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Integrated nitrogen management on the growth and yield of maize (*Zea mays* L.) under conditions of Uttar Pradesh

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ABSTRACT

Investigations on effect of integrated nitrogen management on growth and yield of maize conducted during *kharif* 2003 using two levels of nitrogen 120kg and150kg/ha applied through Urea, Poultry manure and Azotobacter in seven different treatments, with Phosphorous and Potash applied at 60kg/ha and 40kg/ha, respectively. Maximum Plant height (271.00cm), stem girth (2.73cm), leaves/plant (13.10), dry weight/plant (145.6g) and yield/ha(54.56q/ha) was recorded from treatment with nitrogen at 150kg/ha(through urea and Azotobacter) in combination with P_2O_5 (60kg/ha) and K_2O(40kg/ha).Highest grain yield(54.56q/ha) can be attributed due to higher number of grain rows, grains per row, grains per cob and test weight. The use of organic and bio fertilizers helped in improving the soil health and at the same time reduced the cost of production.

Key words : Maize, Integrated nitrogen management, Growth, Yield.

Even with the availability of high yielding crop cultivars lack of suitable crop management aggravates the problem of low productivity in maize, hence it has become the need of the hour to enhance the production of maize by adopting the feasible sustainable nutrient management practices. Integrated nitrogen management has to form a part of crop research agenda for realizing the additional yield. Integrated chemical fertilizers along with organic and biofertilizers has been found to be quite promising not only in maintaining higher productivity but also providing greater stability in crop production.

MATERIALS AND METHODS

Investigation was conducted on Maize cv. Ganga Safed-2 in sandy loam soil of crop research farm, Allahabad Agriculture Institute-deemed University, Allahabad, U.P during *kharif* 2003 on sandy loam soil having 217kg, 22.50kg and 212 kg/ha available N, P, K, respectively with pH. 7.9. The experiment was laid out in a randomized block design with treatments replicated thrice. The treatments consisting of nitrogen at 120kg/ha and 150kg/ha, were applied through inorganic (Urea), organic (Poultry manure) and biofertalizer (Azotobacter).Azotobacter was applied at 0.5kg/ha.Poultry manure 1ton/ha was applied one week before sowing of the crop. Half dose of nitrogen in the form of urea and full dose of P_2O_5 at 60kg/ha as SSP and full dose of K_2O at 40kg/ha as MOP were applied at sowing and remaining dose of N was top dressed in two splits, one at knee height and second at tasseling stage. The crop was sown on 29th of July, 2003 and harvested on 1st November, 2003. All other operations were performed as per the package of practices for the crop.

RESULTS AND DISCUSSION

Application of Nitrogen at 150 kg/ha through urea and Azotobacter (120 Kg N/ha + Azotobacter) improved the growth and yield of maize. At 60 DAS the maximum values for plant height (271 cm), stem girth (2.73 cm) cobs per plant (1.46 cm) and dry Weight (145.06g/plant) was recorded from treatments with Nitrogen at 150 kg/ha applied through urea and Azotobacter (Table 1). Also treatments with Nitrogen at the same rate *i.e.* 150 kg/ha but through urea in combination with poultry manure and Azotobacter found to be statistically at par with treatments having nitrogen at 150 kg/ha through urea and Azotobacter. This increase might be due to surplus nitrogen supply by Azotobacter through free atmospheric nitrogen fixation. Similar findings have been reported by Millick and Saric (1988).

At harvest, maximum value for cobs per plant (1.46), grain rows per cob (16.13) ,grains per row (44.60) , grains per cob (718.01), test weight (205g) and grain yield (54.56q/ha) was observed from the treatment with nitrogen at 150 kg/ha through urea and Azotobacter followed by treatments with nitrogen at the same rate but through urea and poultry manure. While minimum value for all the traits were recorded from treatment with nitrogen at 120 kg/ha through urea only. Amongst all the treatments T6 (120 kg N/ha + Azotobacter) gave the best results because of higher nutrients supplied by the treatment. (Table 2). These results were in close conformity with

Table 1 : Effect of different treatments on plant height, leaves per plant, stem girth, dry weight

N (120 kg/ha) through			N (150 kg/ha) through			At 60 days after sowing			
Urea (Kg/ha)	Poultry manure (t/ha)	Azotobacter (kg/ha)	Urea (Kg/ha)	Poultry manure (t/ha)	Azotobacter (kg/ha)	Plant height (cm)	Leaves/plant (No)	Stem girth (cm)	Dry weight (g/plot)
260.86	-	-	-	-	-	222.6	12.0	2.38	130.6
-	-	-	326.8	-	-	237.6	12.06	2.42	135.0
195.65	1.0	-	-	-	-	239.8	10.0	2.43	135.0
-	-	-	260.86	1.0		258.3	12.80	2.60	142.6
195.65	-	0.5	-	-	-	244.3	12.20	2.58	135.6
-	-	-	260.86	-	0.5	271.0	13.10	2.73	145.6
-	-	-	195.65	1.0	0.5	244.6	12.60	2.58	141.0
C.D.(P=0.05)						-	12.10	2.53	138.4

Table 2: Effect of different treatments on yield attributes and yield

N(120 kg/ha) through			N(150 kg/ha) through			At harvesting					
Urea (Kg/ha)	Poultry manure (t/ha)	Azotobacter (kg/ha)	Urea (Kg/ha)	Poultry manure (t/ha)	Azotobacter (kg/ha)	Cobs per plant (No.)	Grain rows/cob (No.)	Grains/ row (No.)	Grains/cob (No.)	Test weight (g)	Grain yield (q/ha)
260.86	-	-	-	-	-	1.20	13.60	33.9	457.80	166.6	47.20
-	-	-	326.8	-	-	1.33	14.06	34.5	485.36	171.6	49.22
195.65	1.0	-	-	-	-	1.33	14.06	38.9	547.33	173.3	50.88
-	-	-	260.86	1.0	-	1.40	15.13	41.5	624.86	188.3	53.44
195.65	-	0.5	-	-	-	1.40	14.46	39.46	570.94	173.3	52.53
-	-	-	260.86	-	0.5	1.46	16.13	44.60	718.01	205.0	54.56
-	-	-	195.65	1.0	0.5	1.40	14.50	40.73	592.20	178.3	52.96
C.D. (P=0.05)						0.13	1.17	6.25	102.91	-	1.005

Table 3: Economics of different treatments

Cost of main product (Rs.)	Cost of byproduct (Rs)	Gross returns (Rs/ha)	Total cost of cultivation (Rs/ha)	Net return (Rs/ha0	Benefit cost ratio	Per day profit (Rs/day)
23600.00	6330.00	29930.00	18655.69	11274,31	1.60	118.67
24610.00	6600.00	31210.00	18988.03	12221.97	1.64	128.65
25440.00	6400.00	31840.00	18999.00	1840.97	1.67	135.16
26720.00	7165.00	33885.00	19327.69	14557.31	1.75	153.23
26250.00	6680.00	32930.00	18360.63	14597.37	1.79	153.36
27280.00	7300.00	34580.00	18689.29	15890.71	1.85	167.27
26480.00	6966.50	33446.50	19086.63	14359.87	1.74	15.15

Selling price for main product = Rs. 500 /qt
Selling price for byproducts (Stover) =Rs. 50/qt.

results of Patil *et al.* (1993) and Badran (2000).

Economics :

Maximum net return (Rs.15890.71), benefit cost ration (Rs.1.85) and per day profit (Rs.167.27) was recorded from the treatment with nitrogen at 150 kg/ha through urea and Azotobacter followed by treatment with nitrogen at the same rate but through urea and poultry manure. (Table 3).

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