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Effect of integrated nutrient management on nutrient uptake and economics of maize (*Zea mays* L.)

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ABSTRACT

An experiment was conducted during *Rabi* season of 2007-08 on sandy loam soil at Agriculture college, V.C. farm, Mandya, Karnataka to study the Effect of integrated nutrient management on nutrient uptake and economics of maize (*Zea mays* L.). The study comprised of twelve treatments consisting of four different organic sources of nutrients and these organic sources were combined with 50, 75 and 100 per cent recommended dose of nitrogen. The results revealed that combined application of recommended dose of NPK (150:75:40 kg/ha) + FYM 10 t/ha recorded higher grain yield (65.9 q/ha), gross returns (Rs. 44,375/ha), B:C ratio (2.62), nitrogen, phosphorus and potassium uptake (160.8, 41.9 and 77.8 kg/ha, respectively) followed by 75 % recommended through nitrogen fertilizers and 25 % nitrogen through poultry manure which were at par with each other. Lowest grain yield (47.3 q/ha), gross returns (Rs. 31,970/ha), B:C ratio (1.99), nitrogen, phosphorus and potassium uptake (86.1, 22.1 and 77.8 kg/ha, respectively) were noticed in the treatment receiving 100 per cent recommended dose of NPK through chemical fertilizer (150:75:40 kg/ha).

Key words : Economics, Nutrient, Uptake, Yield, Maize

INTRODUCTION

Maize (*Zea mays* L.) constitutes one of the five major crops of the world. Maize is major food grain crop under rainfed areas during rainy (*Kharif*) season. In India, it occupies an area of 7.59 million ha with a production of 14.71 million tonnes and with productivity of 1938 kg/ha (MOA 2007). Maize being an exhaustive crop, has very high nutrient demand and its productivity mainly depend upon nutrient management system. The use of major nutrients alone fail to sustain yield levels due to increasing deficiency of secondary and micronutrients and alteration in the physical and chemical properties of soil which is unfavorable for crop growth. The present hike in the price of chemical fertilizers has compelled the Indian farmers for an alternative nutrient management system. At the same time only organic manures alone do not produce spectacular increase in the crop yields, due to their low nutrient status and availability in short period and on the other hand dependency on chemical fertilizers alone may not provide a viable economic option. Therefore, to maintain soil productivity on a sustainable basis an integrated nutrient management approach, using both organic and inorganic sources of nutrients should be adopted. In the present context, the use of manures must be given prime importance and fertilizer use should be limited to balance the nutrient requirement of the crops. In order to sustain soil fertility and to reap rich harvests of maize, it is imperative that both organic manuring and mineral nutrition have to be given adequate attention under irrigated conditions. Keeping these points in view, the present study was under taken.

MATERIALS AND METHODS

The study was carried out on sandy loam soil at the agronomy field unit, Agriculture College, V.C. Farm, Mandya, Karnataka. The soil was near neutral in soil reaction (6.73). The soil was low in organic carbon (0.39 %) and available nitrogen (198.9 kg/ha), medium in available phosphorus (25 kg/ha) and potassium (220 kg/ha). Eleven treatments comprising of inorganic and organic sources of nutrients compared with chemical fertilizers alone and these treatments were tried in Randomized Complete Block Design (RCBD) with three replications. Experiment was taken up during *Rabi* season by using maize composite- NAC-6004. All the four organic nutrient sources were analyzed for available N, P and K content and the required quantity of farm yard manure, poultry manure, press mud and vermicompost for each plot were calculated based on their nitrogen levels. Recommended dose of phosphorus and potassium were applied through chemical fertilizers where ever deficit. As per the treatments these organic sources were applied and incorporated into soil three weeks before sowing. The inorganic nutrient sources like N, P and K were

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supplied through urea, SSP and MOP, respectively. The seeds were sown with the spacing of 60cm x 30cm. Irrigation was given as and when required depending upon soil moisture. The analysis of plant samples were done at harvest for nutrient uptake studies (Jackson, 1973) and B:C ratio was calculated by using the formula:

$$\text{B : C ratio} = \frac{\text{Netreturns (Rs/ha)}}{\text{Cost of cultivation(Rs/ha)}}$$

RESULTS AND DISCUSSION

The results obtained from the present investigation are presented in Table 1 and 2.

Effect on uptake of nutrients :

Significantly higher uptake of nitrogen, phosphorus and potassium (160.8, 41.9 and 155.7 kg/ha, respectively) was recorded with the application of recommended dose of NPK (150:75:40 kg/ha) + FYM 10 t/ha compared to 100 per cent recommended NPK through chemical fertilizers (86.1, 22.1 and 77.8 kg/ha, respectively) and it was at par with the application of 75 % recommended nitrogen through chemical fertilizers + 25 % recommended nitrogen through poultry manure (146.1, 38.6 and 147.0 kg/ha, respectively) (Table 1). This might be due to the application of FYM at increasing rates enhanced the available nutrient status of soil and resulted in higher uptake by the plants. The constant release of nitrogen from FYM as a result of transformation process and increased mineralization of nitrogen resulted in higher uptake. The higher uptake of potassium was probably due to constant release of potassium from total potassium in soil and also from FYM, where as phosphorus uptake was higher due to reduced activity of phosphorus complexing agents, which leads to higher availability of phosphorus for uptake. The uptake of nutrients being the manifestation of both nutrient concentration in grain, stover and biomass produced, increased as a consequence of increase in both these attributes. The above findings also get support from the results of Tolessa Debele *et al.* (2001), Kamalakumari and Singaram (1996) and Yadav and Chipa (2005).

Effect on economics :

Combined application of recommended dose of NPK (150:75:40 kg/ha) + FYM 10 t/ha was found most remunerative and gave maximum gross returns (Rs. 44,375/ha), net returns (Rs. 32,127/ha and B:C ratio (2.62) followed by application of 75 % recommended nitrogen through chemical fertilizers + 25 % recommended nitrogen through poultry manure (Rs. 40,829, 29,882/ha and 2.61, respectively). This may be due to higher grain yield (65.9 q/ha). The lower gross returns (Rs. 31,970/ha), net returns (Rs.21,287/ha and B:C ratio (1.99) were noticed with the treatment receiving 100 per cent recommended dose of NPK through chemical fertilizer (150:75:40 kg/ha) (Table 2). These results are in confirmity with findings of Chandrashekara *et al.* (2000).

Table 1: Nutrient uptake of maize as influenced by integrated nutrient management

Treatments	Nitrogen (kg/ha)	Phosphorus (kg/ha)	Potassium (kg/ha)
T_1: 75 % Rec. N through CF + 25 % Rec. N through FYM	116.4	31.3	111.9
T_2: 75 % Rec. N through CF + 25 % Rec. N through Pr.M	112.8	29.8	107.9
T_3: 75 % Rec. N through CF + 25 % Rec. N through P M	146.1	38.6	147.0
T_4: 75 % Rec. N through CF + 25 % Rec. N through V C	126.1	33.8	121.3
T_5: 50 % Rec. N through CF + 25 % Rec. N through FYM + 25 % Rec. N through Pr. M	104.2	28.2	101.9
T_6: 50 % Rec. N through CF + 25 % Rec. N through FYM + 25 % Rec. N through P M	114.8	30.9	109.6
T_7: 50 % Rec. N through CF + 25 % Rec. N through FYM + 25 % Rec. N through V C	108.6	28.6	103.3
T_8: 50 % Rec. N through CF + 25 % Rec. N through Pr. M + 25 % Rec. N through P M	114.9	31.3	110.6
T_9: 50 % Rec. N through CF + 25 % Rec. N through Pr. M + 25 % Rec. N through V C	113.2	29.7	104.8
T_{10}: 50 % Rec. N through CF + 25 % Rec. N through V C + 25 % Rec. N through P M	140.5	35.5	130.2
T_{11}: Rec. NPK (150:75:40 kg/ha) + FYM (10 t/ha)	160.8	41.9	155.7
T_{12}: 100 % Rec. NPK through CF (150:75:40 kg/ha)	86.1	22.1	77.8
S.E.±	5.43	1.07	3.03
C.D. (P=0.05)	15.93	3.15	8.87

CF:Chemical fertilizer VC: Vermicompost FYM: Farm Yard Manure
Pr. M: Pressmud PM: Poultry manure Rec: Recommended

Table 2 : Economics of maize as influenced by integrated nutrient management

Treatments	Grain yield (q/ha)	Cost of cultivation (Rs./ha)	Gross returns (Rs./ha)	Net returns (Rs./ha)	B:C ratio
T_1: 75 % Rec. N through CF + 25 % Rec. N through FYM	56.2	11564	37864	26300	2.27
T_2: 75 % Rec. N through CF + 25 % Rec. N through Pr.M	55.6	10617	37436	26819	2.53
T_3: 75 % Rec. N through CF + 25 % Rec. N through P M	60.6	10947	40829	29882	2.61
T_4: 75 % Rec. N through CF + 25 % Rec. N through V C	57.2	15084	38590	23506	1.56
T_5: 50 % Rec. N through CF + 25 % Rec. N through FYM + 25 % Rec. N through Pr. M	54.5	11781	36706	24925	2.11
T_6: 50 % Rec. N through CF + 25 % Rec. N through FYM + 25 % Rec. N through P M	55.7	12027	37489	25462	2.11
T_7: 50 % Rec. N through CF + 25 % Rec. N through FYM + 25 % Rec. N through V C	55.0	16164	37075	20911	1.29
T_8: 50 % Rec. N through CF + 25 % Rec. N through Pr. M + 25 % Rec. N through P M	55.9	11079	37653	26574	2.40
T_9: 50 % Rec. N through CF + 25 % Rec. N through Pr. M + 25 % Rec. N through V C	54.4	15215	36628	21413	1.41
T_{10}: 50 % Rec. N through CF + 25 % Rec. N through V C + 25 % Rec. N through P M	58.8	15548	39635	24087	1.55
T_{11}: Rec. NPK (150:75:40 kg/ha) + FYM (10 t/ha)	65.9	12248	44375	32127	2.62
T_{12}: 100 % Rec. NPK through CF (150:75:40 kg/ha)	47.3	10683	31970	21287	1.99
S.E.±	2.31	-	-	-	-
C.D. (P=0.05)	6.79	-	-	-	-

CF:Chemical fertilizer VC: Vermicompost FYM: Farm Yard Manure
Pr. M: Pressmud PM: Poultry manure Rec: Recommended

Conclusion :

The field trial thus revealed that an integrated supply of farm yard manure or poultry manure with chemical fertilizers in maize favoured for better nutrient uptake resulting in higher grain yield which has caused for releasing higher net returns and B:C ratio.

REFERENCES

Chandrashekara, C.P., Harlapur, S.I., Muralikrishna, S. and Girijesh, G.K. (2000). Response of maize to organic manure with inorganic fertilizers. *Karnataka J. Agric. Sci.,* **13**: 144-146.

Jackson, M.L. (1973). *Soil chemical analysis*, Prentice Hall of India Private Ltd., New Delhi, p. 498.

Kamalakumari, K. and Singaram, P. (1996). Effect of continuous application of FYM and NPK on fertility status of soil, yield and nutrient uptake in maize. *Madras Agric. J.*, **83**:181-184

MOA (2007). Directorate of Economics and Statistics, Ministry of Agriculture, GOI. htpp://dacnet.in/

Tolessa Debele, Sharanappa, Sudhir, K., Sujith, G.M. And Debele, T. (2001). Direct and interactive effect of enriched FYM and nitrogen levels on the productivity and nutrient uptake of maize. *Karnataka J. Agric. Sci.,* **14:**672-676

Yadav, K.K. and Chipa, B.R. (2005). Effect of organic and inorganic soil amanendments on yield and nutrient uptake of wheat irrigated with high RSC water. *Curr. Agric*., **29**(1-2):87-90

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