Pak. j. life soc. sci. (2007), 5(1-2): 11-14

Pakistan Journal of Life and Social Sciences

Influence of Nitrogen Sources on Quantitative and Qualitative traits of Maize (*Zea Mays* L.)

Muhammad Waseem, Shahid Ibni Zamir, Asghar Ali and Amjad Iqbal
Department of Agronomy, University of Agriculture, Faisalabad-Pakistan.

Abstract

A field experiment was carried out to study the Influence of Nitrogen Sources on Quantitative and Qualitative traits of Maize (*Zea Mays* L.) at the Agronomic Research Area, Univ. of Agriculture, Faisalabad .Two maize composite varieties i.e.Composite-20 and Composite-77 were tested with poultry manure @ 5900 kg ha^{-1} and urea @ 260 kg ha^{-1} on a sandy clay loam soil. These composite varieties differed significantly in plant height at maturity, number of grains per cob, number of cobs per plants, 1000-grain weight, grain yield and harvest index. Composit-77 performed better with respect to all growth and yield parameters expect number of plants per plot. Combined use of urea and poultry manure performed best than their sole application in respect of grain yield which is 6.05 t ha^{-1}.

Key words: Urea; Poultry Manure; Nitrogen; Maize

Introduction

Maize (*Zea Mays* L.) is the third most important cereal crop in the world after wheat and rice. In Pakistan it is grown on an area of 1030 thousand hectares with the total production of 3560 thousands tonnes (Anonymous, 2005-06).It highly nutritive and its contains; starch 78% , protein 10%, oil 4.8%,fiber 8.5%,sugar 3.1% and ash 1.7% (Chaudhry,1983). Poor soil fertility and imbalanced use of fertilizer without application of poultry manure and knowing the requirements of crops causes the problems such as deterioration of soil structure, environmental and ground water pollution.

Nitrogen is the most important nutrient for obtaining target yield and N rate depends upon agronomic and biological characteristics of maize varieties used (Getmanets *et al.* 1980). Nitrogen plays a paramount and dominant role in growth process of plants, because it is an integral part of chlorophyll molecule and constituent of enzyme molecules (Power and Schepers 1989). A positive interaction is developed, when combination of urea and poultry manure is used (Thomassins *et al* .1995).

Corresponding author Muhammad Waseem
Department of Agronomy, University of Agriulture, Faisalabad-Pakistan
E.mail:waseem_1028@yahoo.com

Materials and Methods

The field study was carried out to determine the influence of nitrogen sources on quantitative and qualitative traits of maize at the Agronomic Research Area, University of Agriculture, Faisalabad, during the autumn season of 2006. The experiment was laid out in a Randomized Complete Block Design (RCBD) with split plot arrangement having three replications. The treatments included two maize varieties: Composite-20 and Composite-77 and three nitrogen sources such i.e: Chemical sources (Urea) 260 kg ha^{-1}, Poultry Manure (PM) 5900 kg ha^{-1} and combination of chemical and poultry manure in 1:1 ratio. Varieties were kept in main plot and nitrogen sources in sub plot.

The experiment was conducted on a sandy clay loam soil with 0.95% organic matter, 15.4 ppm phosphorus, 175 ppm potash and 0.21% nitrogen. The crop was sown on a well-prepared seedbed on August 17, 2006 with a single row hand drill in 75 cm apart rows using the seed rate of 25 kg ha^{-1}. Plant to plant distance of 25 cm was achieved through thinning the crop at 3 to 4 leaf stage. Urea at the rate of 260 kg ha^{-1} was applied in three splits. The whole of well rottened poultry manure was added one month before sowing the crop. All other agronomic and plant protection practices were kept normal for all the treatment. The crop was harvested on November 29, 2006.

Data collected was subjected to analysis of variance techniques using appropriate statistical package. The treatment means will be separated using LSD test at 0.05 probability level (Steel and Torrie, 1984).

Results and Discussion

The height of plant at maturity is a function of the combined effect of both the genetic and environmental factors. Data present in table-I showed that nitrogen sources did not significantly effect the plant height. Non significant difference among treatment means of plant height at maturity may

partly be due to the genetics characteristics of the varieties and partly to the fact that there was no nutrient competition among plants. The varieties were also statistically non-significant from each other. These results were dissimilar with those of Chandrasekara *et al.* (2000) who reported that application of poultry manure with recommended fertilizer produced taller plants and produced longer and heavier cobs than the application with control. The interaction between two factors was found to be non-significant.

Number of cobs per plant has great effect on the final grain yield of maize. It is mainly dependent upon management practices, edaphic and climatic factors. The data regarding the no. of cobs per plant is shown in table I. The data showed that the no. of cobs per plant is significantly affected by N-sources. The maximum no. of cobs per plant (1.30) was in plots treated with the treatment (T_1) urea which was followed by the treatment (T_3) urea + poultry manure (1.07).The minimum no. of cobs per plant was found in treatment (T_2) poultry manure(1.04). Similar results were found by Khan *et al.*(1999) and Ali *et al.* (1999) in which he observed that organic and inorganic sources significantly effects the number of cobs per plant. The varieties were statistically non-significant from each other. The interaction between varieties and N-sources were significant. The highest no. of cobs per plant was recorded in case of treatment combination T_3V_2 where urea + poultry manure was applied to composite-77. The minimum no. cobs per plant were recorded in T_2V_1 where composite-20 was applied with poultry manure which is statistically at par with T_2 V_2 where composite-77 is applied with poultry manure respectively.

The data regarding no. of grains per cob showed the difference among the treatment which is showed in table -I. The difference in grain numbers per cob may be due to the variable genetic potential of genotypes. The maximum grains per cob is recorded (501.33) in treatment (T_3) urea + poultry manure and then followed by treatment (T_1) urea alone (451.38).This increase in no. of grains per cob is due to application of nitrogen at proper time and its availability. The minimum no. of grains was found in treatment (T_2) poultry manure (414.91).This decrease is due to insufficiency of nutrient. Similar results are founded by Khan *et al.* (1999) and Saleem (2000) .Varieties was statistically non- significant while the interaction between varieties and nitrogen sources was found significant. The maximum no. of grains per cob were noted in T_3V_2 where composite-77 was applied with urea + poultry manure on the other hand minimum no. of grains per cob were recorded in T_2V_1 where composite-20 was applied with poultry manure and it was statistically at par with T_2V_2 where composite-77 was applied with poultry manure respectively.

Table I. Influence of nitrogen sources on yield and yield components of two maize cultivars

Treatments	Plant Height (cm)	Numbers of cobs per plant	Number of grains per cob	1000-grains weight (t ha -1)	Grain yield (t ha^{-1})	Harvest index (%)
T_1 Urea @ 260 Kg ha^{-1} T_2 Poultry manure@ 5900 kg ha^{-1} T_3 Urea+Poultry manure	184.00 183.70 184.35	1.30a 1.04c 1.07b	451.38b 414.91c 501.33a	455.95b 418.65c 519.45a	5.00b 4.25c 6.05a	29.33b 25.46c 35.88a
LSD at 5%	N.S	0.004	1.949	2.428	0.367	3.418
V_1 Composite-20 V_2 Composite-77	183.6 184.3	1.05 1.22	443.81 467.94	446.44 482.30	4.86 5.34	28.92 31.52
N.S	-	-	-	-	-	-
T_1V_1 T_2V_1 T_3V_1 T_1V_2 T_2V_2 T_3V_2	183.7 183.5 183.8 184.3 183.9 184.9	1.05b 1.04d 1.06c 1.56a 1.04d 1.07b	440.25d 403.86f 487.33b 462.52c 425.97e 515.34a	444.4d 409.3f 485.6b 467.5c 428.0e 553.3a	4.8 4.0 5.8 5.2 4.5 6.3	28.54 24.00 34.23 30.12 26.92 37.54
LSD at 5%	N.S	0.005	2.757	3.433	N.S	N.S

Any two means not sharing a letter in common differ significantly at 5% probability level

The plumpness of the grain is positively correlated with the grain yield. The perusal of the data presented in table-I revealed that treatments were significantly different from one another showing the influence of nitrogen sources on grain plumpness. Varieties and N sources and their interaction were highly significant. The analysis of variance shows that maximum 1000-grain weight (519.45) was recorded in treatment (T_3) Urea + poultry manure. It may be due to the timely availability of N in addition with poultry manure. Then it was followed by treatment (T_1) Urea (455.95). The minimum 1000-grain weight (418.65) was recorded in treatment (T_2) poultry manure. The decrease in 1000-grain weight is due to the slow release of nutrients from poultry manure. Similar results were reported by and Sistani *et al.* (2004) who concluded that combination of poultry manure and chemical sources increase the 1000-grain weight. Data showed that varieties were non significant from each other. The interaction between varieties and N sources was significant. The highest 1000-grain weight was observed in case of T_3V_2 where composite-77 was applied with Urea + poultry manure that was statistically at par with T_3 V_1 where composite-20 was applied with Urea + poultry manure. The lowest 1000-grain weight was recorded in T_2V_1 where composite-20 was applied with poultry manure and it was statistically at par with T_2V_2 where composite-77 was applied with poultry manure respectively.

The efficiency and effectiveness of source and time of N application is ultimately determined by the level of grain yield per unit areas which is cumulative behaviour of the yield components. Analysis of the data on grain yield on hectare basis is presented in the table I. The data on grain yield showed that the maximum grain yield (6.05) was noted in treatment (T_3) urea + poultry manure. The better grain yield was due to the timely availability of nitrogen which was attributed to more no. of grains and then followed by treatment (T_1) urea (5). The minimum grain yield (4.25) was recorded in treatment (T_2) poultry manure. It may be due to imbalanced nutrition at certain plant growth stages .These result were similar to the finding of Thomassins *et al.* (1995) who observed that combination of poultry manure with chemicals sources of nitrogen give better results. The varieties were found to be non significant from each other in producing total grain yield .The interaction between varieties and N sources was found to be non significant.

Harvesting index of a crop is an interaction of its physiological efficiency and its ability of converting the photosynthates in to economic yield. Higher the harvest index, greater will be the physiological efficiency of a crop. Harvest index was calculated on percentage basis from each plot and data collected along with statistical analysis are presented in table I. N sources had significant effect on the harvest index .The maximum harvest index (35.88) was recorded in treatment (T_3) urea +poultry manure. It might be due to the timely availability of N and increase in water holding capacity of soil by poultry manure. It was followed by treatment (T_1) urea (29.33). While minimum harvest index (25.46) was observed in treatment (T_2) poultry manure. These results are supported by Erikson *et al.* (1999) and are not in line with khan *et al.* (2005) who observed that poultry manure give maximum harvest index. Varieties were found to be non significant from each other .The interaction between varieties and N sources was also found to be non- significant.

Conclusion

Both the composite varieties significantly effected by the nitrogen sources with number of cobs per plant, number of grains per cob, 1000-grain weight, grain yield and harvest index. Plant height was more in treatment (T_3) urea+poultry manure as compared to other treatments. In case of yield parameters like number of cobs per plant, number of grains per cob, 1000-grain weight, grain yield and harvest index were significantly more from the plots where in the treatment (T_3) urea+poultry manure was used. Varieties were found to be non significant with each other and there interaction with nitrogen sources was significant. On the basis of these experimental findings, it seems that combination give higher yield than either of the sole application of urea or poultry manure.

References

Ali, A., M. A. Malik, M. A. Choudhry, M. Khalid and M. Rafique. Effect of various doses of nitrogen on the growth, yield and protein content of two maize genotypes. Pakistan Journal of Biological Science, 1999. 2 (3): 889-890.

Anonymous, Economic Survey 2005-06. Economic wing (Finance Division)., 2006, Government of Pakistan, Islamabad.

Chandrashekara, C. R., S. I. Harlarpur, S. Muralikrishna and G. K. Girijesh. Response of maize to organic manures within organic fertilizer. Karnataka J. Agri. Sci., 2000, 13(1): 144-146 (CAB Absts., 2000/08 2002/04).

Chaudry, A. R. Maize in Pakistan. Punjab Agri. Research Coordination Board., 1983, Univ.Agri, Faisalabad.

Eriksen, G. N., F. j. Coale and G. a. Boller. Soil nitrogen dynamics and maize production in

municipal solid waste amended soil Agron. J., 1999, 91(16): 720-726.

Getmanets, A. Ya, N. A. Chernyarskaya and D. K. Evstaf. The calculation of fertilizer in yield of maize under irrigated conditions. Agrokhimiya, 5:49-57. (Field Crop Absts., 1980, 35(2): 1122; 1982).

Khan, M., S. Akbar, K. Ahmad and M.S. Baloch, Evaluation of corn hybrids for grain yield in D. I. Khan. Pakistan Journal of Biological sciences, 1999, 2 (2): 413-414.

Khan, M.A., M. Abid, N.Hussain and M.U.Masood. Effect of nitrogen levels on growth and yield of maize cultivars under saline condition. Int.J.Agri, Biology., 2005, (3):511-514.

Powers, J. F., and J. S. Schepers. Nitrate contamination of ground water in North America. Am. J. Prod. Agric., 1989, 91(1): 165-187.

Saleem , M. Effect of bio fertilizers on soil fertility , growth and yield of maize.M.Sc (Hons.) Agri. Thesis .Deptt. of soil science, Uni.of Agi., Faisalabad. Punjab, Pakistan., 2000.

Sistani, R. R., D. E. Rowe, J. Johnson and H. Tewold. Supplemental nitrogen effects on broiler litter fertilized cotton. Agron. J., 2004, 96 (3): 806-811.

Steel, R. G. D. and J. H. Torrie. Principles and procedures of statistics. 2nd Ed. McGraw Hill Book Co. Inc. Singapore., 1984, Pp: 172-178.

Thomassins, J., L.V.Bruce, L.G.karen.M.Bill and V.Green. Evalution of soil and plant N tests for maize on manured soils of atlantic coastal plain. Agron.J., 1995, 87(2):213-222.