second irrigations. At planting super phosphate (15.5 %), at a rate of 30 kg P_2O_5/ fed was applied. All other agricultural practices were done as recommended by Sugar Crop Research Institution from sowing to harvesting .The soil

analysis at 30 cm depth of the experimental site showed that the texture of the soil was silty clay loam and containing (0.17 and 0.18 ppm) available N, (0.19 and 0.17 ppm) K, (7.75 and 7.70) pH and (3.12 and 3.16 %) O.M in the first and second season, respectively.

A sample of five plants was taken randomly at 125 days after sowing date to estimate the following characters i.e., number of leaves / plant, leaf area, leaf area index and plant dry weight .

At harvest the two outer rows were a bilt and a sample of five plants was taken at random to determine the following characters i.e., root length (cm), root diameter (cm), root weight / plant, root yield (fed), top yield (fed) and biological yield (fed) were recorded from the whole plots while, sugar yield (fed) as calculated by root yield (tons/fed x sucrose%), purity %,total soluble solids (T.S.S.) % by hand refract meter and sucrose %. Sucrose percentage was determined using polar miter on a lead acetate extract of fresh root according to method of Le-Docte (1927).

The collected data were statistically analyzed according to the method described by Snedecor and Cochran (1967), The means and interactions compared by Duncan's new multiple range test (Duncan 1955).

RESULTS AND DISCUSSION

I- Effect of preceding crops, nitrogen and potassium fertilization on:-

a) Growth characters:

Data presented in Table (1) cleared that plant dry weight was significantly affected by the preceding summer corps in the first and second seasons. While number of leaves/plant, leaf area and leaf area index were significantly affected by the preceding summer corps in the first season for the former treat and in the second season for the two latter ones. The highest means were obtained when sugar beet was grown after soybean and the lowest means after cotton. It concluded that plant dry weight, number of leaves/plant, leaf area and leaf area index after leguminous crop exceeded that after non-leguminous ones. The increases may be due to the beneficial effect of nitrogen fixation by reduce bacteria which favorably affected plant growth and also increase in O.M. content of the soil after leguminous crops as compared with non-leguminous ones. Similar results are in agreement with Said (2000).

Data in Table (1) pointed out that all growth characters i.e., number of leaves / plant, leaf area, leaf area index and plant dry weight were significantly increased by increasing N levels from zero up to 75 kg N/fed in the two studied seasons, i.e. the highest values were given at 75 kg N/fed, while the lowest values at control. These results may be attributed to high important role to nitrogen on plant growth. Similar data are in accordance with Said (2000).

Data recorded in Table (1) cleared that the 3 different levels of K fertilization levels had significantly effect on all studied characters during the two

investigated seasons . It is important to mention that, growth characters reached to the maximum values at 48 kg K_2O/fed application and to the minimum values at control in 1st and 2nd seasons. These results could be attributed to the important role of potassium in physiological process in plant such as translocation of sugar and carbohydrates of assimilates from to top to the root. Also its role in nutritional balance, which increase organic compounds through photosynthesis.

b) Yield components:

Data listed in Table (2) cleared that, root diameter and root weight were significantly influenced by the preceding summer corps during the first and second season, while root length was significantly affected in the second season only. The highest means of root length (35 and 33.1cm), root diameter (9.3 and 8.9cm) and root weight (719.2 and 777.9g) in both seasons, respectively were given when sugar beet was grown after soybean . The lowest means of root length (33.2 and 31.3 cm), root diameter (8.1and 8.0 cm) and root weight (579.0 and 657.5g/plant) were given when sugar beat was grown after cotton in the 1st and 2nd seasons respectively. These results may be due to nitrogen fixed by leguminous crops compared with non-leguminous crops in the soil. Similar results are in agreement with Said (2000).

Data given in Table (2) showed that root length, root diameter and root weight were significantly increased by increasing nitrogen rates from zero up to 75 kg N/fed. The highest values of root length (36 and 34.5 cm), root diameter (9.4and 9.8cm) and root weight (772.4 and 961.1 g/plant) in the first and second seasons, respectively were given at 75 kg N/fed application .While the lowest values were given at check treatment . These results may be due to the important role to nitrogen for cell division and elongation as well as building up new organs in root . Similar results are in agreement with Abd El-Rahman (1996), Ibrahim (1998), Said (2000), Neamat-Alla and El-Geddawy (2001), Ismail (2002), Ismail and Abo El-Ghait (2005) and Ouda (2007).

Data presented in Table (2) pointed out that root length, root diameter and root weight were significantly increased by increasing K rates from zero up to 48 kg K_2O/fed. The highest values were given at 48 kg K2O/fed, while the lowest means were given at the control treatment during the two investigated seasons. These findings are in accordance with Abd-El-Rahman (1996), Ibrahim (1998), Agami (2000), Ismail and Abo-El -Ghait (2004).

c) Yield (tons / fed):

Data recorded in Table (3) showed that top, biological and sugar yield were significantly influenced by the preceding summer crops in the two investigated season. Whereas, root yield was significantly influenced in the second season only . Generally the highest mean of root yield (18.35 and 18.41 ton / fed), top yield (10.31 and 10.78 ton/ fed),biological yield (28.67 and 29.20ton / fed) and sugar yield (3.17 and 3.08 ton / fed) in 2005 / 2006 and 2006 / 2007 seasons, respectively were produced when sugar beet was grown after soybean . On the contrary the lowest values were obtained after cotton. It could be concluded that soybean is the best preceding crop for sugar beet for producing

root, top, biological and sugar yield. These increases may be due to the presence of soybean in the rotation, which increases the soil organic mater and nitrogen content in the soil. In addition to the high number of microorganisms which contribute to quick decomposition of the organic matter in the soil. Similar results are in agreement with Cootta and Donattel (1990), Marreg and Allam (1999), Said (2000) and John *et al.* (2003).

Table (1): Effect of preceding crops, N and K levels on growth characters during 2005/2006 (S1) and 2006/2007 (S2) seasons.

Treatments	Number of leaves / plant		LA (cm2)		LAI		Plant dry weight (g)	
Preceding crops	S1	S2	S1	S2	S1	S2	S1	S2
Soybean	19.3 a	18.7 a	2612.5 a	2874.3 a	2.18 a	2.40 a	84.7a	86.1 a
Maize	17.2 b	17.3 a	2445.5 a	2408.9 b	2.04 a	2.01 b	66.2 b	68.9 b
Cotton	16.7 b	16.8 a	2326.2 a	2275.2 b	1.94 a	1.90 b	60.8 c	60.3 c
N levels(kg / fed)								
0	15.6c	15.3c	1512.5d	1483.1 d	1.26 b	1.24 d	58.1 d	56.3c
25	17.3b	16.9b	2168.7 c	2303.1 c	1.81 c	1.92 c	68.2 c	66.5 b
50	18.6a	18.7a	2646.2 b	2754.0 b	2.21 d	2.29 b	74.3 b	70.5 b
75	19.5a	19.5a	3518.3 a	3537.7 a	2.93 a	2.95 a	80.4 a	77.9 a
K levels(kg / fed)								
0	17.0b	17.5b	2304.9 b	2246.7 c	1.92 b	1.87 c	69.5 c	62.3 c
24	17.8ab	17.7ab	2471.9 ab	2473.4 b	2.06 ab	2.06 b	69.7 b	68.0 b
48	18.4a	18.2a	2607.5 a	2838.3 a	2.17 a	2.37 a	71.5 a	73.1 a

Table (2): Effect of preceding summer crops, N and K levels on root characters during 2005/2006 (S1) and 2006/2007 (S2) seasons.

Treatments	Root length (cm)		Root diameter(cm)		Root weight (g)	
Preceding crops	S1	S2	S1	S2	S1	S2
Soybean	35.0a	33.1a	9.3a	8.9a	719.2a	777.9a
Maize	34.3a	32.2ab	8.4b	8.3ab	609.6b	728.4b
Cotton	33.2a	31.3b	8.1b	8.0b	579.0b	657.5c
N levels (kg / fed)						
0	31.3c	28.4c	7.5c	6.9d	511.3d	445.4c
25	34.0b	32.4b	8.6b	7.9c	585.1c	670.5b
50	35.4a	33.4ab	8.9ab	8.9b	675.0b	722.9b
75	36.0a	34.5a	9.4a	9.8a	772.4a	961.1a
k levels (kg/fed)						
0	33.2b	31.4b	8.3b	7.8c	586.8c	642.9c
24	34.1ab	31.9b	8.5ab	8.5b	629.8b	728.0b
48	35.3a	33.2a	8.9a	8.9a	691.1a	793.0a

Data presented in Table (3) cleared that root, top, biological and sugar yield were significantly increased by increasing N levels fertilization from zero up to 75 kg N / fed . The highest means of root yield (22. 26 and 18.93 ton/ fed),top yield (9.99 and 11.65 ton/ fed), biological yield (32.25 and 30.58 ton/ fed) sugar yield (4.12 and 3.54 ton/ fed) were produced from applied 75 kg N ton/

fed in the first and second seasons, respectively . While the lowest values of root yield (14.62 and 14.34 ton/ fed), top yield (8.00 and 6.35 tons /fed), biological yield (22.62 and 20.69 ton/ fed) and sugar yield (2.12 and 1.98 ton/ fed) were given at check treatment in the 1st and 2nd seasons respectively. These results may be due to high important role in the metabolic activity in plant, which contributes to the increase in the accumulation of metabolites in plant tissues and these in turn increases the root, top and weight plant after that root, top, biological and sugar yield. Similar findings are in agreement with, El- Maghraby *et al.* (1998), Said (2000), Voronin (2000), Azzazy (2001), Ismail and Abo El–Ghait (2004 & 2005), El- Shafai and Tantawy (2006) and Said (2007).

Data in Table (3) pointed out that root, top biological and sugar yield were significantly increased by increasing K rates from zero up to 48 kg K_2O/ fed. Generally the highest averages of root yield (18.85 and 17.91 ton/ fed), top yield (9.66 and 10.48 ton/ fed), biological yield (28.51 and 28.39 ton/ fed) and sugar yield (3.32 and 3.05 ton/ fed) when applied 48 kg K_2O / fed, in the first and second season, respectively. While the lowest values were obtained at the control treatment. These results are in accordance with Ibrahim and Attia (1990), Neamat Allah (1991), Hegazy *et al.* (1992), Abdel-Rahman (1996), Agami (2000), Ismail (2002) and Ismail and Abo El– Ghait (2004).

Table (3): Effect of preceding crops, N and K levels on root, top, biological and sugar yields in2005/2006(S1) and 2006/2007(S2) seasons

Treatments	Root yield (tons/fed)		Top yield (ton/fed)		Biological yield(ton/fed)		Sugar yield (ton/fed)	
Preceding crops	S1	S2	S1	S2	S1	S2	S1	S2
Soybean	18.35a	18.41a	10.31a	10.78a	28.67a	29.20a	3.17a	3.08a
Maize	17.77a	16.97b	8.56b	9.02b	26.33b	25.99b	2.93ab	2.71b
Cotton	17.28a	14.16c	7.39c	8.21c	24.67b	22.38c	2.76b	2.21c
N levels(kg/fed)								
0	14.62c	14.34c	8.00b	6.35d	22.62c	20.69d	2.12c	1.98d
25	15.93c	14.96c	8.34b	8.52c	24.28bc	23.49c	2.42c	2.21c
50	18.39b	17.83b	8.69b	10.83b	27.08b	28.66b	3.16b	2.96b
75	22.26a	18.93a	9.99a	11.65a	32.25a	30.58a	4.12a	3.54a
K levels(kg/fed)								
0	16.76b	15.22c	7.77b	8.32c	24.53c	23.54c	2.63c	2.30c
24	17.79ab	16.42b	8.84ab	9.21bc	26.64b	25.63b	2.92b	2.66b
48	18.85a	17.91a	9.66a	10.48a	28.51a	28.39a	3.32a	3.05a

(d) Technological characters:

Data given in Table (4) cleared that total soluble solids % and sucrose % were significantly affected by the three previous crops, while purity % was insignificantly affected during the two studied seasons. Generally data recorded that the highest means of T.S.S % (20.6 and 22.9%) and sucrose % (16.9 and 16.4 %) were given when sugar beet was preceded by soybean in the first and second seasons respectively. On the other hand, the lowest values of T.S.S % and sucrose % were taken when sugar beet was grown after cotton . Similar results are in agreement with Said (2000).

Data presented in Table (4) indicated that technological characters (T.S.S %, purity % and sucrose %) were significantly and gradually increased by increasing N levels from zero up to 75 kg N / fed during the two growing seasons . It's important to clear that, T.S.S % was significantly equaled at 25, 50 and 75 kg N / fed and at zero, 25 and 50 kg N / fed in the first and second season . Generally the highest values were given from applied 75 kg N / fed and lowest values were given at the control treatment. Similar data are in harmony with Khan *et al.* (1998), Said (2000), Neamat Allah (2001), Azzazy (2001), Ismail (2002) and Ismail and Abo El – Ghait (2004) and El- Shafai and Tantawy (2006).

Data listed in Table (4) cleared that all studied technological characters (T.S.S %, purity % and sucrose %) were significantly increased by increasing K rates from zero up to 48 kg K2O / fed . Generally, the highest means of T.S.S % (20.5 and 22.8 %), purity % (84.95 and 73.66 %) and sucrose % (17.2 and 16.7 %) were given at 48 kg K2O / fed in the first and second season, respectively .Whereas, the lowest values were given at check treatment . Similar data are in accordance with Agami (2000), Saif Lila (2000), Ismail and Abo-El– Ghait (2004) and Ouda (2007).

Table (4): Effect of preceding crops, N and K levels on T.S.S %, purity % and sucrose % in 2005 / 2006 (S1) and 2006/2007 (S2) seasons.

Treatments	T.S.S %		Purity %		Sucrose %	
Preceding crops	S1	S2	S1	S2	S1	S2
Soybean	20.6a	22.9a	82.3a	71.5a	16.9a	16.4a
Maize	19.9b	22.2ab	82.3a	71.2a	16.2ab	15.7b
Cotton	19.3b	21.7b	81.9a	70.9a	15.7b	15.3c
N levels(kg/fed)						
0	19.3b	21.9b	75.2d	63.1d	14.4d	13.7d
25	19.4ab	22.1ab	82.5c	66.4c	15.0c	14.6c
50	20.3ab	22.4ab	84.6b	73.6b	17.0b	16.5b
75	20.7a	22.8a	89.5a	81.7a	18.4a	18.5a
K levels (kg/fed)						
0	19.3b	21.7b	80.5b	68.5c	15.4c	14.8c
24	20.0a	22.3a	81.2b	71.5b	16.1b	15.9b
48	20.5a	22.8a	84.9a	73.6a	17.2a	16.7a

II- Effect of the interactions:-

Data recorded in Table (5) showed that root length, root diameter, root weight root yield, top yield, biological yield, sugar yield and sucrose % were significantly affected by the interaction between preceding summer crops and 4 different levels of N fertilization during the two growing seasons .Generally, the highest means of root length (36.8 and 34.9 cm), root diameter (10.3 and 10.5 cm), root weight (856.5 and 942.9 g), root yield (23.97 and 21.60 ton / fed), top yield (13.28 and 13.56 ton/ fed), biological yield (37.26 and 35.16 ton/ fed), sugar yield (4.61 and 4.19 ton/ fed) and Sucrose % (15.0 and 15.91 %) were taken when sugar beet was grown after soybean and applied 75 kg N / fed in the first and

second season, respectively . While the lowest values were obtained after cotton and at the control treatment. Similar results are in agreement with Said (2000).

Table (5): Effect of the interaction between preceding crops, and N levels on root characters, root,top, biological and sugar yield and sucrose% in 2005/2006and 2006/2007 seasons.

Characters	Preceding crops	2005/2006 season				2006/2007 season			
		Nitrogen levels (kg /fed)							
		zero	25	50	75	zero	25	50	75
Root length (cm)	Soybean	32.0bcd	34.9a-d	36.3ab	36.8a	29.3bc	33.8a	34.4a	34.9a
	Maize	31.3cd	34.2a-d	35.6abc	36.3ab	28.5c	31.7ab	33.8a	34.7a
	Cotton	30.7d	32.8a-d	34.5a-d	34.8a-d	27.4c	31.8ab	32.0ab	33.8a
Root diameter (cm)	Soybean	7.7efg	9.4abc	9.6ab	10.3a	7.3fgh	8.3c-f	9.5abc	10.5a
	Maize	7.5fg	8.4c-f	8.7b-e	9.1bcd	6.8gh	7.9d-g	8.8bcd	9.7ab
	Cotton	7.1g	8.0d-g	8.3c-f	8.7b-e	6.6h	7.5e-h	8.5cde	9.3bc
Root weight (g)	Soybean	545.6e	710.5bc	764.0b	856.5a	482.0ef	801.3c	885.6b	942.9a
	Maize	525.6ef	528.0ef	640.0cd	744.7b	456.8f	681.8d	835.7c	939.7a
	Cotton	462.7f	516.7ef	620.9b	715.8be	397.4g	528.6e	842.9bc	861.1b
Root yield (tons/fed)	Soybean	14.90fg	16.49d-g	18.05c-f	23.97a	15.61de	16.27d	20.17b	21.60a
	Maize	14.69g	15.97d-g	18.68bcd	21.74ab	15.27de	15.33de	18.53c	18.75c
	Cotton	14.28g	15.33efg	18.44cde	21.06abc	12.13f	13.30f	14.78e	16.44c
Top yield (tons/fed)	Soybean	8.13cd	9.58bcd	10.27abc	13.28a	7.12ef	10.39cd	12.05b	13.56a
	Maize	7.18cd	7.40cd	7.88cd	11.77ab	6.13fg	7.71e	10.71cd	11.54bc
	Cotton	6.67d	7.05cd	7.91cd	7.93cd	5.80g	7.47e	9.74d	9.84b
Biological yield (tons/fed)	Soybean	23.04g	26.07def	28.32cd	37.26a	22.73fg	26.67d	32.23b	35.16a
	Maize	21.87g	23.38efg	26.573de	33.51b	21.4gh	23.04fg	29.24c	30.29c
	Cotton	20.96g	22.38g	26.35de	30.00c	17.94i	20.77h	24.52ef	26.29de
Sugar yield (tons/fed)	Soybean	2.23e	2.64de	3.19cd	4.61a	2.20ef	2.51d	3.42b	4.19a
	Maize	2.13e	2.37e	3.23cd	3.98b	2.10fg	2.23ef	3.03c	3.48b
	Cotton	1.99e	2.24e	3.04d	3.77bc	1.63h	1.86gh	2.41de	2.93c
Sucrose %	Soybean	15.0ef	15.9de	17.5b	19.0a	14.0fg	15.3e	16.9d	19.3a
	Maize	14.4f	14.8f	17.2bc	18.3ab	13.7g	14.5f	16.3b	18.5b
	Cotton	14.0f	14.5f	16.4cd	17.8b	13.4g	13.9fg	16.2d	17.7c

Data in Table (6) revealed that root length,root diameter, root weight, root yield, top yield, biological yield, sugar yield and sucrose % were significantly differed by the interaction between preceding crops and K levels in the first and second season. Generally the highest values of the above traits were given when sugar beet was grown after soybean and received 48 kg K_2O/ fed., while the lowest values were given after cotton at zero level at potassium during the two investigated seasons. The highest means of root length (36.3 and 34 .0 cm), root diameter (9.9 and 9.4 cm), root weight (802.7 and 874.7 g), root yield (19.37 and 20.44 ton/ fed), top yield (11.36 and 11.84 ton / fed), biological yield (30.734 and 32.289 ton/ fed), sugar yield (3.55 and 3.61 ton/ fed) and sucrose % (18.0and17.3%) were given after soybean ×48 kg K_2O / fed interaction in the first and second season respectively . While, the lowest means of all studied characters were taken after cotton and at zero level of K fertilization in the first and second season.

Table (6): Effect of the interaction between preceding crops and K levels on root characters, root, top, biological and sugar yield and sucrose % in 2005/2006and 2006/2007 seasons

Characters	Preceding crops	2005/2006 season			2006/2007season		
		Potassium levels (K2O/fed)					
		zero	24	48	zero	24	48
Root length (cm)	Soybean	34.2a	34.5a	36.3a	32.4ab	32.8ab	34.0a
	Maize	33.3a	34.5a	35.2a	31.5ab	31.9ab	33.2ab
	Cotton	32.1a	33.3a	34.2a	30.4b	31.0b	32.3ab
Root diameter (cm)	Soybean	8.7bc	9.2ab	9.9a	8.3bcd	8.9ab	9.4a
	Maize	8.2bc	8.4bc	8.7bc	7.7cd	8.5ab	8.8ab
	Cotton	7.9c	8.0c	8.3bc	7.4d	8.0bcd	8.5abc
Root weight (g)	Soybean	636.3bcd	718.6ab	802.7a	686.6cd	772.5b	874.7a
	Maize	577.5cd	593.3cd	657.9bc	676.7cd	738.1bc	770.6b
	Cotton	546.7d	577.6cd	612.7cd	565.5e	673.4d	733.6bcd
Plant weight (g)	Soybean	881.4cd	1008.9ab	1113.5a	1019.4e	1132.1c	1376.3a
	Maize	839.0cd	854.1cd	963.3bc	970.5f	1080.8d	1217.2b
	Cotton	772.1d	841.1cd	915.8bc	775.0h	961.2g	1035.1e
Root yield (tons/fed)	Soybean	17.35ab	18.34ab	19.37a	16.91cd	17.88bc	20.44a
	Maize	16.54ab	17.76ab	19.01ab	15.90de	16.75cd	18.25b
	Cotton	16.37b	17.28ab	18.18ab	12.83g	14.62f	15.03ef
Top yield (tons/fed)	Soybean	9.15abc	10.43ab	11.36a	9.41cd	11.09ab	11.84a
	Maize	8.00abc	8.67abc	9.00abc	7.93e	8.76de	10.36bc
	Cotton	6.14c	7.42bc	8.61abc	7.62e	7.78e	9.22cd
Biological yield (tons/fed)	Soybean	26.51bc	28.77ab	30.73a	26.33c	28.98b	32.28a
	Maize	24.54cd	26.44bc	28.01abc	23.84de	25.52cd	28.62b
	Cotton	22.52d	24.70cd	26.79bc	20.46f	22.41e	24.27d
Sugar yield (tons/fed)	Soybean	2.82bcd	3.12abc	3.55a	2.63cd	2.99b	3.61a
	Maize	2.59cd	2.88bcd	3.31ab	2.37e	2.72c	3.04b
	Cotton	2.47d	2.74bcd	3.08a-d	1.88f	2.27e	2.48de
Sucrose %	Soybean	16.0bcd	16.6bc	18.0a	15.9c	16.5b	17.3a
	Maize	15.4de	16.0bcd	17.1ab	14.7d	16.0b	16.5b
	Cotton	14.8e	15.6cde	16.6bc	14.4d	15.3c	16.2b

Data listed in Table (7) pointed out that root characters i .e., (root length, root diameter and root weight), plant fresh weight, (root, top, biological and sugar yields) and sucrose % were significantly affected by the interaction between both of N and K levels . Its important to clear that the highest means of root length (37.3 and 35.1 cm), root diameter (9.8 and 10.6 cm), root weight (825.8 and 1174.7 g), plant fresh weight (1290.6 and 1742.6g), root yield (23.37 and 20.65 ton / fed), top yield (13.66 and 12.81 ton / fed), biological yield (37.04 and 33.47 ton / fed), sugar yield (4.63 and 4.11 ton / fed) and sucrose % (19.7 and 19.8 %) were obtained at 75 kg N/fed× 48 kg K_2O/ fed in the first and second season, respectively . While the lowest means of all studied characters were given at control of nitrogen and potassium in the two growing seasons. There findings are in agreement with Abd El – Rahman (1996) and Ismail and Abo El-Ghait (2004).

Table (7): Effect of the interaction between N and K levels on root characters, root, top, biological and sugar yield and sucrose % in 2005/2006and 2006/2007 seasons .

Characters	N levels (kg/fed)	2005/2006 season			2006/2007 season		
		k levels (Kg/fed)					
		zero	24	48	zero	24	48
Root length (cm)	0	30.7e	31.1e	32.3de	27.5d	28.5d	29.2cd
	25	33.1cde	34.0bcd	34.8a-d	31.5bc	31.7bc	34.0ab
	50	34.4a-d	35.3abc	36.6ab	32.5ab	33.2ab	34.4ab
	75	34.7a-d	36.0abc	37.3a	34.1ab	34.3ab	35.1a
Root diameter (cm)	0	7.2e	7.3de	7.9cde	6.4f	7.0f	7.4ef
	25	8.3bcd	8.6bc	8.9abc	7.2f	8.2de	8.4cd
	50	8.5bc	8.9abc	9.1ab	8.6cd	8.9cd	9.3bc
	75	9.1abc	9.3ab	9.8a	8.9bcd	9.9ab	10.6a
Root weight (g)	0	483.1e	492.7e	558.1be	392.6g	461.7f	481.9f
	25	516.9e	608.3cd	630.0cd	587.3e	669.3d	755.0d
	50	604.7cd	669.6c	750.6b	665.8c	738.2b	760.3a
	75	742.5b	748.8b	825.8a	926.1bc	1042.9b	1174.7a
Root yield (tons / fed)	0	13.70f	15.05ef	15.12ef	13.20h	14.11gh	15.70f
	25	15.03ef	15.63ef	17.13cde	13.56h	15.27fg	16.06def
	50	16.76de	18.63cd	19.78bc	16.85cde	17.43c	19.20b
	75	21.54ab	21.86ab	23.37a	17.26cd	18.86b	20.65a
Top yield (tons / fed)	0	6.03d	7.69cd	10.26abc	5.74g	6.26fg	7.05efg
	25	7.95cd	8.40bcd	8.67bcd	7.17ef	8.20e	10.20d
	50	6.98cd	7.05cd	7.83cd	9.92d	10.71bcd	11.87ab
	75	10.09a-d	12.22ab	13.66a	10.45cd	11.68abc	12.81a
Biological yield (tons / fed)	0	19.74d	22.74cd	25.39c	18.94e	20.37e	22.76d
	25	22.99cd	24.04c	25.81c	20.73e	23.48d	26.26c
	50	23.75c	25.68c	27.61c	26.77c	28.14c	31.08b
	75	31.63b	34.09ab	37.04a	27.72c	30.54b	33.47a
Sugar yield (tons / fed)	0	1.87f	2.20ef	2.28ef	1.74f	1.94f	2.25e
	25	2.19ef	2.34ef	2.71de	1.84g	2.30e	2.47de
	50	2.67de	3.16cd	3.63bc	2.06d	2.91c	3.34b
	75	3.77b	3.95b	4.63a	3.00c	3.48b	4.11a
Sucrose %	0	13.6f	14.6e	15.1de	13.1h	13.7g	14.3f
	25	14.6e	14.8e	15.8d	13.4gh	14.9e	15.4e
	50	16.0d	16.9c	18.3b	15.4e	16.7d	17.3c
	75	17.4bc	17.9b	19.7a	17.3c	18.4b	19.8a

Data presented in Table (8) cleared that, root weight was significantly influenced by the interaction between preceding crops × N × K as well as, root, top, biological and sugar yield during 2005/ 2006 and 2006/ 2007 season . Similar trend was observed to sucrose % trait . Generally the highest means of plant weight (1422.6 and 1912.99 g), root weight (994.2 and 957.0 g), root yield (25.15 and 24.90 ton / fed), top yield (14 .21 and 14.68 ton/fed), biological yield (35.32 and 39.58 ton/fed), sugar yield (5.17and 5.13 ton/fed) and sucrose % (20.6 and 20.6 % in the 1st and 2nd season, respectively were given when sugar beet was grown after soybean × 75 kg N/fed and 48 kg K_2O/ fed interaction . While the lowest means were given when sugar beet was grown after cotton and zero level of potassium and nitrogen level in the first and second season .

Table (8): Effect of the interaction between Preceding crops, Nitrogen and potassium levels on root weight, root, top, biological, and Sugar yield sugar yield and Sucrose %during 2005/2006 (S1)and 2006/2007 (S2) seasons.

Preceding crops	N levels (kg/ fed)	K levels (kg / fed)	Root weight (g)		Root yield(ton/ fed)		Top yield(ton/fed)		Biological yield (ton/fed)		Sugar yield(ton/fed)		Sucrose%	
			S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Soybean	0	0	506.7ij	442.8jk	14.60j-o	14.44hij	6.21lm	6.66bc	20.811-o	21.10ijk	1.95mn	2.07klm	13.4pq	14.5mno
		24	520ij	496.7ijk	15.25h-m	15.12g-j	7.30i-m	7.75abc	22.55k-n	22.87h-k	2.11k-n	2.28i-m	13.8opq	15.0j-n
		48	610c-j	506.5ijk	17.00d-j	15.17g-j	7.85h-m	9.99abc	24.85h-k	25.51f-j	2.54h-k	2.33i-m	14.9j-n	15.4h-m
	25	0	560f-j	666.5gh	15.07i-m	15.55f-j	8.36g-l	7.95abc	23.44j-m	23.70g-k	215j-n	2.37h-m	14.2l-p	15.1j-n
		24	775.9b	824.2b-f	16.60f-l	15.84f-j	11.23c-f	9.73abc	27.82d-h	25.57e-j	2.68f-i	2.49g-m	16.1f-i	15.5h-m
		48	795.8b	913.2a-d	17.15d-i	17.87c-j	11.59c-f	11.06abc	28.74d-g	28.93d-h	2.69f-i	3.05e-k	15.7h-k	17.1d-i
	50	0	687.5b-h	802.5c-f	18.70c-f	15.84f-j	11.16c-f	8.75abc	29.85c-g	24.59g-k	2.97e-h	2.64f-m	15.9g-j	16.6f-k
		24	793.8b	392.2ab	19.10cde	19.03b-i	11.77b-e	9.87abc	30.87cde	28.90d-h	3.21de	3.27d-i	16.8fg	17.2d-h
		48	810.8b	922.2abc	22.72b	19.28b-i	13.25abc	12.18abc	35.97b	21.40b-f	4.08b	3.66b-f	17.9cde	18.9bcd
	75	0	790.9b	934.8ah	19.30cd	23.41ab	11.94bcd	12.25abc	31.23cd	35.65abc	3.46cd	4.21bcd	18.0cd	17.9b-f
		24	784.6b	937.0ab	20.60c	23.37ab	14.08ab	13.37ab	34.67b	36.75ab	3.97b	4.43abc	19.3b	18.7bcd
		48	994.2a	957.0a	24.90a	25.16a	14.69a	14.22a	39.58a	39.37a	5.13a	5.17a	20.6a	20.6a
Maize	0	0	489.2ij	424.4k	13.90m-p	13.93ij	5.59m	5.98c	19.49nob	19.90jk	1.85mno	1.90lm	13.3pq	13.5no
		24	494.2ij	461.2jk	14.50k-o	15.03hij	5.95lm	6.41bc	20.45mno	21.43ijk	2.00imn	2.22j-m	13.8opq	14.7imn
		48	593.4d-j	484.9ijk	17.42d-i	15.11g-j	6.85j-m	9.17abc	24.27i-n	24.28jk	2.46ijk	2.26i-m	14.1m-p	15.0i-n
	25	0	497.5ij	556.5hij	13.92m-p	15.09g-j	6.62klm	7.42abc	20.55mno	22.51h-k	1.87mno	2.18klm	13.4pq	14.4mno
		24	535.8hij	727.0fg	15.32g-m	15.56f-j	6.72klm	7.80abc	22.04k-n	23.36h-k	2.26i-m	2.29i-m	14.7k-o	14.7imn
		48	550.8gij	762.0efg	16.65e-k	17.28d-j	9.78d-i	7.00abc	26.53f-j	24.28g-k	2.57hij	2.64f-m	15.3ijk	15.3i-n
	50	0	584.2e-j	799.0def	17.70d-j	16.38e-j	9.62d-i	7.46abc	27.32e-j	23.84g-k	2.67ghi	2.61g-m	15.1i-m	16.0g-m
		24	601.7c-j	729.3fg	18.50c-f	18.99d-i	11.06c-f	8.01abc	29.56c-j	27.00d-i	3.10d-g	3.24d-j	16.7fgh	17.1d-i
		48	734.2b-e	978.7a	19.40cd	20.69a-f	11.46c-f	8.17abc	30.85cde	28.87d-h	3.32de	3.84b-e	17.1def	18.5b-e
	75	0	739.2b-e	827.0b-f	18.10def	20.78a-f	9.91d-h	11.16abc	28.01d-h	31.93b-e	3.11def	3.66b-f	17.2def	17.6c-g
		24	741.7bcd	935.0ab	18.70c-f	21.47a-e	11.33c-f	11.65abc	30.03c-f	33.11bcd	3.51cd	3.78b-e	18.7bc	17.7c-g
		48	753.3bc	955.8a	19.45cd	22.97abc	13.37abc	12.50abc	32.82bc	35.46abc	3.80bc	4.51ab	19.5b	19.6ab
Cotton	0	0	453.4j	310.6i	11.10q	12.75j	5.44m	5.47c	16.53p	18.21k	1.41p	1.63m	12.7	12.8o
		24	463.9ij	427.2k	12.60opq	15.00hij	5.53m	5.92c	18.13op	20.91ijk	1.72nop	2.11klm	13.6pq	14.2mno
		48	470.8ij	454.4jk	12.70h-q	15.11g-j	6.45klm	8.64abc	19.15nop	23.75g-k	1.76nop	2.25i-m	13.9op	14.9k-n
	25	0	493.3ij	490.0ijk	11.70pq	14.25hij	6.52klm	6.50bc	18.22op	20.75ijk	1.49op	2.04klm	12.8q	14.2mno
		24	513.4ij	556.9hij	13.90m-p	15.51f-j	6.67klm	6.97abc	20.57mno	22.48h-k	1.95mn	2.23j-m	14.0nop	14.3mno
		48	543.4g-j	589.9hi	14.30-o	16.25e-j	9.23e-j	7.68abc	23.53j-m	23.39g-k	2.15j-n	2.45g-m	15.1i-n	15.0k-n
	50	0	542.5g-j	595.8def	14.15mno	18.08b-j	9.01f-k	7.75abc	23.15k-h	25.83e-j	2.16j-n	2.76f-l	15.3i-l	15.3h-n
		24	613.3c-i	653.0efg	14.70j-o	17.87c-j	9.30e-j	7.27abc	24.00i-m	25.14f-j	2.43i-l	2.97e-k	16.6fgh	16.5f-i
		48	706.7b-f	980.0a	15.50g-m	19.37b-h	10.92c-g	8.71abc	26.41g-j	28.09d-h	2.62hi	3.39d-h	16.9efg	17.5c-g
	75	0	697.5b-g	816.6b-f	14.40k-o	20.44a-g	9.53d-i	7.87abc	23.92i-m	28.31d-h	2.43i-l	3.45c-g	16.9d-g	16.8e-j
		24	720.0b-e	856.7a-e	17.30d-i	20.75a-f	9.64d-i	7.90abc	26.93f-j	28.65d-h	2.97e-h	3.64b-f	17.1def	17.5c-g
		48	730.0b-e	910.0a-d	17.62b-h	22.01a-d	10.38d-h	8.08abc	28.00d-h	30.08c-g	3.39cde	4.21bcd	19.2b	19.1abc

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تأثير المحاصيل السابقة والتسميد الآزوتي والبوتاسي علي إنتاجية بنجر السكر

جابر يحيي محمد همام*، صديق عبد العزيز صديق محيسن*،
فخرى محمد عبد الغني سيف النصر، أنور عوض الملاح *****

* قسم المحاصيل ــ كلية الزراعة بمشتهر – جامعة بنها – مصر.

** قسم بحوث التكثيف المحصولي – معهد بحوث المحاصيل الحقلية – مركز البحوث الزراعية – الجيزة – مصر

*** وزارة الزراعة واستصلاح الأراضي.

أجريت هذه الدراسة بمحطة البحوث الزراعية بزرزورة – مركز ايتاى البارود – محافظة البحيرة – خلال الموسمين ٢٠٠٥/٢٠٠٦ & ٢٠٠٦/٢٠٠٧م لدراسة تأثير ثلاثة محاصيل صيفية سابقة هى فول صويا(جيزة ٢١)، ذرة شامية (هجين ثلاثى ٣٢١)، قطن (جيزة٨٩) وأربع مستويات من التسميد الأزوتي (صفر، ٢٥، ٥٠، ٧٥ كجم أزوت / فدان) وثلاث مستويات من التسميد البوتاسي (صفر، ٢٤، ٤٨ كجم بو٢أ / فدان) على المحصول ومكوناته في بنجر السكر وأهم النتائج المتحصل عليها هى:-

- تأثرت صفات الوزن الجاف للنبات والجذر (قطر الجذر، وزن الجذر) والمحصول البيولوجي ومحصول السكر والصفات التكنولوجية (نسبة السكروز، المواد الصلبة الذائبة الكلية) معنوياً بالمحاصيل الصيفية السابقة خلال موسمي الدراسة أما صفة مساحة الأوراق للنبات ودليل مساحة الأوراق وطول الجذر ومحصول الجذور

للفدان فقد تأثرت معنوياً خلال الموسم الثاني فقط بينما تأثرت صفة عدد أوراق النبات في الموسم الأول فقط. أما صفة النسبة المئوية للنقاوة فلم تتأثر معنوياً خلال موسمي الدراسة وتحصل أفضل النتائج عقب فول الصويا وأقل النتائج عقب القطن.

- تأثرت جميع الصفات المدروسة معنوياً بمستويات التسميد الأزوتي خلال موسمي الدراسة، وقد سجلت أعلي النتائج عند إضافة ٧٥ كجم أزوت / فدان وأقل نتائج عند المستوي صفر كجم أزوت / الفدان.
- تأثرت جميع الصفات المدروسة معنوياً بالتسميد البوتاسي خلال موسمي الدراسة، وعموماً فإن أعلي النتائج قد تم الحصول عليها عند إضافة ٤٨ كجم بو ٢ أ / فدان وأقل النتائج عند معاملة الكنترول خلال موسمي الدراسة.
- أظهرت النتائج أن صفات الجذر (طول الجذر، قطر الجذر، وزن الجذر) وكذلك محصول الجذر، والعرش، المحصول البيولوجي، محصول السكر بالإضافة إلي النسبة المئوية للسكروز فقد تأثرت معنويا بالتفاعل بين المحاصيل السابقة ومستويات التسميد الأزوتي وكذلك التفاعل بين المحاصيل السابقة ومستويات التسميد البوتاسى والتفاعل بين مستويات التسميد الازوتى والبوتاسى وقد سجلت أعلي النتائج بعد الزراعة عقب فول صويا مع إضافة ٧٥ كجم أزوت / فدان وعقب فول صويا مع إضافة ٤٨ كجم بو ٢أ / فدان والتسميد ب٧٥ كجم أزوت / فدان و٤٨ كجم بو ٢ أ / فدان على الترتيب خلال موسمي الدراسة .
- أظهرت النتائج أن صفات وزن الجذر والمحصول للجذور والعرش والسكر والنسبة المئوية للسكروز قد تأثرت معنويا بالتفاعل بين المحاصيل السابقة ومستويات التسميد الأزوتي والبوتاسي وسجلت أعلي القيم عند زراعة البنجر عقب فول صويا مع إضافة ٧٥ كجم أزوت / فدان، ٤٨ كجم بو ٢ أ / فدان خلال موسمي الدراسة ويمكن التوصيه بهذه النتيجة تحت ظروف هذه التجربة .