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INFLUENCE OF SWEET CORN CULTIVARS AND PLANT SPACINGS ON VEGETATIVE GROWTH ,YIELD QUALITY AND CHEMICAL COMPOSITION CHARACTERESTICS IN NEWLY RECLAIMED SOILS

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ABSTRACT

Two field experiments were carried out , in a newly reclaimed calcareous soils, at the Experimental Farm (at El–Noubaria), Horticultural Research Station , Ministry of Agriculture and Land Reclamation, during 2004 and 2005 summer seasons .The objective of this investigation was to study the effects of three different sweet corn cultivars (Basin, Challenger and Shimmer),three different plant spacings (20,25 and 30cm between plants), and their interactions on vegetative growth , yield and its components, kernels quality, and chemical compositions of leaves. The obtained results indicated generally that the evaluated cultivars varied in their performances for some vegetative growth characters, and most of the studied characters of yield and its components , kernels quality and leaves chemical contents , in both summer seasons. The best cultivar that gave the highest values for some of the vegetative growth characters, and most of the studied yield and its component characters was Shimmer ,during the two seasons. Also, cultivar Shimmer was the best in kernels quality parameters ;.i.e., reducing sugars ,total sugars ,starch and carbohydrates contents; in the two seasons; and it was the best one for the sucrose content , in the second season .Cultivated sweet corn plants at 30cm, significantly, increased stem diameter, number of leaves plant^{-1}and dry weight of leaves; yield character and its components, with only one exception; and all kernels quality characters. Increasing the plant spacing was associated

with corresponding increments in leaves contents of N,P and K percentages .The widest spacing, at 30cm, with each of the three cultivars resulted in shorter plants , thicker stems , more number of leaves plant^{-1}, higher weight of dry matter leaves ;and increased the averages of all the studied kernels quality components, in the two seasons .Such interaction treatment reflected the significant highest values of N and K percentages, in both seasons .The interaction between either the cultivar Shimmer or Challenge ,and the spacing between plants at 30cm was the best treatment combinations for the most studied yield and its components characters, in the two growing seasons.

INTRODUCTION

Sweet corn (*Zea mays var. rugosa*, L .) is a member of Poaceae (Grass) family . It differs from all other types of corn , because it produces and retains large amounts of sugar in the kernels (Walter ,1991) ; since , it has a single gene (a sugary gene) that makes the kernels sweetness , and convert the sugar to starch slowly , preserving the sweetness for longer periods after harvest (Garwood *et al* , 1976).So , sweet corn is a popular vegetable , occupying position in many countries of the world , especially , north and west Europe , United States of America as well as Asia . The edible tender immature kernels is now used for human food in a cooking ingredient in salads, as a more traditional side food because of its unique taste and high nutritional values , for livestock food and as a row material in industry .Whereas, in Egypt, this untraditional crop has still nót getting commercial importance , mainly due to lack of enough information concerning suitable cultivars , cultivation practices , good market practices and awareness on its use . Nevertheless , farmers may get good income by exporting it to many other countries all over the world .

It is well known that cultivar management practices are more important and essential for the production of satisfactory crops . Factors influencing the productivity of sweet corn and maize are numerous and include environmental conditions, cultivars characteristics ,soil management practices and plant population density (Bhargava and Saha,1980; Chambi and Taylor, 1986 ;and Tetio–Kagho and Gardner, 1988). Therefore, improving production of sweet corn could be achieved through improving the cultural practices such as plant population density and cultivar characteristics (Patel *et al* , 1988) .

The influences of the different cultivars, at the different plant population densities ,concerning yield and quality of sweet corn and maize were studied by many researchers such as Yodpetch and Bautista (1984); Bauer and Carter (1986); Rogers and Lomman (1988); Falivene (1995); Jagtap *et al* (1998) , Sukanya *et al* (1998) and Akman (2002) .They found that ears yield character increased with increasing plant population densities; but, grain yield decreased ; Whereas , Navarro *et al* (1995) ; Modarres *et al* (1999) ; Miftahulla *et al* (2002); New York Vegetable and Cultural Practices (2000) and Amin (2006); who found that grain yield of sweet corn was also increased .However, the used cultivars differed from one another in their responses to plant population densities. Moreover Lang *et al* (1956) and Keating *et al* (1988;1990) reported that the optimal density for maximum yield of maize increased as nitrogen supply improved .

Numerous investigators studied the effects of plant population density and cultivars on one or more of the vegetative growth , yield and its components characteristics of sweet corn and maize . Park *et al* (1989) found that increasing plant density resulted in increased plant height and then declined .Similar finding was, also, obtained by Miftahulla *et al* (2002). Studies made by some investigators on the effects of plant density on some characters of sweet corn such as Yodpetch and Bautista (1984) for plant height , ears number and ear length; Rogers and Lomman (1988) for ear diameter and weight of cobs; and Amine (2006) for plant growth. Since, they found that increasing the plant density have led to decrease in their previously mentioned characters .On the other hand ,Mullins (2000) found that plant height, plant diameter, ear weight ,ear length ,ear diameter and grain yield were not significantly affected by using some sweet corn cultivars and different plant spacings .Also ,Hemphill *et al* (1996) reported that the effect of row spacings on yield of sweet corn tended to be slightly greater at wider spacing ; but , the effect of spacing on ear weight and ear length was not significant .In addition ,Akman (2002) determined that lower density gave highest ear length and ear diameter , and these studied characters varied depending on the used cultivars of sweet corn .

The main objective of the present investigation was to study the effects of different cultivars , plant spacings and their interactions on growth, yield and its components , kernels quality and on some leaves chemical components of sweet corn .

MATERIALS AND METHODS

During the summer seasons of 2004 and 2005 ,two field trials were carried out in the Experimental Farm (El-Noubaria), Horticultural Research Station ,Ministry of Agriculture and Land Reclamation, The experimental site belongs to the newly reclaimed calcareous soils irrigated by the surface irrigation system .Prior to the initiation of each experiment , soil samples from the upper layer of the experimental site to 20 and 20 – 40 cm depth were collected and analyzed according to the methods outlined by Page *et al*,(1982) and Klute ,(1986) . Results of the analyses for some chemical and physical properties are given in Table 1. It was a deep sandy clay loam and with a medium permeability ; and well drained .

Table 1. Some chemical and physical properties of the experimental sites in the seasons of 2004 and 2005.

Seasons	**2004**		**2005**	
Characteristics	0 – 20 cm	20 – 40 cm	0 – 20 cm	20 – 40 cm
Ec;dsm^{-1}	1.52	1.85	1.75	2.05
pH(1:2.5soil:water)	8.25	8.19	8.15	8.10
OM ; %	0.55	0.39	0.45	0.35
$CaCO_3$; %	26.5	28.05	28.20	29.35
No_3+ NH_4;mg kg^{-1}	39.80	48.50	30.28	33.51
$NaHCO_3$-P;mg kg^{-1}	13.30	10.65	12.12	11.52
Exch- K ,mg kg^{-1}	385.50	320.50	325.50	298.50
Sand %	85.5	84.30	83.5	85.3
Soil texture class	SCL	SCL	SCL	SCL

SCL = Sandy Clay Loam

Each experiment contained nine treatments representing all possible combinations of three cultivars of sweet corn (Basin, Challenger and Shimmer) and three different plant spacings (20,25 and

30cm between plants) . The used experimental layout was a split-plot system in a randomized complete blocks design (RCBD) with three replications .The used cultivars were arranged as the main plots , and spacings between plants were considered as the sub-plot .Each sub-plot consisted of four rows 4 m long and 60 cm wide . A guard row was left without planting to separate each two adjacent sub-plot .The same experimental steps were conducted in the first season of 2004 and in the second season of 2005 .Seeds of the three cultivars of sweet corn were, directly, planted on one side of the row at the used plant spacings (20,25 and 30cm apart) on May 15, 2004 and June 1, 2005. The mineral N,Pand K fertilizers in the forms of ammonium nitrate (33.5% N), calcium super phosphate (15.5% P_2O_5) and potassium sulphate (48%K_2O) N and K fertilizers were added to the growing plants in three equal parts at 25,35 and 45 days from planting ..Whereas. calcium super phosphate was broadcasted throughout the soil preparation (before planting) .During the growing seasons , all other recommended agro-managements for sweet corn production were followed .

During the growing seasons, required data were recorded. At tasseling and silking stages (after 35 – 40 days from planting time) , ten plants were, randomly, selected from the central two rows of each sub-plot to measure the studied vegetative growth parameters as plant height (cm) stem diameter (cm), number of leaves plant^{-1}and dry matter content (%).At the harvesting stage (after 70 days from sowing date, in the milky immature kernels), when the kernel moisture content was75–80% (Evensen and Boyer ,1986), all husked ears of sweet corn plants in the middle two rows in each experimental unit were harvested to determine the characters of yield and yield components, kernels quality in addition to the chemical compositions of leaves. All the harvested husked ears were allocated to determine total ears yield fad.$^{-1}$ and number of ears plant^{-1} .The total ears yield fad.$^{-1}$ was estimated by weighing all harvested husked ears in each experimental unit and then converted into tons fad.$^{-1}$; and the total number of harvested ears from each sub-plot was divided by the number of the harvested plants to estimate the average number of ears plant^{-1}.Ten harvested ears from each sub-plot were randomly selected to determine averages of husked ear weight (g) ,ear length (cm) and ear diameter (cm) .Sub samples of five husked ears were also chosen to estimate the average of unhusked ear weight (g), net weight of ear, after removing the husks and shanks .The kernels were separated by cutting from the cobs of the five selected ears and weighed. Then, the weight of the kernels were divided by the five randomly ears to estimate the kernels weight ear^{-1}(g), which were used to estimate the kernels weight $plant^{-1}$,and then converted into tons $fad.^{-1}$to calculate kernels yield $fad.^{-1}$.

The kernels quality were expressed by the grains constituents from dry matter ,reducing sugars ,total sugars ,sucrose ,starch ,carbohydrates and total soluble solids (T.S.S %). Immediately after harvesting; kernels of the collected ears samples ,as previously mentioned, were bulked for each sub-plot and then kernels samples were randomly taken to determine the kernels constituents of sucrose ,total sugars, reducing sugars, starch, carbohydrates, total soluble solids, and dry matter content . Total soluble solids percentages readings were taken, after extracting of the kernels juice ,by a hand digital Refractometer .Thirty grams samples of kernels were oven dried at 70°C for 48 hours to a constant weight and reweighed to estimate the percentage of kernels dry matter .Sub samples of dried kernels were then taken , ground into powder with a coffee grinder for subsequent sucrose , reducing sugars , total sugars ,starch and carbohydrates analyses .Determination of sucrose and reducing sugars concentrations ($mg.g^{-1}$dry weight of kernels) was conducted as outlined by Cornin and Smith (1979) .Total sugars contents were obtained by the summation of the reducing sugars and sucrose. Phenol sulphoric acid method, proposed by Malik and Singh (1980), was used to determine the starch content in grains .Total carbohydrates content was obtained by summation of the total sugars and starch contents .A random sample of leaves of sweet corn plants from each sub-plot were collected ,washed with distilled water ,oven dried at 70°C to a constant weight ,and then ground in order to measure the chemical N,P and K compositions . The concentrations of N,P and K contents in sweet corn plants leaves were determined on the basis of dry weight as illustrated by Evenhuis and Dewaard (1980).

Appropriate analysis of variance of experimental data was performed (using CoStat Software program of analyses ,2004). Comparisons among the means of different treatments were undertaken ,using Duncan's multiple range test procedure at p=0.05 level, as illustrated by Steel and Torrie (1984).

RESULTS AND DISCUSSIONS

The results of the main effects of sweet corn cultivars and plant spacings , and their interactions on vegetative growth , yield and its components characters ,kernels quality and leaves chemical composition of sweet corn plants, in the two summer seasons of 2004 and 2005 , are shown in Tables 2 , 3 ,4 and 5.

Vegetative growth characters

The results of the main effects of the three different cultivars (Basin ,Challenger and Shimmer) of sweet corn and the three plant spacings (20,25 and 30cm) on vegetative growth characters ; plant height , stem diameter ,number of leaves plant^{-1} and leaves dry matter percentage ;are shown in Table 2 .The comparisons among the cultivars means of the characters number of leaves plant^{-1}and leaves dry matter ,in the first season and plant height and number of leaves plant^{-1} in the second season appeared to be significant .The previous mentioned results were in general accordance with those reported by many researchers such as Akman (1998) and Zhong (1998) for plant height ; and Mullins (2000) for plant height and stem diameter , who found that the cultivars of sweet corn varied in the mentioned characters .On the other hand ,the results showed that the differences among the three sweet corn cultivars for the characters plant height and stem diameter , in the first season ; and stem diameter and the percentage of leaves dry weight in the second season , were found to be insignificant .Which seemed to agree with the finding of Khan *et al* (2002). The results showed also that cultivar Shimmer ,significantly, gave more number of leaves plant^{-1} during two growing seasons, increased leaves dry matter content, in the first season ;and gave the highest mean value of plant height, in the second season .

Concerning the main effect of the different plant spacings on vegetative growth characters, in Table2, the results illustrated, generally, that the comparisons among the mean values of all studied vegetative growth characters of sweet corn plants appeared to be significant ;but with different magnitudes ,in both growing seasons .The narrowest spacing between plants (20cm) reflected the significant height mean value; i.e., the tallest plants ;of plant height, in the two seasons. This result seemed generally to cope with the findings of Akman (2002) and Miftahullah *et al* (2002),who found that plant height character of sweet corn, significantly, increased through

Table 2 : Effects of different cultivars , plant spacings , and their interactions on vegetative growth characters of sweet corn , during the seasons of 2004 and 2005.

Seasons / Characters / Treatments	2004				2005			
	Plant height (cm)	Stem diameter (cm)	No.of leaves Plant-1	Leaves dry matter (%)	Plant height (cm)	Stem diameter (cm)	No.of leaves Plant-1	Leaves dry matter (%)
Cultivars								
Basin (C-1)	114.44 a	2.52 a	10.81 b	23.48 b	112.63 c	2.64 a	8.85 b	24.08 a
Challenger (C-2)	114.57 a	2.40 a	11.78 ab	23.96 b	121.55 b	2.21 a	9.33 ab	24.74 a
Shimmer (C-3)	130.18 a	2.34 a	12.37 a	25.10 a	136.00 a	2.51 a	10.18 a	24.18 a
Plant spacings (cm)								
20 (P.S - 1)	131.30 a	2.11 b	10.81 b	20.99c	133.43 a	1.99 b	8.22 b	22.40 b
25 (P . S - 2)	116.94 b	2.28 b	11.74 ab	23.65 b	121.76 b	2.28 b	9.70 a	23.88 b
30 (P . S - 3)	110.96 b	2.87 a	12.40 a	27.90 a	114.99 b	2.91 a	10.44 a	26.73 a
CultivarsXplant spacings								
(C - 1) x (P . S - 1)	130.00 a	2.22 a-c	9.67 c	20.38 e	122.61 bc	1.85 b	7.56 e	20.87 d
(C - 1) x (P . S - 2)	109.44 b	2.52 a-c	10.83bc	21.07 e	114.94 c	2.43 ab	9.44 b-d	24.74 bc
(C - 1) x (P . S - 3)	103.89 b	2.81 a-c	11.94 ab	28.98 a	100.33 d	3.10 a	9.57 b-d	26.64 ab
(C - 2) x (P . S - 1)	130.83 a	2.01 c	11.45 a-c	20.17 e	137.67 a	2.09 b	8.11 de	24.27 b-d
(C - 2) x (P . S - 2)	110.55 b	2.22 a-c	11.67 a-c	24.14 cd	117.22 c	2.14 b	9.22 b-d	24.58 bc
(C - 2) x (P . S - 3)	102.33 b	2.97 a	12.22 ab	27.57 ab	109.78 cd	2.41 ab	10.67 ab	25.38 a-c
(C - 3) x (P . S - 1)	133.06 a	2.09 bc	11.32 a-c	22.42 de	140.00 a	2.05 b	9.00 cd	22.07 cd
(C - 3) x (P . S - 2)	130.83 a	2.09 bc	12.72 ab	25.73 bc	133.11 ab	2.27 b	10.44 a-c	22.32 cd
(C - 3) x (P . S - 3)	126.67 a	2.83 ab	13.06 a	27.14 ab	134.89 ab	3.22 a	11.11 a	28.17 a

Values followed by the same letter (s) , within a comparable group of means , are not significantly different , using Duncan's multiple range test at 0.05 level .

the increasing of plant population . On the contrary , Yodpetch and Bautista (1984), on sweet corn ; and Jagtap *et al* (1997) on maize, found that the tallest plants were obtained at low density ; while ,the shortest plants were obtained with the highest population density .Park *et al* (1989) reported also that increasing plant densities resulted in increasing plant height of sweet corn and then declined . On the other hand , the result concerning plant height did not agree with that reported by Faiguenbaum and Olivares (1995) ,who found that population densities of sweet corn plants did not have significant effect on plant height . Nevertheless ,using the widest spacing between plants (30cm) gave the significant highest mean values for stem diameter ,number of leaves plant^{-1}and dry matter of leaves . These results were in line with those obtained by Amin (2006) , who found that increasing seed density, significantly, reduced plant growth characters of sweet corn. However, Mullins (2000) found that population densities did not reflect any significant effect on stem diameter of sweet corn plants .

As for the effects of the interactions between cultivars and plant spacings on the vegetative growth characters are illustrated in Table 2. The results reflected, generally, some significant differences among the mean values of treatment combinations in all the studied characters ,with different magnitudes ,during the two seasons .However ,in this respect, Mullins (2000) on plant height and stem diameter of sweet corn and Khan *et al* (2002) on plant height of maize, reported that using the interaction between plant densities and cultivars on their studied characters appeared insignificant .The results illustrated, also, that wide spacing between sweet corn plants combined with each cultivar resulted in shorter plants , thicker stem , more number of leaves and weight dry leaves .On the contrary , increasing the plant population (narrow spacings between plants) combined with each cultivar from the tested cultivars caused increases in the mean values of plant height character and decreases in the mean values of stem diameter, number of leaves plant^{-1}and leaves dry matter ,in both growing seasons. The favourable treatments combination between cultivars and plant spacings that gave the highest mean values for the vegetative growth characters were the combinations between cultivar Shimmer with 20cm between plants, cultivar Challenger and 30cm spacing ; cultivar Shimmer with 30cm spacing and cultivar Basin with 30cm spacing; for the characters plant height ,stem diameter ,number of leaves plant^{-1}and leaves dry matter, respectively, in the first season .In the second season ,the best combinations that gave the highest mean value were, cultivar Shimmer with 20cm spacing for plant height and cultivar Shimmer with the 30cm for the characters stem diameter , number of leaves plant^{-1} and leaves dry matter .

Yield and its components

The results concerning the effects of the two studied factors; three cultivars of sweet corn and three different spacings, and their interactions on the characters of yield and its components , in the two growing seasons , are presented in Tables 3-a and 3-b.

With respect to comparisons among three cultivars of sweet corn for yield and yield components characters , the results illustrated generally that the comparisons among the mean values of the studied characters reflected significant differences, with different magnitudes ,in most cases ,in the two growing seasons .In the first season, the data showed that the differences among the mean values of the number of ears plant^{-1} ,husked ear weight , ear length ,ears yield fad.$^{-1}$and kernels yield fad.$^{-1}$were not high enough to be significant. However, the comparisons among the mean values of the other three characters; unhusked ear weight , ear diameter and kernels weight ear^{-1};appeared to be significant. The cultivar Shimmer gave significant higher mean values for the characters unhusked ear weight ,ear diameter and kernels weight ear^{-1}, than those of cultivar Basin . On the other side ,in the second season ,the results concerning the values of the characters number of ear plant^{-1} ,unhusked ear weight ,ear diameter , kernels weight ear^{-1}and kernels yield fad.$^{-1}$reflected generally that the evaluated cultivars significantly varied in their performances for these characters (Tables 3-a and 3-b) . The best cultivar that gave the significant highest mean values for the characters number of ears plant^{-1},ear diameter and kernels yield fad.$^{-1}$was Shimmer ;whereas ,cultivar Challenger produced the highest values of unhusked ear weight and kernels weight ear^{-1}.Nevertheless ,the comparisons among the mean values of the husked ear weight , ear length and ears yield.

Table 3-a : Effects of different cultivars and plant spacings , and their interactions on yield and its components characteristics of sweet corn , during the season of 2004 .

Season / Characters / Treatments	No.of ears plant-1	Husked ear weight (g)	Unhusked era weight (g)	Ear dimension Length (cm)	Ear dimension Diameter (cm)	Kernels weight ear-1 (g)	Kernels yield (tons fad-1)	Ears yield (tons fad-1)
2004								
Cultivars								
Basin (C - 1)	2.44 a	217.09 a	163.89b	17.17a	4.00b	92.89 b	5.77 a	13.50 a
Challenger (C - 2)	2.48 a	236.33 a	194.89 a	18.05 a	4.68 a	118.55 a	7.24 a	14.99 a
Shimmer (C - 3)	2.40 a	242.41 a	198.05 a	18.22 a	4.72 a	111.55 a	8.81 a	14.92 a
Plant spacings (cm)								
20 (P.S - 1)	2.19 b	203.44 c	173.05b	16.94 a	3.75 c	92.55 c	6.43 a	14.20a
25 (P . S - 2)	2.54 a	226.16 b	176.94 b	17.61 a	4.34 b	106.55 b	6.83 a	14.66 a
30 (P . S - 3)	2.59 a	266.23 a	206.83 a	18.90 a	5.30 a	123.89 a	6.56 a	14.66 a
CultivarsXplant spacings								
(C - 1) x (P . S - 1)	2.00 c	187.78 d	151.67d	16.50 a	3.67 d	85.00 d	5.35 b	11.80 a
(C - 1) x (P . S - 2)	2.77 a	213.49 b-d	154.17 d	16.83 a	3.93 cd	91.00 cd	6.38 ab	15.07 a
(C - 1) x (P . S - 3)	2.57 ab	250.00 ab	185.83 bc	18.17 a	4.40 bc	102.67 bc	5.58 ab	13.63 a
(C - 2) x (P . S - 1)	2.37 a-c	204.76 cd	179.17 c	16.83 a	3.90 cd	100.67 bc	7.57 a	15.61 a
(C - 2) x (P . S - 2)	2.43 a-c	225.00 b-d	179.17 c	18.17 a	4.30 bc	115.00 b	7.07 ab	13.81 a
(C - 2) x (P . S - 3)	2.43 a-c	279.24 a	226.33 a	19.17 a	5.83 a	140.00 a	7.10 ab	15.56 a
(C - 3) x (P . S - 1)	2.20 bc	217.78 b-d	188.33 bc	17.50 a	3.70 d	92.00 cd	6.37 ab	15.18 a
(C - 3) x (P . S - 2)	2.43 a-c	240.00 a-c	197.50 bc	17.83 a	4.80 b	113.67 bc	7.03 ab	14.82 a
(C - 3) x (P . S - 3)	2.57 ab	269.44 a	208.33 ab	19.33 a	5.67 a	129.00 a	7.02 ab	14.77 a

Values followed by the same letter (s) , within a comparable group of means , are not significantly different , using Duncan's multiple range test at 0.05 level .

Table 3-b : Effects of different cultivars and plant spacings , and their interactions on yield and its components characteristics of sweet corn , during the season of 2005 .

Season	2005							
Characters / Treatments	No.of ears plant-1	Husked ear weight (g)	Unhusked era weight (g)	Ear dimension Length (cm)	Ear dimension Diameter (cm)	Kernels weight ear-1 (g)	Kernels yield (tons fad-1)	Ears yield (tons fad-1)
Cultivars								
Basin (C - 1)	1.82 b	232.93 a	177.22 b	17.94 a	4.12 b	104.78 b	4.88 b	10.67 a
Challenger (C - 2)	1.95 ab	242.9 a	203.61 a	17.55 a	4.37 ab	122.22 a	6.04 a	11.22 a
Shimmer (C - 3)	2.24 a	256.57 a	187.77 ab	17.94 a	4.57 a	116.67 ab	6.34 a	13.77 a
Plant spacings (cm)								
20 (P.S - 1)	1.57 c	218.52 b	171.11 b	16.39 b	3.92 b	95.55 c	4.73 c	10.81 a
25 (P . S - 2)	2.07 b	246.20 ab	186.66 b	18.17 ab	4.15 b	113.22 b	5.69 b	11.32 a
30 (P . S - 3)	2.39 a	267.75 a	210.83 a	18.78 a	5.01 a	134.89 a	6.85 a	13.54 a
CultivarsXplant spacings								
(C - 1) x (P . S - 1)	1.37 e	216.67 b	158.33 c	15.50b	3.73 d	94.33 f	4.12 d	9.25 cd
(C - 1) x (P . S - 2)	1.97 cd	238.33 ab	177.50bc	18.67 ab	3.97 cd	102.33 ef	5.15 b-d	11.85 b
(C - 1) x (P . S - 3)	2.13 bc	243.80 ab	195.83 a-c	19.67 a	4.67 b	117.67 cd	5.32 bc	10.91 bc
(C - 2) x (P . S - 1)	1.67 de	216.67 b	181.67 bc	16.00 ab	3.83 d	89.00 f	4.70 d	11.40 b
(C - 2) x (P . S - 2)	1.80 d	269.72 ab	199.17 ab	18.17 ab	4.15 cd	127.67 bc	5.83 bc	7.88 d
(C - 2) x (P . S - 3)	2.40 ab	283.33 a	230.00 a	18.50 ab	5.14 a	150.00 a	7.60 a	14.39 a
(C - 3) x (P . S - 1)	1.67 de	222.22 b	173.33 bc	17.67 ab	4.18 cd	103.33 ef	5.36 bc	11.38 b
(C - 3) x (P . S - 2)	2.43 ab	230.55 a.b	183.33 bc	17.67 ab	4.33 bc	109.67 de	6.10 bc	14.23 a
(C - 3) x (P . S - 3)	2.63 a	276.10 ab	206.67 ab	18.17 ab	5.20 a	137.00 ab	7.64 a	15.31 a

Values followed by the same letter (s) , within a comparable group of means , are not significantly different , using Duncan's multiple range test at 0.05 level .

fad.$^{-1}$of the tested cultivars appeared insignificant. The mentioned results concerning yield and its components characters were in general accordance with those reported by many investigators ;such as Lana (1956) for ear weight ,number of ears plant^{-1}, ears yield and cut corn yield; Rogers and Lomman (1988) for ear weight ; Wong *et al* (1995) for ear length , ear weight and kernels yield ; Sukanya *et al* (1998) for ears and grains yields ;Zhong (1998) for ears yield ,ear length and ear diameter ; New York Vegetable and Cultural Practices (1999) for ear length and ear diameter ;Mullins (2000) for ear length , ear diameter , ear weight and grains yield ;and Akman (2002) for ear diameter and ears yield ; who found that the sweet corn cultivars differed significantly in their yield and its component characters .

Pertaining the effects of the used spacings between plants on the yield and its component characters of sweet corn ,the results in Tables 3-a and 3-b illustrated, generally, that increasing the distance between plants from 20 to 30cm was associated with corresponding increases in the averages of these studied characters ,with significant differences ,in both seasons .The obtained results reflected general agreement with those reported by Bauer and Carter (1986) for ears yield of maize ;Thakur *et al*(1997) for baby corn yield ;Jagtap *et al* (1997) for grain ear^{-1}of maize ; Sukanya *et al* (1998) for sweet corn grains yield ; Akman(2002) for ear length of sweet corn ; Miftahulla *et al* (2002) for number of ears plant^{-1} of sweet corn , who found that increasing the spaces between plants (low density) resulted in significant increases in their studied characters .The comparisons among the mean values of the three spacing treatments (20,25 and 30cm) showed significant effects on the number of ears plant^{-1}, husked ear weight, unhusked ear weight , ear diameter and kernels weight ear^{-1}, in both seasons (Tables 3-a and 3-b) .The most favourable effects of plant distance on these characters were those of 30 cm between sweet corn plants ,during the two seasons; which seemed to match with those reported by Rogers and Lomman (1988) and Akman (2002) for ear diameter ;Faiguenbaum and Olivars (1995) for number of ears plant^{-1}; New York Vegetable and Cultural Practices (1999) for unhusked ear weight ,who showed that the highest plant density (narrow spacing) decrease significantly these characters of sweet corn plants .On the contrary, the obtained results ,apparently ,disagree with the findings of Habib *et al* (1996) ; Miftahullah *et al* (2000) and Amin (2006) for

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grain yield ; Falivene (1995) ; Yodpetch and Bautista (1984) ; Akman (2002) and Pereira *et al* (1998) for ear yied ; Lana (1956) for ear weight ,number of ears plant $^{-1}$ and cut corn yield ;and Chipman and Mackay (1960) for ear weight and number of ear plant^{-1} .They also reported that, with high population densities (narrow spacing between plants) of sweet corn, let to increase their studied parameters .On the other side ,the differences among the mean values of the three different spacings for the characters ear length ,kernels yield fad.$^{-1}$, and ears yield fad^{-1}in the first seasons , and ears yield fad^{-1} , in the second season , were not high enough to be significant .These results agreed generally with those reported by Faiguenbaum and Olivares (1995) for yield; Hemphill *et al* (1996) for ear length and Mullins (2000) for ear length and grains yield, who obtained insignificant differences for these characters of sweet corn were due to different population densities .However,using 30cm distance between plants reflected the highest mean values of ear length and ears yield fad.$^{-1}$,in the first season , and for the kernels yield fad.$^{-1}$,in the second season .

With respect to the interaction effects between cultivars and spacings between plants on the studied characters of yield and its components ,the results in Tables 3-a and 3-b revealed, generally, that the most of the comparisons among the treatment combinations of the characters were found significant , in the two seasons .However, these obtained results, did not cope with those reported by Lana (1956) for number of ears plant^{-1},ear weight ,yield of cut corn and ears yield ; Mullins (2000) for ear weight ,ear length and ear diameter ;and Akman (2002) for ear diameter ,ear length and ears yield . They found that the effects of interactions between cultivars of sweet corn and plant population densities were not found significant on their studied characters of sweet corn .Respecting the results of the interaction effects between the two studied factors , the data presented in Table (3-a) illustrated that the interaction between cultivar Basin and the distance between plants at 25cm was the best one for the number of ears plant^{-1}character ,in the first season .The highest significant values of husked ear weight ,unhusked ear weight ,ear diameter and kernels weight ear^{-1}characters were given by the interaction between cultivar Challenger with spacing at 30cm between plants ,in the season of 2004. Likewise, the best combination that gave the highest mean value of kernels yield fad.$^{-1}$was that between cultivar Challenger and the

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narrowest distance of 20cm between plants. Meanwhile , the mean values of the characters ears yield fad.$^{-1}$ and ear length did not reflect high enough interaction effects to be significant .Similarly ,Lana (1956) for ears yield ; Mullins (2000) for ear length ,and Akman (2002) for ear length and ears yield, reported that the differences among cultivars at different population densities (interaction effects) were not found significant .In the second season ,the results illustrated that growing the plants of cultivar Shimmer and the widest plant distance (at30cm) remarked the best treatment combination that attained the highest significant mean values of the characters number of ears plant^{-1} ,ear diameter , ears yield fad.$^{-1}$,and kernels yield fad.$^{-1}$; while , the combination between cultivar Challenger and the plant at 30cm gave the best combination that reflected the highest and significant mean values for husked ear weight ,unhasked ear weight and kernels weight ear^{-1}, in the second season .As for the ear length character , the highest mean value was given by the combination between cultivar Basin and the widest spacing between plant (at30cm) .The previous mentioned results which reflected some variation in some of the yield and its component characters from year to year, could be explained, generally, on the basis of the variations in environmental conditions such as temperature ,and interplant competition for soil nutrients ,light and water as a result of different spacings and different responses of sweet corn cultivars under the newly reclaimed area at El-Noubaria region from year to year .

Kernels quality characters

The results of the main effects of cultivars and plant spacings ,and their interactions on the kernels quality characters ; i.e., Kernels dry matter , T.S.S. ,sucrose , reducing sugars , total sugars , starch and carbohydrates , during the two summer seasons of the study, are shown in Tables 4-a and 4-b. The results illustrated, generally, that the comparisons among the mean values of each the two main factors and their interactions for all the studied kernels quality characters reflected some significant effects for the main factors and their interactions , with few exceptions , in both growing seasons .These exceptions were noticed on the T.S.S. and sucrose contents, in the first season , and T.S.S. and kernels dry matter contents, in the second season for the main effects of the cultivars of sweet corn .Since , the differences among the mean values of these parameters were not significant .

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Pertaining the comparisons among the three cultivars mean values of the kernels quality characters , Tables 4-a and 4-b, the results indicated that cultivar Shimmer was the most favourable cultivar ,which gave the highest significant values for reducing sugars , total sugars , starch and carbohydrates contents , in the two seasons .Meanwhile , cultivar Challenger gave the highest significant mean value of kernels dry matter , in the first season and cultivar Shimmer produced the highest mean value of sucrose content, in the second season .Such results illustrated ,generally, that the differences in the values of these characters perhaps refer to different responses of the used sweet corn cultivars at the newly reclaimed area at El-Noubaria region from year to year .Cultivars differences were also detected in such quality characters by Kientz *et al* (1965) for reducing sugars; Evensen and Boyer (1986) for starch , sucrose , reducing sugars and total sugars ;Wong *et al* (1994) for sucrose and total sugars ;Zhong (1998) for sugar and Kleinhez (2003) for soluble solids ;who found that the concentrations of these contents were, significantly, affected by different cultivars of sweet corn .A study made by Wong *et al* (1994) illustrated also that sucrose and total sugars concentrations in Sh_2 hybrids of sweet corn varied from one to another ;since ,the variability among these hybrids referred to genotypic differences , determined mainly by genetic factors .

Regarding the effect of the three spacings treatments (20,25 and 30cm) on the kernels quality characters , the results indicated generally that cultivated sweet corn plants at 30cm, significantly, increased all kernels quality components than cultivation at either 20 or 25cm , in both years . Since ,using distance between plants at 30cm resulted in the highest mean values of T.S.S., sucrose,reducing sugars, total sugars, starch ,carbohydrates and kernels dry matter contents ,in both years .Such results seemed generally to indicate that the used cultivars of sweet corn reflected higher responses for these constituents at the widest spacing (low population density) under the environmental conditions of the newly reclaimed area at EL- Noubaria region.

Table 4-a : Effects of different cultivars , plant spacings , and their interactions on T.S.S.,sugars , starch , carbohydrates and kernel dry weight;, contents of sweet corn during the season of 2004.

Season	2004						
Characters / Treatments	T.S.S. (%)	Sucrose (mg.g-1.d.w.)	Reducing sugars (mg.g-1.d.w.)	Total sugars (mg.g-1.d.w.)	Starch (mg.g-1.d.w.)	Carbohy-drates (mg.g-1.d.w.)	Kernels dry weight (%)
Cultivars							
Basin (C - 1)	8.88 a	154.22 a	71.22 c	225.44 b	257.01 a	483.05 b	22.76 c
Challenger(C - 2)	9.17 a	152.44 a	75.00 b	227.44 b	232.92 b	460.36 c	27.14 a
Shimmer (C - 3)	10.04 a	156.78 a	80.33 a	237.11 a	269.96 a	507.07 a	25.29 b
Plant spacings (cm)							
20 (P.S - 1)	8.07 b	148.22 b	66.22 c	214.44 c	213.07 c	427.61 c	22.74 b
25 (P . S - 2)	8.95 b	153.00 b	73.78 b	226.78 b	251.03 b	477.81 b	25.80 a
30 (P . S - 3)	10.44 a	162.22 a	86.55 a	248.78 a	296.29 a	545.07 a	26.64 a
Cultivars Xplant spacings							
(C - 1) x (P . S - 1)	8.37 d	149.67 bc	62.33 d	212.00 c	217.28 de	429.28 ef	19.37d
(C - 1) x (P . S - 2)	8.50 cd	152.33 a-c	68.33 c	220.67 c	251.85 cd	472.52 c-e	24.12 c
(C - 1) x (P . S - 3)	9.77 bc	160.67 a-b	83.00 b	243.67 b	303.70 ab	547.37 ab	24.78 c
(C - 2) x (P . S - 1)	8.63 b-d	144.00 c	68.33 c	212.33 c	195.06 e	407.39 f	24.88 c
(C - 2) x (P . S - 2)	8.93 b-d	150.00 bc	71.67 c	221.67 c	237.05 cd	458.72 de	27.63 ab
(C - 2) x (P . S - 3)	9.97 b	163.33 a	85.00 b	248.33 ab	266.67 bc	515.00 bc	28.90 a
(C - 3) x (P . S - 1)	9.10 b-d	151.00 bc	68.0 c	219.00 c	227.16 c-e	446.16 ef	23.97 c
(C - 3) x (P . S - 2)	9.43 b-d	156.67 ab	81.33 b	238.00 b	264.20 bc	502.20 b-d	25.66 bc
(C - 3) x (P . S - 3)	11.60 a	162.67 a	91.67 a	254.33 a	318.52 a	572.85 a	26.25 bc

Values followed by the same letter (s) , within a comparable group of means , are not significantly different , using Duncan's multiple range test at 0.05 level

Table 4-b : Effects of different cultivars , plant spacings , and their interactions on T.S.S., sugars , starch , carbohydrates and kernel dry weight;, contents of sweet corn during the season of 2005.

Season	2005						
Characters / Treatments	T.S.S. (%)	Sucrose (mg.g-1.d.w.)	Reducing sugars (mg.g-1.d.w.)	Total sugars (mg.g-1.d.w.)	Starch (mg.g-1.d.w.)	Carbohy-drates (mg.g-1.d.w.)	Kernels dry weight (%)
<u>Cultivars</u>							
Basin (C - 1)	10.41 a	160.55 b	72.22 b	232.77 b	246.09 b	478.86 b	25.56 a
Challenger(C - 2)	11.67 a	176.77 a	76.33 a	253.11 a	245.80 b	498.91 b	26.33 a
Shimmer (C - 3)	11.40 a	178.66 a	79.66 a	258.33 a	282.30 a	540.63 a	26.85 a
<u>Plant spacings (cm)</u>							
20 (P.S - 1)	10.21 b	156.22 c	71.55 c	227.77 c	225.22 c	452.99 c	23.33 c
25 (P . S - 2)	11.35 a	175.22 b	77.11 b	252.33 b	261.73 b	514.06 b	25.80 b
30 (P . S - 3)	11.92 a	184.55 a	79.55 a	264.11 a	287.24 a	551.35 a	29.49 a
<u>Cultivars Xplant spacings</u>							
(C - 1) x (P . S - 1)	9.53 c	142.67 e	68.66 e	211.33 f	214.81 e	426.14 d	21.42 d
(C - 1) x (P . S - 2)	10.77 a-c	164.67 cd	72.66 cd	237.33 de	249.38 cd	486.71 c	26.41 a-c
(C - 1) x (P . S - 3)	10.93 a-c	174.33 bc	75.33 bc	249.66 c	274.07 bc	523.73 b	28.83 ab
(C - 2) x (P . S - 1)	11.10 a-c	158.00 d	71.33 de	229.33 e	216.42 e	445.75 d	23.43 cd
(C - 2) x (P . S - 2)	11.83 ab	183.00 ab	77.00 b	260.00 b	254.32 b-d	514.32 bc	25.28 b-d
(C - 2) x (P . S - 3)	12.10 ab	189.33 a	80.66 a	270.00 a	266.67 b-d	536.67 b	29.98 a
(C - 3) x (P . S - 1)	10.00 bc	168.00 c	74.66 bc	242.66 cd	244.44 d	487.10 c	25.15 b-d
(C - 3) x (P . S - 2)	11.47 a-c	178.00 b	81.66 a	259.66 b	281.48 b	541.14 b	25.73 a-d
(C - 3) x (P . S - 3)	12.73 a	190.00 a	82.66 a	272.66 a	320.99 a	593.65 a	29.67 ab

Values followed by the same letter (s) , within a comparable group of means , are not significantly different , using Duncan's multiple range test at 0.05 level

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With respect to the interaction effects between the evaluated cultivars and the used plant densities on kernels quality characters ,illustrated in Tables 4-a and 4-b,the results showed generally that using each cultivar with increasing of distance between sweet corn plants from 20 to 30cm was associated with corresponding increases in the averages of all studied kernels quality components ,in the two summer seasons of 2004 and 2005 .These results means that the cultivars of sweet corn interacted well at the widest spacings between plants (30cm) ,in the newly reclaimed area at EL- Noubaria region , and gave the most favourable performances for these characters .The highest significant mean values for the T.S.S. ,reducing sugar ,total sugars ,starch and carbohydrates contents were given by the treatment combination of cultivar Shimmer grown at 30cm ,in both seasons .The most favourable interactive treatment ,which resulted in the highest value of kernels dry weight was given by the combination between cultivar Challenger and the widest spacing between plants at 30cm ,in the two experiments .The best interaction that showed the highest values of sucrose content was the combination between either cultivar Challenger or the cultivar Shimmer with the distance between plants at 30cm , during the two growing seasons .

Chemical Compositions of Leaves

The obtained results , given in Table 5 ,concerning the effects of each of the two studied factors ;i.e., three cultivars of sweet corn and three plant spacings; and their interactions on the chemical components of the leaves , illustrated generally that the differences among the values of N ,P and K percentages appeared to be significant ;but, with different magnitudes , in most cases ; in the two growing seasons .

Concerning the main effects of the two studied factors on the chemical contents of sweet corn leaves ,the results revealed that the cultivars ,in the first season, varied in their contents of N , P and K percentages .Since ,the cultivar Shimmer gave the highest significant value of N content ,and cultivar Challenger produced the significant highest values of K percentage, in the two growing seasons .Meanwhile ,cultivar Basin reflected the significant highest value of P percentage, in the second season .On the contrary, the differences among the values of P and N percentages, in the first and second seasons ,respectively, were not high enough to be significant.

Table 5 : Effects of different cultivars , plant spacings , and their interactions on the leaves chemical composition of sweet corn , during the seasons of 2004 and 2005 .

Seasons	2004			2005		
Characters / Treatments	N (%)	P (%)	K (%)	N (%)	P (%)	K (%)
Cultivars						
Basin (C-1)	1.68 b	1.14 a	1.59 ab	2.31 a	1.33 a	1.33 b
Challenger (C-2)	1.70 b	1.10 a	1.71 a	2.41 a	1.23 b	1.54 a
Shimmer (C-3)	2.09 a	2.31 a	1.48 b	2.40 a	1.27 b	1.41 ab
Plant spacings (cm)						
20 (P.S - 1)	1.55 c	1.18 a	1.33 c	1.98 c	1.19 b	1.18 c
25 (P . S - 2)	1.75 b	2.15 a	1.58 b	2.37 b	1.29 ab	1.30 b
30 (P . S - 3)	2.15 a	1.23 a	1.87 a	2.78 a	1.35 a	1.81 a
CultivarsXplant spacings						
(C - 1) x (P . S - 1)	1.50 cd	1.08 a	1.43 bc	1.80e	1.20 a	1.20 d
(C - 1) x (P . S - 2)	1.50 cd	1.05 a	1.50 b	2.40 b-d	1.40 a	1.10d
(C - 1) x (P . S - 3)	2.03b	1.30 a	1.83 a	2.73 ab	1.40 a	1.70 ad
(C - 2) x (P . S - 1)	1.33d	1.08 a	1.37 bc	2.07 de	1.17a	1.23 d
(C - 2) x (P . S - 2)	1.73 bc	1.17 a	1.87 a	2.43 bc	1.27a	1.50 bc
(C - 2) x (P . S - 3)	2.03 b	1.06 a	1.90 a	2.73 ab	1.27 a	1.90 a
(C - 3) x (P . S - 1)	1.83 b	1.37 a	1.20 c	2.071de	1.20 a	1.10 d
(C - 3) x (P . S - 2)	2.03 b	1.24 a	1.37 bc	2.27 cd	1.20 a	1.30 cd
(C - 3) x (P . S - 3)	2.40 a	1.33 a	1.87 a	2.87 a	1.40 a	1.83 a

Values followed by the same letter (s) , within a comparable group of means , are not significantly different , using Duncan's multiple range test at 0.05 level .

Dealing with the influence of the three plant distances on the leaves contents of N , P and K , the results of the two seasons presented ,Table 5, generally that increasing of plant spacings was associated with corresponding increments in the N , P and K contents in sweet corn leaves , in both growing seasons .The highest significant mean value of each element was given by using the distance at 30cm between plants , in both seasons , comparing with the other two spacings ; with only one exception in the first season .This exception was noticed in the case of P content , since , the differences among the values appeared insignificant .

Regarding the interaction effects between the two studied factors on the chemical components of leaves, in the two seasons ,the results illustrated that the cultivars Shimmer or Challenger combined with the widest spacing between plants (at30cm) reflected the highest significant mean values of N and K contents , respectively. On the other side , the interaction between the two studied factors did not reflect any significant effects on the P content, in the two summer seasons .Generally ,the results concerning the chemical compositions of sweet corn leaves could be explained on the basis of the cultivars varied in their contents of these elements ; N,P and K percentages ; since, the used cultivars differed in their performances at different spacings in the newly reclaimed area at EL-Noubaria region .Also ,the ability of the used cultivars of sweet corn to produce more concentrations of these elements as affected by the different spacings may be related to the genetic potential of these hybrids .

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الملخص العربى

تـأثيرات أصناف الذرة السكرية والمسافات بين النباتات على النمو الخضرى والمحصول ومكوناته والجودة والتركيب الكيماوى تحت ظروف الأراضى المستصلحة حديثاً .

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نفذت تجربتان حقليتان فى الموسمين الصيفيين لعامى ٢٠٠٤ ، ٢٠٠٥ فى مزرعة التجارب (بالنوبارية) بمحطة بحوث البساتين التابعة لوزارة الزراعة واستصلاح الأراضى تحت ظروف الأراضى المستصلحة حديثا ، وذلك بهدف دراسة تأثير كل من ثلاثة أصناف من الذرة السكرية ، (كمحصول خضر غير تقليدى فى مصر) والأصناف هى (باسين – شالنجر – شيمر) وثلاث مسافات زراعية (٢٠-٢٥-٣٠ سم بين النباتات) وجميع التدخلات الممكنة بينها على صفات النمو الخضرى (عدد الأوراق – إرتفاع النبات – قطر الساق – النسبة المئوية للمادة الجافة للأوراق) وصفات المحصول ومكوناته (عدد الكيزان / نبات ، وزن الكوز بالغلاف ، وزن الكوز بدون غلاف ، قطر الكوز ، طول الكوز ، المحصول الكلى للكيزان / فدان ، المحصول الكلى للحبوب / فدان، وزن الحبوب / كوز) ، كذلك صفات الجودة للحبوب (النسبة المئوية للمادة الجافة للحبوب ، محتوى الحبوب من السكروز – السكريات الكلية – السكريات المختزلة – المواد الصلبة الذائبة الكلية – النشا – الكربوهيدرات) بالإضافة الى محتوى الأوراق من النيتروجين والفوسفور والبوتاسيوم .استخدم تصميم القطاعات العشوائية الكاملة بنظام القطع المنشقة لمرة واحدة وذلك بثلاث مكررات ، حيث وزعت معاملات الأصناف على القطع الرئيسية ، ومعاملات التسميد المعدنى المركب على القطع تحت الرئيسية .ولقد أوضحت الدراسة النتائج التالية : -

- أظهرت النتائج بصفة عامة أن أصناف الذرة السكرية تختلف فى سلوكها العام ، حيث عكست قيم معظم صفات النمو الخضرى ، والصفات المحصولية وكذلك صفات الجودة للحبوب ومحتوى الأوراق من العناصر(نيتروجين ، فوسفور ، بوتاسيوم) وجود هذة الأختلافات فى كل من موسمى الزراعة لعامى ٢٠٠٤ و ٢٠٠٥ وأتضح أيضاً أن أفضل الأصناف هو الصنف "شيمر" والذى عكس أعلى القيم لهذة الصفات . خلال الموسمين . كما أن الصنف" شيمر" أعطى أعلى القيم لصفات السكريات

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الكلية والسكريات المختزلة ، النشا ، الكربوهيدرات ، فى كلا الموسمين ، بينما اعطى أعلى القيم للسكروز فى الموسم الثانى فقط .

- أتضح من النتائج أن نباتات الذرة السكرية المنزرعة على مسافة ٣٠ سم عكست زيادة فى قيم كل من قطر الساق ، عدد الأوراق / نبات ، النسبة المنوية للمادة الجافة للأوراق ، وكذلك قيم كل من المحصول ومكوناته وصفات الجودة للحبوب ، فى كلا الموسمين . تبين أيضاً من النتائج أن زيادة المسافة بين النباتات يتبعها زيادة فى محتوى أوراق الذرة من عناصر النتروجين والفسفور والبوتاسيوم .

- عكست نتائج مقارنة معاملات العاملين للتداخل من المستوى الأول بين العاملين الأساسيين ، حيث أتضح أن أستخدام المسافة الواسعة بين النباتات (٣٠ سم) مع كل من أصناف الذرة الثلاث المستخدمة أعطى نباتات قصيرة فى الطول وسميكة فى قطر الساق مع زيادة فى عدد الأوراق ، والنسبة المئوية للمادة الجافة فى الأوراق ، كذلك زيادة فى قيم متوسطات كل صفات الجودة للحبوب لكلا الموسمين لعامى ٢٠٠٤ ، ٢٠٠٥ .

- أوضحت نتائج التداخل بين الأصناف المستخدمة والزراعة على مسافة ٣٠ سم بين النباتات زيادات معنوية ولكن بدرجات متفاوتة فى قيم النسب المنوية المقدرة لعنصرى النيتروجين والبوتاسيوم فى موسمى الزراعة . أتضح أن أفضل معاملة للتداخل هى الموجودة بين كل من الصنف " شيمر " أو الصنف " شالنجر " مع استخدام مسافة الزراعة ٣٠ سم بين النباتات ، حيث عكستا اعلى القيم لمعظم صفات المحصول ومكوناته خلال موسيمى الزراعة .

وبصفة عامة أتضح وجود درجات متفاوتة من التأثيرات سواء كانت لأستجابة أصناف الذرة السكرية أو لمسافات الزراعة بين النباتات أو التداخل بينهما على جميع الصفات المدروسة لمحصول الذرة السكرية تحت ظروف الأرضى المستصلحة حديثاً.