J. Agric. Sci. Mansoura Univ., 28(7): 5173 - 5181, 2003

MAIZE AND ITS RELATION TO PLANT POPULATION AND NITROGEN FERTILIZER LEVELS

Zohry,A. A. and B. S. Farghaly
Field Crops Research Institute, Agric. Res. Center, El-Gamma st., Giza, Egypt.

ABSTRACT

Four field experiments were carried out at Mallawi (Middle Egypt) and Shandawill (Upper Egypt), Research Stations, Agricultural Research Center during 2001 and 2002 seasons. To study are the effect of plant population and nitrogen fertilizer levels and their interaction on yield and yield components of maize.

Split plot design was used with four replications. The main plots were randomly assigned to the four plant population i.e. 15, 20, 24 and 30 thousand plants/fed obtained from planting at 40, 30, 25 and 20 cm with one plant/hill. The subplots devoted to nitrogen fertilizer rates of 30, 60, 90, 120 and 150 Kg N/fed. the most important results could be summarized as follows :

1- The increases in maize plant density from 15,000 to 30,000 plants/fed significantly increased means of plant height, ear height and the period from planting to 50 % tasseling or silking but the yield components were decreased by increasing densities. Grain yield of maize was significantly affected by plant density. Plant population 30,000 plants/fed had the highest grain yield followed by 24,000 plants/fed.
2- Raising nitrogen levels from 30 to 150 Kg N/fed increased growth, yield and yield components characters and reduced the period from sowing to 50 % tasseling or silking.
3- No significant differences between grain yield/fed of 120 and 150 Kg N/fed and between 24 and 30 thousand plant/fed, it can be recommend that to produce higher and economical grain yield/fed must fertilizer with 120 Kg N/fed and plant density is 24000 plant/fed.
4- The treatment of plant density of 24,000 plant/fed with 120 Kg N/fed gave the highest yield, there for it could be recommended to maximize maize productivity under the environmental conditions of the present study.

INTRODUCTION

Maize (*Zea mays* L.) is one of the most important cereal crops, in Egypt. It is used mainly for human consumption and animal feeding. Therefore, efforts are focused to increase its productivity to fill the gap between the local production and human consumption of cereals through different agricultural practices as plant density, fertilization etc. The previous studies proved that increasing plant density gave taller plants, increased ear height and the period to 50 % silking become longer (Abdel-Galil, *et al*, (1990), El–Deep, (1990), Atta Allah, (1996) and Shams and El–Habbak, (1996)). On the other hand, Hashemi – Dezfouli and Herbert, (1992), indicated that increasing population density significantly delayed the date of pollen shedding and silking but decreased plant and ear height. Increasing plant density decreased ear length, ear diameter, number of rows/ear, number of grains/ ear, grain weight/ear , number of ears/plant and 100–grain weight (Abdel-Galil, *et al* (1990), El–Deep, (1990), Badr, *et al*, (1996), El–Sheikh, (1993), Mosalem and Shady, (1996) and Shams and El–Habbak,

(1996)). Shilling percentage and barrenness percentage increased by increasing plant density (Abdel-Galil, *et al* (1990) and Mosalem and Shady, (1996)). Grain yield increased with increasing plant density (Matta, et al, (1990), El–Bially, (1995), Soliman, et al (1995) and Badr, et al, (1996)) Atta Allah, (1996) Showed that grain yield/fed increased from 23.6 to 24.9 and 26.8 ard. First season and from 19.5 to 22.5 and 24.2 ard. Second seasons when population density was increased from 15,000 to 20,000 and 30,000 plants/fed, respectively, but El-Deeb (1995) found a reduction in grain yield as plant population become dances.

The application of Nitrogen fertilizer increased growth characters of maize as plant height, ear height, number of green leaves/plant, number of days to 50 % tasseling and silking (El–Sheikh, (1993), Shafshak, *et al,* 1994, Moshtohry, *et al*, (1995) and Shams and El–Habbak,
(1996)). Grain yield components of maize i.e; ear length, ear diameter, number and weight of grains/ear, number of ears / plant, shilling percentage and 100–grain weight increased as N levels increased (El–Sheikh, (1993), Shafshak, *et al, (*1994) and Shams and El–Habbak, (1996)). While number of rows/ear was not affected by nitrogen application rates El–Sheikh, (1993). Grain yield of maize was increased with increasing levels of nitrogen fertilizer. (Shafshak, *et al,* (1994), Moshtohry, *et al*, (1995) and Shams and El–Habbak, (1996)).

The objective of the present study is to investigate the effect of plant population and Nitrogen fertilizer levels on grain production of maize under Middle and Upper Egypt condition.

MATERIAL AND METHODS

Four field experiments were carried out at Mallawi (Middle Egypt) and Shandawill (Upper Egypt) Research Stations, Agricultural Research Center during 2001 and 2002 seasons. Each experimental design was split plot with four replications. The main plots were randomly assigned to four plant populations i.e. 15, 20, 24 and 30 thousand plants/fed obtained from planting at distance 40, 30, 25 and 20 cm with one plant/hill. The subplots devoted to nitrogen fertilizer (ammonium nitrate 33.5 % N) rates of 30, 60, 90, 120 and 150 Kg N/fed. The size of each subplot was 21 m^2 including 6 ridges with 5 m long and 70 cm a part. The preceding crop was wheat. Each nitrogen fertilizer rate was applied at two equal doses just before the first and second irrigation. Normal cultural practices of growing maize were used. Maize grains (TWC 310) were planted on 5 th and 8 th Jun. in Mallawi and 6th and 12 th Jun. in Shandawill in the two seasons, respectively. While harvesting took place on 3 rd and 6 th October in Mallawi and 6th and 8 th October in Shandawill in the two seasons, respectively. At harvest, the six ridges of sub plots were harvested and grain yield was determined on the basis of 15 % moisture. The following data were recorded: Plant height, ear length, number of days to 50 % tasseling and silking, number of ear/plant, ear length, ear diameter, number of row/ear, number of kernels/row, weight of kernels/ear, weight of 100-kernels , shilling percentage and grain yield.

Table(1):Soil chemical analyses of the experimental site before planting the experiment:

Chemical Analysis		
	Mallawi location	Shandawill location
Ph (1:2.5, soil:water)	7.6	8.13
Ec mmohs/cm (1:5, Soil:water)	0.31	0.46
Available N (PPm)	60	55
Available P (PPm)	9.13	7.2
Available K (PPm)	450	430

From table (1) it is clear that nitrogen and phosphorus levels in experimental site are a moderate content but potassium level toward to high content, this is reflect of soil fertility and grain yield of maize must be in higher case.

Combined analysis of data for two growing seasons was done according to Snedecor and Cochran (1980), using MSTAT-Computer V4 (1986) L.S.D. test at 0.05 level was used to compare between treatments means.

RESULTS AND DISCUSSION

Plant population

The increases in maize plant density from 15,000 to 30,000 plants/fed significantly increased means of plant height, ear height and the period from planting to 50 % tasseling or silking at Mallawi and Shandawill (Table 2). The increases in plant height and ear height may be due to the taller internodes that resulted owing to the excessive competition between plants in more dense patterns. These results are in agreement with those obtained by El-Deeb (1990), Matta *et al.* (1990) and Shams and El-Habbak (1996). Delay of silking or tasseling by increasing plant population density may be due to the intensive competition for light, nitrogen element and water. Similar results were obtained by Adel-Galil *et al*, (1990), Matta *et al*, (1990) and Shams and El-Habbak (1996).

As shown in Table (2) that different yield component characters i.e. number of ear/plant, ear length, ear diameter, in both locations and number of kernels/row, weight of kernels/ear and shilling percentage at Mallawi were significantly increased with decreasing plant density. While number of row/ear and 100–kernels weight were not significantly affected by plant density.

Grain yield of maize was significantly affected by plant density (Table 2). Grain yield/fed were 9.83, 16.97, 18.97 and 21.23 ardab/fed with 15, 20, 24 and 30 thousand plants/fed for Mallawi and were 9.29, 16.82, 19.00 and 22.03 ardab/fed for Shandawill, respectively. It is clear that using plant population 30,000 plants/fed had the highest grain yield followed by 24,000 plant/fed.The current data indicate that reduction in ear characters at higher densities could compensated by the increase in number of plants per unit area. Such results are in accordance with those mentioned by Soliman et al, (1995) and Atta Allaha, (1996) reported that the optimum plant density in maize planting ranged from 20–30 thousand plants/fed with good distribution vhof plants in the field.

Table(2):Effect of plant population on growth component characters and maize yield, average the two seasons.

Characters / Plant population / fed.	Plant height (cm)	Ear height (cm)	No. of days to 50 %		No. of ear / plant	Ear length (cm)	Ear diam-eter (cm)	No. of rows / ear	No. of kernels/ row	Wet. of kernels / ear (g)	Shill-ing %	100 kern-els wet. (g)	Grain yield / fed Ardab.
			Tasseling	Silking									
	(Mallawi location)												
D_1 (40 cm) 15.000	228.9	140.9	67.93	68.27	1.17	19.98	4.28	12.26	42.8	238.5	79.27	39.51	9.83
D_2 (30 cm) 20.000	242.1	144.4	68.40	70.27	1.14	19.88	4.26	12.21	43.3	239.3	77.33	40.75	16.97
D_3 (25 cm) 24.000	250.2	154.4	70.47	72.07	1.11	18.43	3.86	11.48	38.7	228.9	76.33	39.35	18.97
D_4 (20 cm) 30.000	263.2	160.0	72.13	72.80	0.99	17.71	3.06	11.34	36.6	215.9	74.40	37.70	21.23
L.S.D. at 5%	3.5	2.1	0.36	0.66	0.02	0.42	0.07	N.S.	1.1	3.1	1.14	N.S.	1.29
	(Shandawill location)												
D_1 (40 cm) 15.000	246.7	150.5	67.73	70.07	1.16	18.42	4.35	11.27	41.91	246.3	78.53	38.32	9.29
D_2 (30 cm) 20.000	248.7	158.3	69.33	72.20	1.11	20.45	4.29	11.56	43.08	239.9	78.87	38.27	16.82
D_3 (25 cm) 24.000	256.1	161.7	70.80	73.33	1.07	18.09	4.25	11.21	40.47	229.7	77.93	38.11	19.00
D_4 (20 cm) 30.000	266.3	160.9	72.27	73.73	1.01	17.62	3.19	11.27	38.45	215.9	76.60	37.33	22.03
L.S.D. at 5%	3.9	N.S.	0.65	0.88	0.02	0.38	0.09	N.S.	N.S.	N.S.	N.S.	N.S.	1.31

D_1, D_2, D_3 and D_4 = distance between hills

Nitrogen dose fertilizers

Results in Table (3) clear that all studied characters were significantly affected with nitrogen fertilizer levels at Mallawi and Shandawill. Increasing nitrogen levels from 30 to 150 Kg N/fed increased plant height, ear height and reduced the period from planting to 50 % tasseling or silking. The active role of nitrogen on growth characters of maize showed marked increases in plant height and other characters owing to an increase in nitrogen application (Table 3) these increases may be attributed to the increase in meristmatic activity as well as the production of auxin which encourage cell elongation and increase stem length, on the other hand, nitrogen deficiency inhabit metabolism and meristemic activity in plant organs. Nitrogen has a positive effect on tasseling and silking due to its role on C/N ratio in maize plants. Similar results were reported by Shafshak, *et al,* (1994), and Shams and El-Habbak, (1996).

Results also show significant differences among nitrogen fertilizer rates in their effect on yield component characters of maize in both locations. number of ear/plant, ear length, ear diameter, number of rows/ear, number of kernels/row, weight of kernels/ear and 100–grain weight increased by increasing nitrogen dose up to 150 Kg N/fed. Differences between all nitrogen levels were significantly effected on all yield component characters, except ear length, ear diameter, number of kernels/row, weight of kernels/ear and 100–kernels weight are not significant between 120 and 150 Kg N/fed. The

increment in most yield component as nitrogen rates increased may be due to the well utilization of nitrogen in metablism and merestimic activity, than where nitrogen fertilization improved growth characters, this will be reflected on yield components.

With respect to nitrogen levels effect on grain yield, results in Table (3) indicate that grain yield significantly increased by increasing nitrogen levels up to 150 Kg N/fed the increase in grain yield /fed is mainly due to the great reduction in different yield component characters which were improved by increasing nitrogen levels up to 150 Kg N i.e. number of ear/plant, ear length, ear diameter, number of kernels/row, weight of kernels/ear and 100-kernels weight. Similar results were reported by Shams and El–Habbak, (1996) who found that increasing nitrogen levels increased maize grain yield.

Table(3): Effect of nitrogen fertilizer on growth component characters and maize yield, average the two seasons.

Characters / N. fertilizer levels (Kg/fed)	Plant height (cm)	Ear height (cm)	No. of days to 50 %		No. of ear / plant	Ear length (cm)	Ear diam-eter (cm)	No. of rows / ear	No. of kernels/ row	Wet. of kernels / ear (g)	Shill-ing %	100 kern-els wet. (g)	Grain yield / fed Ardab.
			Tasseling	Silking									
	(Mallawi location)												
30	205.4	145.4	71.75	73.42	0.79	15.75	3.79	10.29	35.50	170.3	74.50	37.53	10.60
60	241.1	147.9	70.75	72.50	1.02	18.45	3.93	10.58	38.67	221.6	76.08	38.75	13.65
90	252.7	150.1	69.83	70.92	1.13	19.97	4.02	11.82	40.92	242.4	77.33	39.75	17.04
120	265.4	152.0	68.75	69.25	1.25	20.39	4.14	12.94	42.58	260.7	77.58	40.13	21.02
150	266.2	154.2	67.58	68.17	1.31	20.45	4.13	13.49	44.08	258.2	78.67	40.65	21.54
L.S.D. at 5%	4.6	1.2	0.47	0.64	0.02	0.34	0.07	0.36	2.01	3.9	0.68	0.88	0.21
	(Shandawill location)												
30	238.3	151.8	72.08	74.25	0.78	16.05	3.80	10.38	35.88	202.6	73.33	36.18	10.49
60	250.9	155.8	71.17	73.33	1.03	17.92	4.00	10.32	39.86	218.5	77.25	36.55	14.15
90	256.5	159.7	70.42	72.25	1.13	19.01	4.05	11.24	42.30	242.3	79.08	38.08	17.54
120	260.6	160.0	68.75	71.42	1.22	19.99	4.10	12.27	43.17	248.0	79.92	39.23	20.72
150	265.9	162.4	67.75	70.42	1.27	20.27	4.14	12.43	43.68	253.4	80.33	40.01	20.04
L.S.D. at 5%	3.9	1.7	0.56	0.53	0.02	0.32	0.06	0.32	1.14	11.7	0.93	0.62	0.26

Plant population and nitrogen levels interaction

Results in Tables (4 and 5) show a significant effect for the interaction between nitrogen levels and plant densities on ear height, number of ear/plant, ear length, number of rows/ear, number of kernels/row, weight of kernels/ear and grain yield/fed at Mallawi and number of ear/plant, ear length, ear diameter and grain yield/fed at Shandawill. Plant density 15,000 plants/fed which fertilized with 150 Kg N/fed resulted the highest values for number of ear/plant, ear length, number of rows/ ear, number of kernels/row and weight of kernels/ear at Mallawi and for number of ear/plant, number of rows/ear and ear diameter at Shandawill. While the lowest values observed in 30,000 plant/fed and fertilizer with 30 Kg N/fed for number of ear/plant, ear length, ear diameter, number of rows/ear and number of kernels/row at Mallawi and for number of ear/plant, ear diameter, number of kernels/row and weight of kernels/ear at Shandawill.

Data also show that plant population 30,000 plants/fed which fertilized with 150 Kg N/fed had the highest values of ear height and 15,000 plants/fed which fertilized with 30 Kg N/ fed gave the lowest values at both locations. The highest value of grain yield was observed by 30,000 plants/fed with 150 Kg N/fed at Mallawi and with 120 Kg N/fed at Shandawill. While the lowest value was observed by 15,000 plants/fed by fertilizer with 30 Kg N/fed at both locations, respectively. The effect of plant density on grain yield was greater than the effect of nitrogen fertilizer levels. Plant population 20,000 plants/ fed by fertilizer with 90 Kg N/fed and the plant population 30,000 plants/fed by fertilizer with 120 Kg N / fed resulted higher grain yield than 15.000 plants / fed and fertilizer with 150 Kg N/fed and the 24,000 plants/fed by fertilizer with 150 Kg N/fed, respectively. Grain yield of maize was more affected by the interaction between plant density and nitrogen fertilizer levels at both locations.

The current data indicate that reduction in grain yield the lowest densities could not compensated by the increase in Nitrogen fertilizer levels. The result confirmed with those of Shahata *et al* (1983) they found that population densities between 50,000–75,000 plants / hectare, where nitrogen is not limiting with give higher yield levels.

It is clear that no significant differences between grain yield/fed of 120 and 150 Kg N/fed and between 24 and 30 thousand plant/fed, it can be recommend that to produce higher and economical grain yield/fed must fertilizer with 120 Kg N/fed and plant density is 24000 plant/fed under conditions Mallawi and Shandawill.

Table(4):Effect interaction of plant population × nitrogen fertilizer levels on yield and its components of maize average of two seasons.

(Mallawi location)									
Plant distance and population / fed.	Nitrogen levels (Kg/fed)	Ear Height (cm)	No. of ear / plant	Ear length (cm)	No. of rows / ear	No. of kernels / row	Wet. of kernels / ear (g)	Ear diameter (cm)	Grain yield / fed Ardab.
D_1 (40 cm) 15.000	30	135.0	0.87	15.97	10.00	36.00	173.0	4.03	6.53
	60	136.7	1.06	19.03	11.53	40.00	229.3	4.20	9.05
	90	143.3	1.18	21.30	12.33	45.00	255.0	4.30	10.54
	120	144.7	1.35	21.67	13.60	45.33	267.3	4.47	1123
	150	144.7	1.38	21.93	13.83	47.80	268.0	4.43	11.80
D_2 (30 cm) 20.000	30	138.7	0.83	15.50	10.60	37.33	174.0	4.13	10.2
	60	143.7	1.05	18.80	10.43	24.67	238.0	4.17	13.00
	90	143.7	1.14	21.43	12.00	43.00	252.3	4.20	17.16
	120	147.0	1.29	21.70	13.67	45.67	264.0	4.40	22.33
	150	149.0	1.37	21.97	14.37	47.67	268.0	4.40	22.16
D_3 (25 cm) 24.000	30	148.7	0.78	15.80	10.37	35.00	166.7	3.67	12.18
	60	153.7	1.04	18.80	10.20	36.67	209.3	3.80	15.28
	90	153.7	1.13	18.60	11.33	39.67	241.7	3.93	18.81
	120	156.0	1.27	19.67	12.03	41.00	264.7	3.93	23.70
	150	160.0	1.30	19.30	13.47	41.33	262.0	3.97	24.87
D_4 (20 cm) 30.000	30	159.3	0.71	15.73	10.20	33.67	167.7	3.33	13.51
	60	157.7	0.93	17.17	10.13	35.33	209.7	3.53	17.30
	90	159.7	1.07	18.53	11.60	36.00	220.7	3.63	21.64
	120	160.3	1.07	18.53	12.47	38.33	246.7	3.77	26.41
	150	163.0	1.18	18.60	12 30	39.67	234.7	3.73	27.33
L.S.D. at 5 %	2.4	0.05	0.68	0.72	2.01	7.8	N.S.		0.45

Table(5): Effect interaction of plant population × nitrogen fertilizer levels on yield and its components of maize average of two seasons.

(Shandawill location)									
Plant distance and population / fed.	Nitrogen levels (Kg/fed)	Ear height (cm)	No. of ear / plant	Ear length (cm)	No. of rows / ear	No. of kernels / row	Wet. of kernels / ear (g)	Ear diameter (cm)	Grain yield / fed Ardab.
D_1 (40 cm) 15.000	30	147.0	0.80	15.47	10.40	34.60	214.0	3.97	6.01
	60	150.0	1.07	17.13	10.27	40.00	222.3	4.37	8.45
	90	151.7	1.18	18.17	11.53	44.30	273.7	4.37	9.79
	120	152.3	1.33	20.27	11.93	45.20	257.0	4.43	10.72
	150	151.7	1.38	21.07	12.20	45.47	264.7	4.60	11.47
D_2 (30 cm) 20.000	30	150.7	0.78	16.50	10.27	39.20	216.0	4.10	10.5
	60	153.3	1.04	19.43	10.33	42.17	228.0	4.27	13.6
	90	162.0	1.15	21.43	11.93	43.77	242.7	4.33	16.0
	120	160.3	1.26	22.33	12.60	45.67	252.3	4.33	22.0
	150	165.3	1.30	22.57	12.67	44.60	260.7	4.40	22.1
D_3 (25 cm) 24.000	30	156.0	0.79	16.23	10.40	36.53	203.0	4.13	11.20
	60	160.3	1.05	18.20	10.53	39.83	217.0	4.27	15.80
	90	162.7	1.12	18.20	10.40	41.50	229.7	4.30	21.58
	120	165.0	1.16	19.07	12.40	42.13	248.7	4.37	23.00
	150	164.7	1.21	18.77	12.33	42.33	250.0	4.20	23.44
D_4 (20 cm) 30.000	30	153.7	0.73	16.00	10.46	33.17	177.3	3.00	14.26
	60	158.0	0.97	16.90	10.13	37.43	206.7	3.10	19.10
	90	162.3	1.05	18.23	11.10	39.63	223.0	3.20	22.81
	120	162.3	1.14	18.30	12.13	39.67	234.0	3.30	27.16
	150	168.0	1.18	18.67	12.53	42.33	238.0	3.37	26.82
L.S.D. at 5 %		N.S.	0.04	0.64	N.S.	N.S.	N.S.	0.11	0.5

CONCLUSION

It may conclude that the treatment of plant population with 30,000 plants/fed combined with treatment of nitrogen dose with 150 Kg N/fed gave the optimal yield component under the experiment condition. It may worth to mention that reduction in grain yield the lowest densities could not compensated by the increase in nitrogen fertilizer levels.

Both plant population combined nitrogen fertilizer are very important to yield component quality and total yield especially at high rate nitrogen. It should be taken into consideration that at low plant population, nitrogen fertilizers even with high dose do not compensated increased yield.

ACKNOWLEDGMENTS

The authors would like to thank Dr. M. A., Abou Keriash field crop institute, A.R.C. for assistance in conducting the study.

REFERENCES

Abdel-Galil, A. A.; D. A.Zeiton, S. A. Ghanem ; N. M. Moselhy (1990). Effect of planting density and foliar N fertilization on growth of maize. Proc. 4th Conf. Agron., Cairo, Vol. I : 389-403.

Atta Allah, S. A. A. (1996). Effect of irrigation intervals and plant densities on growth yield and its components of some maize varieties. Proc. 7th Conf. Agronomy, 9 – 10 sept., 1996, 59 – 70.

Bader, Aly, A. M.; M. H. M. Greish (1996). Effect of variety plant population and nitrogen application on grain yield of two maize varieties. Proc. 7th Conf. Agronomy, 9 – 10 sept., 1996, 71 – 80.

El-Bially, M. E. (1995). Weed control treatments under different density patterns in maize. Annals Agric. Sci. Ain Shams Univ. Cairo, 40 (2) 697 – 708.

El-Deeb, A. A. (1990). Effect of plant density and nitrogen level on the yield, models of certain maize cultivars. Proc. 4th Conf. Agronomy, Cairo 15 – 16 : 419 -434.

El-Sheikh, F. T.; Z. M. (1993). Response of maize (*Zea mays* L.) to nitrogenitrogen fertilizer and foliar application with zinc. Annals of Agric. Sci. Moshtohor, Egypt, 31 (4): 1999 – 2009.

El-Sheikh, M. H. (1994). Response of two maize varieties to plant densities and irrigation, 15 treatments. J. Agric. Sci. Mansoura Univ. 19 (2): 413 – 422.

Hashemi – Dezfouli, A. ; T. S. J. Herber (1992). Intersifying plant density response of corn with artificial shade. Agron. J. 84, 547 – 551.

Matta, S. F. O.; E. A. F. Khedr; G. M. A. Mahgoub and M. A. K. Shalaby (1990).Effect of plant population and nitrogen fertilization on growth and yield of some late maturity maize varieties. Egypt, J. Appl. Sci. 5 (8): 519 – 531.

Mosalem, M. E.; M. F. Shady (1996): Effect of plant population and chemical weed control on maize (Zea Mays L.) production. Proc. 7th conf. Agron, Mansoura I: 41-58.

Moshtohry, M. R. , Barhoma, M. A., Hubib, M. W. and Yehia, Z. R. (1995): the influence of interaction between weed control methods and N fertilization levels on maize (*Zea mays* L.) Annals of Agric. Sci. Moshtohor, Egypt, 33 (2): 579 – 587.

MSTAT (1986). A micro computer program of the Design Management and Analysis of Agronomic Research Experiments. Michigan State Univ. U.S.A..

Shafshak, S. E. ; G. Y. Hamman; M. Samia; Amer ; A. E. Fatma Nofal (1994). Deferential growth and yield response of some maize genotypes to nitrogenitrogen fertilizer. Annals of Agric. Sci. Moshtohor, Egypt, 32 (3): 1265 – 1278.

Shahata, A. H.; M. A. Khalifa, M. A. Farghaly ;M. A. Ali (1983).Yield response to varying plant density and levels of Nitrogen in these maize Genotypes. Proceeding of the first conference of Agronomy 1 (1): 187 – 194.

Shams El-Din, G. M. ; K. E. El-Habbak (1996). Use of nitrogen and potassium fertilizer levels by maize grown under three plant densities for grain yield. Annals of Agric. Sci. Moshtohor, 34 (2): 513 – 528.

Snedecor, G. W.; W. G. Cochran (1980). Statistical methods. 7th Edition Lowa State Univ. Press. Ames. Lowa U.S.A..

Soliman, F. M.; A. Sh. Goda; M. M. Ragheb and M. Samia; Amer (1995). Response of maize (Zea mays L.) hybrids to plant population density under different environmental conditions. Zagzig J. Agric. Res. 22 (3): 663-676.

الذرة الشامية وعلاقته بالكثافة النباتية والتسميد الآزوتي

عبد الحفيظ أحمد زهري – بدر سعد فرغلي

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

أقيمت أربعة تجارب في محطتي البحوث الزراعية بملوى و شندويل خلال موسمي ٢٠٠١ ، ٢٠٠٢ لدراسة تأثير أربعة معدلات من الكثافة النباتية وهي (١٥ ،٢٠، ٢٤ ، ٣٠ ألف نبات للفدان) وخمسة معدلات من التسميد الآزوتي (٣٠، ٦٠، ٩٠، ١٢٠، ١٥٠ كجم نيتروجين للفدان) على المحصول ومكوناته للذرة الشامية.

وكانت أهم النتائج المتحصل عليها كما يلي :

١- زيادة الكثافة النباتية (من ١٥ – ٣٠ ألف نبات للفدان) أدت إلى زيادة أطوال النبات وارتفاع الكوز وتأخير طرد النورة المذكرة و المؤنثة ولكن مكونات المحصول انخفضت مع زيادة الكثافة النباتية. محصول الذرة الشامية تأثر كثيرا بزيادة الكثافة النباتية. الكثافة النباتية العالية (٣٠ ألف نبات للفدان) أعطت أعلى محصول ، يلي ذلك كثافة (٢٤ ألف نبات للفدان) بينما الكثافة المنخفضة (١٥ ألف نبات للفدان) أعطت اقل محصول.

٢- زيادة معدل التسميد من ٣٠ – ١٥٠ كجم نيتروجين للفدان أدت إلى زيادة الصفات الخضرية والمحصول و مكوناته بينما قصرت الفترة من الزراعة حتى طرد النورة المذكرة و المؤنثة.

٣- لقد أوضحت النتائج أنه لا يوجد اختلافات معنوية في المحصول سواء مع إضافة ١٢٠ كجم نيتروجين للفدان و ١٥٠ كجم نيتروجين للفدان و كذلك الكثافة النباتية ٢٤٠٠٠ نبات للفدان و ٣٠٠٠٠ نبات للفدان وعلى هذا يمكن التوصية بأنه للحصول على أعلى محصول اقتصادي يتم بزراعة ٢٤٠٠٠ نبات للفدان مع التسميد بإضافة ١٢٠ كجم نيتروجين للفدان تحت ظروف ملوي و شندويل.

٤- أعطت الكثافة النباتية ٢٤٠٠٠ نبات / فدان مع التسميد بمعدل ١٢٠ كجم نيتروجين للفدان أعلى محصول ولذلك فأنة يمكن التوصية بهذه المعاملة لتعظيم إنتاجية الذرة الشامية تحت ظروف هذه الدراسة.