ISSN 1110-0419

Annals Of Agric. Sc., Moshtohor,
Vol. 44(3): 887-897, (2006).

PERFORMANCE OF THREE MAIZE HYBRIDS UNDER SPRAYING WITH ZINC AND NITROGEN FERTILIZATION

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ABSTRACT

The study was carried out at the Agricultural Research and Experimental Center of the Faculty of Agriculture, Moshtohor, to determine the effect of foliar application of zinc sulphate (zero, 0.4%) and four nitrogen fertilizer levels(60, 90, 120 and 150 kg/fed) on growth, yield and yield components for three maize hybrids (T.W.C.310, S.C.122 and S.C.155 Yellow). The important results which were obtained from this study were as follows:

The varietal differences were significant in all agronomic growth characters, ear characters, yield and yield components in combined analysis except ear diameter, number of kernels/row and 100-kernel weight .S.C.122 gave the highest values of ear height, leaf area topmost ear, number of ears/plant, ear length, weight of kernels/ear, grain yield/plant and grain yield/fed as compared with T.W.C.310 and S.C. 155Y.

Zinc application as spray resulted in significant increases in plant height, ear height, leaf area topmost ear, number of ears/plant, ear length, weight of kernels/ear, grain yield per plant and fed in the combined analysis.

Applying of 120 or 150 kg N/fed caused increased significantly all growth characters, ear characters, yield and yield components in the combined analysis except number of rows/ear and shelling percentage more than 60 or 90 kg N/fed.

The interaction between maize hybrids and spraying of zinc significantly affected ear height, ear length and grain yield/fed. Interaction between maize hybrids and nitrogen fertilizer levels significantly affected plant height, ear height, stem diameter, weight of kernels/ear and grain yield/fed. Interaction between spraying of zinc and nitrogen fertilizer levels significantly affected ear height and grain yield/fed in the combined analysis.

It could be concluded that under the conditions of the experiment, S.C.122 supplied with 120 or 150 kg N/fed and spraying of zinc gave the highest grain yield/fed

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Key words: Maize hybrids, Foliar application of zinc, N-levels, Growth, Yield and yield components.

INTRODUCTION

Maize (*Zea mays* L.) is one of the most important cereal crop in Egypt and the world. Maize is still a major traditional food and feed crop in many regions. Furthermore, the grain is a key industrial raw material for very diverse purposes. In Egypt great attention has been paid to increase its total production. This could be achieved by using high yielding cultivars and fertilization. In this connection, maize cultivars differ in growth, grain yield and yield components as reported by El-Sheikh (1998); El-Bana (2001); Khalil (2001) and El-Wakil (2002).

As for zinc spraying, Khalil (1992) found that growth characters significantly increased by increasing Zn level up to 0.8%. Hefni *et al.* (1993 a, b) illustrated that the mean values of leaf area/plant and leaf area index at 60 and 75 day after sowing and stem diameter significantly increased by increasing the level of zinc sulphate up to 0.3%. Ashoub *et al.* (1996) reported that zinc application as foliar spray resulted in significant increases in ear length, ear diameter, number of grains/row, weight of 100 grains, shelling percentage, grain and straw yield/fed in the two seasons.

With regard to growth characters, grain yield and yield components were positively affected by increasing the rate of nitrogen fertilizer (Zaghloul, 1999; Salem, 1999; El-Banna and Gomaa, 2000; Sobh *et al.*, 2000; El-Banna, 2001 and El-Wakil, 2002).

The aim of this investigation was to study the effect of nitrogen fertilization and foliar application of zinc on growth, yield and yield components of some maize hybrids.

MATERIALS AND METHODS

This investigation was conducted at the Agricultural Research and Experimental Center of the Faculty of Agriculture, Moshtohor, Kalubia Governorate, Benha University, Egypt, in 2005 and 2006 seasons, to study the effect of nitrogen and zinc fertilization on growth, yield and yield components of three maize hybrids.

The soil type was clay with pH value of 7.89 and 7.80. Organic mater was 1.85 and 1.96%. Total N was 0.19 and 0.21% and contained 0.78 and 0.88 ppm of zinc in the first and second growing seasons, respectively. The experimental sites were preceded by wheat in the two seasons. Each experiment included 24 treatments which were the combinations of three maize hybrids [Three way cross 310 (T.W.C. 310), Single cross 122 (S.C. 122) and Single cross 155 yellow (S.C.155 y)], two foliar application of zinc (without zinc and 0.4% $ZnSO_4$) and four nitrogen levels (60, 90, 120 and 150 kg N/fed) in the form of ammonium nitrate 33.5%N. Nitrogen levels were applied in two split applications before the first and second irrigations. Foliar application of zinc equal to 400 liters solution/fed spraying at 45 days from planting.

The experimental design was split-split plot design with three replications. Maize hybrid were arranged at random in the main plots, foliar application of zinc in the sub-plots and N-levels in the sub-sub plots. Each sub-sub plot was 10.5 m^2 (1/400 fed) consisting of 5 ridges, 3.5 m long and 70 cm width while, the distance between plants was 25 cm planting date was June 14th and 8th in 2005 and 2006 seasons, respectively. All recommended cultural practices for the region were followed in both season.

Random samples of ten plants were taken from each sub-sub plot at 90 days from planting to determine plant height (cm), ear height (cm), stem diameter (cm), leaf area of topmost ear (cm^2) and number of ears/plant. At harvest ten plants were taken at random from each sub-sub plot to determine ear length (cm), ear diameter (cm), number of rows/ear, number of kernels/row, kernels weight/ear (g), grain yield/plant (g), shelling percentage and 100-kernel weight. Grain yield (kg/fed) was determined on the whole sub-sub plot basis. The grain yield per fed was adjusted to 15.5% moisture content. Data of the experiments were statistically analyzed according to Steel and Torrie (1980).The combined analysis of variance for two seasons was conducted testing the error homogeneity, and L.S.D test at 0.05 level of probability was used to compare between means.

RESULTS AND DISCUSSION

A- Effect of growing seasons:

Results in Table (1) show that the seasonal effect was insignificant for all traits under study except ear height, 100-kernel weight and grain yield/fed. Higher mean values for all characters were detected in the second season except ear diameter and shilling percentage. It could be concluded that the increase of grain yield and other characters in the second season may be due to early planting date accompanied with high percentage for organic matter and total N in the experimental soil.

Table (1): Mean values of seasonal effect.

Traits / Seasons	Plant height (cm)	Ear height (cm)	Stem diameter (cm)	Leaf area of topmost ear (cm^2)	No. of ears/ plant	Ear length (cm)	Ear diameter (cm)
2005	253.5	127.4	2.33	566.6	1.119	17.39	4.33
2006	253.7	129.6	2.34	572.9	1.122	17.68	4.30
F test	n.s	**	n.s	n.s	n.s	n.s	n.s
Traits / Seasons	**No. of rows ear**	**No. of kernels row**	**wt . of kernels ear (gm)**	**Grain yield Plant (gm)**	**100 kernels wt. (gm)**	**Shelling %**	**Grain yield (kg/fed)**
2005	13.87	42.46	227.57	255.4	37.28	83.63	3093
2006	13.99	42.51	228.69	256.2	38.18	83.43	3218
F test	n.s	n.s	n.s	n.s	*	n.s	**

*. ** Significant at 0.05, 0.01 level of probability, respectively

B- Growth characters:

1) Varietal performance:

Data presented in Table (2) reveal that the differences among maize hybrids regarding growth characters i.e. plant height, ear height, stem diameter, leaf area of topmost ear and number of ears/plant were significant in both seasons as well as combined analysis. The two hybrids (S.C. 122 and T.W.C. 310) surpassed S.C.155Y for all the growth characters in the two seasons and combined analysis except plant height. S.C.122 gave the highest values of ear height, leaf area topmost ear and number of ears/plant in the first season and leaf area topmost ear and number of ears/plant in the combined. However, the two hybrids S.C. 122 and T.W.C. 310 gave the highest values of ear height and stem diameter in the second season and combined, leaf area topmost ear and number of ears/plant in the second season only. These results are mainly due to the differences in the genetical make up among maize hybrids. These results are in accordance with those obtained by El-Sheikh (1998); El-Banna (2001); Khalil (2001) and El-Wakil (2002).

2) Effect of zinc application:

Data in Table (2) indicate that the spraying of zinc sulphate generally led to significant increases in number of ears/plant in the first season, plant height, leaf area of topmost ear and number of ears/plant in the second season and plant height, ear height, leaf area, topmost ear and number of ears/plant in the combined analysis. These results may be due to the role of zinc as an essential component for the activity of some dehydrogenases, proteinases and alcohol dehydrogenase (Vallee and Wacher, 1970). Similar results were obtained by Hefni *et al.* (1993 a).

3) Effect of nitrogen fertilizers:

Table (2) show that mean values of growth characters in both seasons as well as combined analysis were significantly increased by increasing N levels up to 150 kg N/fed. The highest values of plant height, ear height, stem diameter, leaf area topmost ear and number of ears/plant in the first and second seasons as well as combined analysis were obtained with the highest nitrogen fertilizer level (150 kg N/fed). Similar results were reported by El-Sheikh (1998) and El-Wakil (2002).

C- Ear characteristics:

1) Varietal performance:

The results illustrated in Table (3) indicate clearly that the three maize hybrids differed significantly in their ear characters. S.C.122 and T.W.C.310 produced the highest value of ear diameter and weight of kernels/ear in the first season and ear length, number of rows/ear and weight of kernels/ear in the second season as well as combined analysis. Differences among T.W.C.310, S.C.122 and S.C.155Y for ear length, ear diameter and number of kernels/row in the first season and ear diameter and number of kernels/row in the second as well as combined analysis were insignificant. Similar results were obtained by Hefni *et al.* (1993 b), El-Sheikh (1998) and El-Wakil (2002).

Table (2): Effect of hybrids, zinc spraying and nitrogen fertilizer on some growth characters of maize plants in the first and second seasons as well as combined analysis.

Treatments	Plant height (cm)			Ear. height (cm)			Stem diameter (cm)			LA. of topmost Ear (cm2)			No. of ears/plant		
	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.
hybrids															
T.W.C.310	259	259	259	128	132	130.	2.3	2.3	2.3	567.9	579.8	573.8	1.13	1.13	1.13
S.C.122	249	247	248	131	131	131	2.3	2.3	2.3	585	595	590	1.161	1.162	1.162
S.C.155 Y	249	247	254	123	125	124	2.2	2.2	2.2	548	544	545	1.060	1.073	1.067
L.S.D.(5%)	6	8	4	2	3	2	0.04	0.03	0.02	16	29	14	0..013	0.044	0.019
Za.spray															
Control	252	252	252	127	129	128	2.2	2.3	2.3	565	569	567	1.110	1.110	1.110
Spraying	255	255	255	128	130	129	2.3	2.3	2.3	569	579	572	1.127	1.133	1.130
L.S.D.(5%)	n.s	3	2	n.s	n.s	1	n.s	n.s	n.s	n.s	3	3	0.05	0.017	0.008
N-Fert.															
60 (kg/fed)	242	242	242	126	128	127	2.2	2.3	2.2	543	551	547	1.088	1.097	1.093
90(kg/fed)	250	251	251	127	129	128	2.3	2.3	2.3	562	569	564	1.117	1.118	1.117
120(kg/fed)	258	259	259	128	130	129	2.3	2.3	2.3	579	587	583	1.132	1.132	1.132
150(kg/fed)	263	262	263	129	131	130	2.3	2.3	2.3	583	585	584	1.138	1.140	1.139
L.S.D.(5%)	2	2	2	0.69	1.13	0.65	0.01	0.02	0.01	4.2	3.8	3	0.006	0.011	0.006

Table (3): Effect of hybrids, zinc spraying and nitrogen fertilizer on ear characters of maize plants in the first and second seasons as well as combined analysis

Treatments	Ear. length(cm)			Ear. Diameter (cm)			No. of rows/ear			No. of kernels/row			Wt. of kernels/ear(g)		
	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.
Hybrids															
T.W.C.310	17.6	17.5	17.5	4.35	4.27	4.32	13.8	13.7	13.7	43.6	42.0	42.8	235	227	231
S.C.122	18.1	18.5	18.3	4.43	4.37	4.41	14.0	13.9	14.0	42.6	43.2	42.9	239	242	241
S.C.155 Y	16.5	17.0	16.6	4.22	4.24	4.23	13.8	14.4	14.1	41.2	42.4	41.8	208	217	212
L.S.D.(5%)	n.s	0.44	0.64	0.16	n.s	n.s	n.s	0.54	0.25	n.s	n.s	n.s	4	5	3
Zn.spray															
Control	17.0	17.2	17.1	4.35	4.27	4.32	13.9	13.9	13.9	42.4	41.9	42.1	226	225	226
Spraying	17.8	18.2	18.0	4.31	4.32	4.32	13.9	14.1	14.0	42.6	43.2	42.9	229	232	231
L.S.D.(5%)	0.66	0.42	0.35	n.s	n.s	n.s	n.s	n.s	n.s	n.s	1.24	n.s	2	2	1
N-Fert.															
60 (kg/fed)	16.3	17.0	16.6	4.05	4.14	4.10	13.9	13.7	13.8	40.8	40.8	40.8	220	222	221
90(kg/fed)	17.5	17.4	17.5	4.35	4.16	4.25	13.9	14.1	14.0	42.5	42.6	42.5	227	226	227
120(kg/fed)	17.6	18.0	17.8	4.46	4.43	4.45	13.9	14.0	13.9	43.2	43.0	43.1	232	231	231
150(kg/fed)	18.2	18.3	18.3	4.48	4.47	4.48	13.8	14.2	14.0	43.4	43.6	43.6	232	235	234
L.S.D.(5%)	0.81	0.22	0.41	0.16	0.26	0.15	n..s	n.s	n.s	1.7	0.9	0.9	1.9	2.3	1.4

2) Effect of zinc application:

There were no significant differences in ear diameter, number of rows/ear and number of kernels/row in the first and second seasons as well as combined analysis as affected by foliar application with zinc sulphate (Table, 3). These results may be due to the fact that regarding these characters are genetically controlled and are not easy to be modified by the other applied environmental factors. Hefni *et al.* (1993 b) obtained similar conclusions. On the other hand, the average values of ear length and weight of kernels/ear significantly increased in the first and second seasons as well as combined analysis by foliar application with zinc sulphate. The same results were obtained by Khalil (1992) and Ashoub *et al.* (1996).

3) Effect of nitrogen fertilizer:

Table (3) indicates that the ear length and diameter, number of kernels/row and weight of kernels/ear were significantly affected by nitrogen fertilizer levels in the first and second seasons as well as combined analysis, but number of rows/ear in both seasons and combined analysis was not significantly affected. The highest values of ear length, ear diameter, number of kernels/row and weight of kernels/ear were obtained with highest dose of nitrogen fertilizer (150 kg N/fed). There were significant response to nitrogen with ear characters asserting the vital need for N application to maize production in this soil. These results agree with those reported by El-Sheikh (1998), El-Banna (2001) and Khalil (2001).

D- Grain yield and its related characters:

1) Varietal performance:

The three maize hybrids showed marked differences in grain yield/plant, shelling percentage, 100-kernel weight and grain yield/fed (Table 4). Hybrid S.C.122 gave the highest values for all studied traits in both seasons and combined analysis. The results also show that S.C.122 surpassed T.W.C.310 and S.C.155Y in grain yield/plant by 6.77% and 23.00%, in grain yield/fed by 7.97% and 14.90% in the combined analysis, respectively. The superiority of S.C.122 is reflected in its superiority over the other tested hybrids in the leaf area topmost ear, number of ears/plant, ear length, ear diameter, number of kernels/row, weight of kernels/ear, grain yield/plant and 100-kernel weight. Similar results were reported by El-Sheikh (1998), El-Banna (2001); Khalil (2001) and El-Wakil (2002).

2) Effect of zinc application:

Data in Table (4) indicate that the spraying of zinc sulphate significant increases grain yield/plant and grain yield/fed in both seasons and combined analysis, 100-kernel weight in the second season and combined analysis. These increases in the yield components may be due to the increases in leaf area topmost and number of ears/plant. Furthermore, the increase in grain yield is mainly due to the increases in yield components. Similar results were obtained by Khalil (1992); Hefni *et al.* (1993 b) and Ashoub *et al.* (1996).

3) Effect of nitrogen fertilizer:

There were significant responses to nitrogen with grain yield and its components asserting the vital need for N application to maize hybrids production in this soil. Results in Table(4)reveal that increasing N-level from 60 to 90 or 120 or 150kg N/fed led to significant increases in grain yield/plant by 5.35%, 8.96% and 10.42%; in 100-kernel weight by 4.41%, 5.79% and 7.16% and in grain yield/fed by 3.91%, 8.81% and 8.71% in the combined analysis, respectively. The increases in yield and components may be due to the increases in the growth characters and indirectly affected by N general functions in plant. Russell (1973) stated that the higher of nitrogen supply the more rapidly the synthesized carbohydrates are converted to proteins and to protoplasm and the small proportion left available for cell wall material. Furthermore, the increase in grain yield/fed is attributed mainly to the increases in yield components. These results are in harmony with those of Ashoub *et al.* (1996); El-Sheikh (1998); Zaghloul (1999); Salem (1999); El-Banna and Gomaa (2000); Sobh *et al.* (2000); El-Banna (2001) and El-Wakil (2002).

Table (4): Effect of hybrids, zinc spraying and nitrogen fertilizer on grain yield of maize and its characters in the first and second seasons as well as combined analysis

Treatments	Grain yield/plant (g)			Shelling %			Wt of 100-kernel (g)			Grain yield (kg/fed)		
	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.	S1	S2	Comb.
Hybrids												
T.W.C.310	267	255	261	83.9	84.2	84.1	37.2	38.3	37.8	3094	3176	3135
S.C.122	278	281	279	84.0	84.0	84.0	37.9	39.1	38.5	3346	3424	3385
S.C.155 Y	221	233	227	83.0	82.0	82.5	36.8	38.0	37.4	2837	3055	2946
L.S.D.(5%)	6.4	9.8	4.9	0.5	n.s	1.2	n.s	n.s	n.s	15	27	13
Zn.spray												
Control	252	250	251	83.6	83.0	83.3	37.0	38.0	37.4	3061	3201	3130
Spraying	259	262	261	83.6	83.8	83.8	37.6	39.2	38.4	3124	3235	3180
L.S.D.(5%)	3.7	2.5	1.8	n.s	n.s	n.s	n.s	1.0	0.7	7	8	5
N-Fert.												
60 (kg/fed)	239	242	241	83.5	83.4	83.5	35.4	37.2	36.3	2939	3058	2995
90(kg/fed)	254	253	254	83.6	84.2	83.9	37.4	38.3	37.9	3046	3178	3112
120(kg/fed)	263	262	263	83.7	83.0	83.4	38.1	38.8	38.4	3199	3319	3259
150(kg/fed)	265	267	266	83.6	83.1	83.4	38.2	39.5	38.9	3194	3319	3256
L.S.D.(5%)	3.0	2.3	1.8	0.13	n.s	n.s	1.1	1.2	0.8	10	7	6

E- Interaction effects:

Insignificant effect of interaction between maize hybrids and application of zinc was obtained for all the studied traits except ear height, ear length and grain yield/fed in the combined analysis (Table 5a). The highest value for ear height, ear length and grain yield/fed were 131.3 cm, 18.42 cm and 3408 kg respectively, obtained from S.C.122 hybrid by spraying zinc sulphate. Different between S.C.122 and T.W.C.310 hybrids by spraying zinc on the ear height and ear length were not significant. On the other hand, the lowest values of ear height,

ear length and grain yield/fed were 122.5cm, 16.21 cm and 2929 kg, respectively obtained from S.C.155 Y without spraying zinc.

Data illustrated in Table (5 b) show that the average values of ear height, stem diameter, weight of kernels/ear and grain yield/fed were significantly affected by the interaction between maize hybrids and nitrogen fertilizer levels in combined analysis. The highest mean value of ear height was 132.7 cm, obtained from T.W.C.310 without significant S.C.122 by 150 kg N/fed without significant 120 kg N/fed, for stem diameter was 2.42 cm obtained from S.C.122 by 150 kg N/fed and for weight of kernels/ear and grain yield/fed were 244.5 g and 3489 kg, respectively obtained by S.C.122 by 150 kg N/fed without significant by 120 kg N/fed. Whereas the lowest value of ear height, stem diameter, weight of kernels/ear and grain yield/fed were 122.3 cm, 2.26 cm, 203.7 g and 2786 kg respectively, obtained from S.C.155 Y by 60 kg N/fed.

The interaction between spraying of zinc and N fertilizer levels (Table 5c) had significant effect on ear height and grain yield/fed in the combined analysis. The highest value obtained for ear height was detected by spraying or without spraying and applied 120 or 150 kg N/fed and for grain yield/fed was detected by spraying of zinc and applied 120 or 150 kg N/fed. On the other hand, the lowest value obtained for both traits were detected without spraying of zinc and applied 60 kg N/fed.

Table (5 a): Effect of the interaction between hybrids and zinc spraying on ear height; ear length and grain yield/fed of maize (over the combined analysis)

Hybrids	T.W.C 310	S.C 122	S.C 155 Y	T.W.C 310	S.C 122	S.C 155 Y	T.W.C 310	S.C 122	S.C 155 Y
Zn-spray	Ear height (cm)			Ear length (cm)			Grain yield (kg/fed)		
Wthout	130.8	130.8	122.5	16.85	18.25	16.21	3101	3362	2929
Zinc	130.3	131.3	125.6	18.33	18.42	17.17	3170	3408	2963
L.S.D (5%)	1.7			0.61			8		

Table (5b): Effect of the interaction between hybrids and N-levels on plant height; ear height; stem diameter; weight of kernels/ear and grain yield/fed of maize (over the combined analysis)

Hybrids	T.W.C 310	S.C 122	S.C 155 Y	T.W.C 310	S.C 122	S.C 155 Y	T.W. C310	S.C 122	S.C 155 Y	T.W. C310	S.C 122	S.C 155Y
N-levels	ear height (cm)			stem diameter(cm)			Wt. of kernels/ear (g)			grain yield(kg/fed)		
60 (kg/fed)	128	130	122	2.32	2.30	2.26	226	232	205	2980	3219	2786
90 (kg/fed)	130	130	124	2.35	2.33	2.28	230	239	211	3100	3339	2897
120 (kg/fed)	132	132	125	2.38	2.37	2.29	234	245	216	3231	3493	3053
150 (kg/fed)	133	132	125	2.38	2.42	2.31	236	247	219	3231	3489	3049
L.S.D 5%	1			0.02			2			12		

Table (5c): Effect of the interaction between zinc spraying and N-levels on ear height and grain yield/fed maize (over the combined analysis)

N-levels (kg/fed)	60	90	120	150	60	90	120	150
Zn-spray	ear height(cm)				grain yield (kg/fed)			
Without	125.7	126.9	129.2	130.2	2980	3092	3225	3226
Zinc	127.7	129.2	129.3	130.0	3010	3132	3293	3287
L.S.D (5%)	0.9				9			

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سلوك ثلاث هجن من الذرة الشامية للرش بالزنك والتسميد الأزوتى

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أجريت هذه الدراسة بمركز البحوث الزراعية بكلية الزراعة بمشتهر – جامعة بنها خلال موسمى ٢٠٠٥، ٢٠٠٦ بهدف دراسة تأثير الرش بالزنك (بدون رش زنك، رش زنك بمعدل ٠,٤%) وأربعة مستويات من التسميد الأزوتى (٦٠، ٩٠، ١٢٠، ١٥٠ كجم ن/فدان) على ثلاثة هجن من الذرة الشامية (هجين ثلاثى ٣١٠، هجين فردى ١٢٢، هجين فردى ١٥٥ أصفر) على بعض صفات النمو والمحصول ومكوناته. وتتلخص أهم النتائج المتحصل عليها على النحو التالى:

- أدت الاختلافات بين الهجن إلى تأثير معنوى على كل الصفات المدروسة فى التحليل التجميعى للموسمين معا عدا سمك الكوز وعدد حبوب الصف ووزن الـ ١٠٠ حبة، وسجل الهجين الفردى ١٢٢ أعلى القيم لكل من ارتفاع الكوز، مساحة ورقة الكوز، عدد كيزان النبات، طول الكوز ووزن حبوبه، محصول حبوب النبات والفدان مقارنة بكل من الهجين الثلاثى ٣١٠ والهجين الفردى الأصفر ١٥٥.
- أظهر الرش بالزنك زيادة معنوية فى ارتفاع النبات والكوز، مساحة ورقة الكوز، عدد كيزان النبات، طول الكوز، وزن حبوب الكوز، محصول الحبوب للنبات والفدان فى التحليل التجميعى.
- أدت إضافة ١٥٠ أو ١٢٠ كجم ن/فدان إلى زيادة معنوية فى كل الصفات المدروسة للنمو وصفات الكوز والمحصول ومكوناته فى التحليل التجميعى ما عدا عدد صفوف الكوز والنسبة المئوية للتصافى.
- أثر التفاعل بين هجن الذرة والرش بالزنك معنويا على ارتفاع الكوز وطول الكوز ومحصول الحبوب للفدان وبين هجن الذرة ومعدلات التسميد الأزوتى أثر معنويا على ارتفاع الكوز وسمك الساق ووزن حبوب الكوز ومحصول الحبوب للفدان وبين الرش بالزنك ومعدلات التسميد الأزوتى أثر معنويا على ارتفاع الكوز ومحصول الحبوب للفدان.

تحت ظروف هذه التجربة يمكن التوصية بزراعة الهجين الفردى ١٢٢ وتسميده بمعدل ١٢٠ أو ١٥٠ كجم ن/فدان والرش بالزنك للحصول على أعلى محصول.