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INTEGRATED USE OF NITROGEN AND FYM ON YIELD, NUTRIENT UPTAKE AND ECONOMICS OF MAIZE IN EASTERN UTTAR PRADESH

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ABSTRACT

A field experiment was conducted during kharif season of 2008 and 2009 at crop research station, Bahraich (U.P.) to study the effect of integrated use of nitrogen and FYM on yield, nutrient uptake and economics of maize .The experiment was laid out in randomized the block design with eight treatments and replicated thrice. The results revealed that the crop growth and yield contributing characters were increased with application of 210 kg N + 5 t FYM ha^{-1}. The higher grain yield (74.97 q ha$^{-1)}$ and net return (Rs. 41676) with B:C ratio(2.53) was also noticed under the same treatments. Results also indicated that application of 5 t FYM ha^{-1} was more effective with all doses of inorganic fertilizer. The higher nutrient uptake (195.6, 55.6 and 175.6 kg NPK ha^{-1}) was noticed under the 201 kg N + 5 t FYM ha^{-1} treatment.

Key words: Integrated, nitrogen, FYM, yield economics maize, eastern Uttar Pradesh.

INTRODUCTION

Maize (*Zea mays L.*) is the third most important cereal crop of India after rice and wheat. Introduction of high yield hybrids of maize with the assured supply of the inputs enhanced the productivity of crop. Among the different inputs, nutrient plays a vital role in enhancing the crop productivity. Nitrogen is one of the most important nutrients limiting maize production.Nitrogen is an indispensable element for aptimum functioning of crops. FYM is a good source of nutrients and contributed towards build up of organic matter in soil. Ashok Kumar et al (2005) recorded maximum yield of maize when 100 % NPK was applied with FYM @ 10 tones ha^{-1}. Maize responded markedly to graded levels of FYM and showed spectacular response to integration of FYM and fertilizer. In eastern U.P. farmers generally use low and imbalanced dose of chemical fertilizer in hybrid maize which resulted in low yield of maize. Keeping this in view the present experiment was undertaken to evaluate the effect of integrated use of nitrogen and FYM for higher yield of maize at Bahraich, Uttar Pradesh.

MATERIALS AND MATHODS

A field experiment was laid out at crop research station Bahraich (U.P.) during 2008 and 2009 in kharif season. The soil was as sandy loam in texture with an annual rain fall of 1000 mm. of which more than 85 % is received during June to September. The experimental soil was neutral in reaction (pH 7.4) low in organic carbon (2.4 g kg ha^{-1}) and available N (170 kg ha^{-1}) and medium in available P (13.5 kg ha^{-1}) and available K (175.8 kg ha^{-1}). Experiment was conducted in randomized block design with three replications. Treatments were T_1 – 120 kg N ha^{-1} , T_2 – 150 kg N ha^{-1} , T_3 – 180 kg N ha^{-1}, T_4 – 210 kg N ha^{-1}, T_5- 120 kg N + 5 t FYM ha^{-1}, T_6 - 150 kg N + 5 t FYM ha^{-1}, T_7 – 180 kg N + 5 t FYM ha^{-1}, T_8 -210 kg N + 5 t FYM ha^{-1}. The variety HQPM-I was sown at 15 June in both the years. The half dose of N and full dose of P and K was applied as basal dressing at the time of sowing in line and remaining half dose of N was applied as top dressing in two equal split dose (first at 50 cm. height of plant and second at silk stage of crop). Farm yard manure was added to soil one week before sowing as per treatments, Nitrogen, P and K were applied through urea, diammonium phosphate and muriate of potash, respectively. The doses of P and K were 60 and 40 kg ha^{-1}**,** respectively. Irrigation and inter culture operations were done as per requirement of the crop. The data on growth parameters were recorded at full maturity of crop. Data on yield attributes and yields were recorded at harvest of the crop. The N, P and K content were determined by standard procedure adopted by Jackson (1973). The economics of the treatments was calculated on the basis of prevailing market price of the produce.

RESULTS AND DISCUSSION

Yield attributes and yield

The different nitrogen levels expressed significant effect on plant height, cob length, cob girth, grain row/cob, grain per row and test weight at harvest for all the N levels with the highest value recorded for 210 kg N ha^{-1} .In all the N levels, lowest values observed for 120 kg N ha^{-1} were significantly lower than higher level of N application. This increase in all yield attributes may be attributed to higher availability of nitrogen leading to higher productivity and translocation of photosynthatis. Similar fiunding were reported by Avasthe (2011). Yield attributes were significantly influenced by integrated use of N and FYM (Table 1). The highest cob length (18.8 cm.), cob girth (12.2 cm.), average number of row/cobs (12.8) grains/row (39.7) and test weight (240.6 g) were observed with the application of 210 kg N + 5 t FYM ha^{-1} followed by 180 kg N + 5 t FYM ha^{-1} treatment among these combinations, application of 120 kg N + 5 t FYM ha^{-1} produced lower values of yield attributes. The similar findings were reported by Singh and Singh (2006) and Paramasivam et al (2011). All growth and yield attributes were reported highest when 5 t FYM was included with all the levels of nitrogen levels as compared to the crop fertilized only by nitrogen. This may be attributed to improved nutrient status and physicochemical properties of soil with FYM. The similar findings were also reported by Meena et al (2007), Meena et al (2012) and Nagar and Kumar (2012).

Table 1: Effect of integrated use of N and FYM on yield attributes and yield of maize (mean of 2 years)

Treatments	Plant Height (cm)	Cob length (cm)	Cob Girth (cm)	Grain row/cobs	Grain/ row	1000 grain weight (g)	Grain yield (q ha^{-1})	Stover yield (q ha^{-1})
T_1 – 120Kg N ha^{-1}	145.25	16.5	8.6	9.2	24.5	210.5	55.26	65.6
T_2 – 150 Kg N ha^{-1}	165.5	17.2	10.4	11.5	30.7	218.7	58.14	70.4
T_3 - 180 Kg N ha^{-1}	182.25	17.8	11.4	11.8	32.5	226.5	65.47	74.6
T_4- 210 Kg N ha^{-1}	192.25	18.4	11.8	12.4	36.4	265.8	70.63	78.7
T_5- 120 Kg N + 5 t FYM ha^{-1}	186.75	16.8	8.8	9.6	26.5	215.7	57.14	69.9
T_6 - 150 Kg N + 5 t FYM ha^{-1}	198.25	17.9	10.9	11.8	33.7	224.9	63.31	72.7
T_7 - 180 Kg N + 5 t FYM ha^{-1}	208.25	18.2	11.9	12.2	36.8	235.7	70.31	81.5
T_8 - 210 Kg N + 5 t FYM ha^{-1}	216.5	18.8	12.2	12.8	39.7	240.6	74.97	88.7
CD (P=0.05)	5.8	1.25	1.10	0.25	0.35	0.48	2.54	3.25

Different levels of N application produced significantly higher maize grain yield, which increased progressively up to 210 kg N ha^{-1}. Application of 210 kg N ha^{-1} recorded higher yield which was significantly higher over other N levels. Stover yield increase under different N levels was significantly higher over 120 kg ha^{-1}, Stover production showed trend similar to grain yield with higher value recorded with 210 kg N ha^{-1}. Significantly highest grain and stover yield (74.97 and 88.7 q ha^{-1}) were recorded with the application of 210 kg N + 5 t FYM ha^{-1}. The application of 180 kg N + 5 t FYM ha^{-1} resulted in the next highest grain and stover yield (70.31 and 81.5 kg ha^{-1}). Application of 120 kg N ha^{-1} recorded the lower grain and stover yield (55.26 and 65.6 kg ha^{-1}) than the other treatments. The treatment 210 kg N + 5 t FYM ha^{-1} gave 26.2 % higher grain yield than that of 120 kg N ha^{-1} and the treatment 180 kg N+ 5 t FYM ha^{-1} recorded 21.4 % higher grain yield than that of 120 kg N ha^{-1}. This was also supported with the findings of Ramachandrappa *et al.* (2007).

Table 2: Effect of integrated use of N and FYM on economics and nutrient uptake in maize (mean of 2 years)

Treatments	Net Profit (Rs ha^{-1})	B:C ratio	Uptake of nutrient (kg ha^{-1})		
			Nitrogen	Phosphorus	Potassium
T_1 – 120 Kg N ha^{-1}	25768	2.03	147.4	22.6	125.6
T_2 - 150 Kg N ha^{-1}	28152	2.10	158.7	35.7	140.7
T_3 - 180 Kg N ha^{-1}	34036	2.31	175.6	42.6	155.6
T_4- 210 Kg N ha^{-1}	38204	2.45	185.8	50.7	165.8
T_5- 120 Kg N + 5 t FYM ha^{-1}	26702	2.02	152.7	30.7	130.7
T_6 - 150 Kg N + 5 t FYM ha^{-1}	31518	2.19	170.4	40.6	148.9
T_7 - 180 Kg N + 5 t FYM ha^{-1}	37598	2.40	180.8	48.9	165.7
T_8 - 210 Kg N + 5 t FYM ha^{-1}	41676	2.53	195.6	55.6	175.6
CD (P=0.05)	285.8	0.045	8.5	2.5	9.5

Nutrient uptake

The nutrient uptake by maize was affected significantly due to various doses of N application (Table 2). The uptake of N, P and K by the crop increased significantly with successive increase in N doses. The uptake of nutrients was significantly influenced by N application with significant variation between N levels. Under the treatment 210 kg N + 5 t FYM ha^{-1} recorded highest NPK uptake (195.6, 55.6 and 175.6 kg ha^{-1}) that was significantly higher than that of 120 kg N ha^{-1}. The treatment without FYM application gave the lower value of NPK uptake at same dose of N application. The higher uptake of P and K was also observed with highest dose of N and FYM application which was due to the balanced supply of nutrients to plants at all stage of crop growth. The nutrient uptake by the crop is determined by its nutrient contents and yield and apparently yield was a more vital deciding factor for the uptake of nutrients by the crop. Similar findings were also observed by Paramasivam et al (2011).

Economics

Amongst the different doses of nitrogen higher net return (Rs. 38204 ha^{-1}) and B:C ratio (2.45) was recorded under 210 kg N ha^{-1} . Data indicated that higher net returns of Rs. 47676 and B:C ratio 2.53 was noticed under 210 kg N + 5 t FYM ha^{-1}, followed by 180 kg N + 5 t FYM ha^{-1} (Rs 37598 and 2.40 net return and B:C ratio respectively). The lowest value net return of Rs. 25768 and B:C ratio 2.03 were recorded when crop was fertilized with 120 kg N ha^{-1} only. The successive dose of nitrogen in maize crop along with FYM application increased the grain yield as well as net return. The present study indicated that the combined application of 210 kg N + 5 t FYM ha^{-1} played a significant role in increasing the yield and net returns from maize and proved superior to either recommended dose of nitrogen or other combinations of N and FYM.

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