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Productivity and quality of baby corn (*Zea mays*) fodder as influenced by nutrient management practices in the Indo-Gangetic plains of India

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Introduction

Maize occupies an important place among cereals in the world ranking at third place in respect of area and production. Owing the diversified uses for food, feed and industrial utilization and having the greater yield potential among the cereals maize has become an important crop in India. For diversification and value addition of maize and growth of food processing industry; an interesting recent development is the growing maize for vegetable purpose as "baby corn". The duration of baby corn ends with 60-70 days; until it enters into reproductive phase (40-45 DAS). Besides, from its cultivation ensures availability of good-quality green fodder and add enormously to total economic returns. Baby corn, being a relatively new introduction in India, requires development of production technology. Among the different production factors, nutrient management plays a key role in improving the productivity of crops. Since, corn is nutrient exhaustive crop and deplete soil fertility extensively. For obtaining high productivity, heavy doses of costly fertilizers and their use in higher amounts can lead to environmental pollution. Moreover, poor recycling of organic sources and application of high analysis fertilizers leads to deficiency of several micronutrients. Making press mud based distillery effluent bio-compost mixing the nutrient rich press mud from sugar mills with NPK rich spent wash obtained from distillery unit in the ratio of 1:2.5 is a good source of nutrients. However, there is a lake of information regarding the performance of bio-compost in relation to productivity and fertility of soil particularly under vegetable-based cropping in Indo-Gangetic plains. Hence, the present study was planned to evaluate the performance of bio-compost in terms of growth, yield and economics of baby corn-potato- mungbean cropping system and to compare it with the traditional manure i.e. FYM as substitute of fertilizer N

Materials and Methods

A field experiment was conducted during *kharif, rabi* and summer season of 2007-08 and 2008 -09 at IARI, New Delhi. The soil at site was sandy loam with organic carbon 0.40% and 7.5 pH. In baby corn, six combinations of organic and inorganic sources were applied in randomized block design. All the treatments were replicated thrice. The NPK analyzed in FYM and BC was 0.48 and 1.61% N, 0.22 and 1.45% P_2O_5 and 0.51 and 2.70% K_2O during 2007 and 0.49 and 1.63% N, 0.23 and 1.47% P_2O_5 and 0.50 and 2.71% K_2O in 2008. The bio-sources (FYM and BC) were applied in different combination with chemical fertilizers for substitution of 50 and 25% recommended dose of N to baby corn (Table 1). Baby corn ('HM- 4') was planted on the side of ridges made at 60 cm apart by keeping the intra row spacing of 20 cm and harvested in 2-3 pickings within 2-3 days of silk emergence. As per the treatments N, P and K were applied to the crops in the form of urea, single super phosphate and muriate of potash, respectively. Half the dose of N, full amount of P and K was applied as basal. While, remaining amount of N was splitted in two equal doses and applied at knee high and pre-tasseling stage of baby corn and in potato, remaining N dose was top dressed at 30 days after planting. The data recorded for different parameters were analysed with the help of analysis of various (ANOVA) technique using MSTAT-C software. The result are presented at 5% level of significance (P=0.05).

Results and Discussion

Significantly higher baby corn fodder yield (green and dry) was recorded under all the nutrient management practices over control during both the years (Table 1). Further, fodder yield was superior under 25% substitution of RDN either through BC or FYM than 50% substitution. The treatment receiving $N_{90}P_{20}K_{25}$ + BC equivalent to 30 kg N/ha which was at par with 100% NPK recorded the highest green and dry fodder yield during both the years. Higher fodder yield with combined application of organic and inorganic sources of nutrients could be ascribed to efficient utilization of nutrients from combined sources compared to the single source. These findings were in agreement with the observation of several

other researchers (Nanjappa *et al.*, 2001, Mahala *et al.*, 2006). The 25% substitution with FYM recorded 34.2 and 29.9 % increase in green fodder and 51.6 and 37.6 % increase in dry fodder yield over control during 2007 and 2008, respectively. The respective increase with use of BC was 50.2 and 50.6 % of green fodder; and 86.2 and 57.7 % of dry fodder during each year. Application of BC might have increased the P availability through the formation of soluble complex with organic compounds increased the P uptake. Transformation from existing solid phase of K to a soluble metal complex increased the K uptake. In the present study, higher baby corn yield with 75%NPK along with 25% RDN through BC or 100%NPK was attributed to high cob weight and more number of cobs/plant. The BC besides having higher available N, P and K status has rich population of microbes might have degraded and mobilize the nutrients to available form.

Results reveals that significantly highest N, P and K concentration in baby corn cob, husk and fodder; and the highest protein content in baby corn cob (13.7 and 13.4%) and fodder (9.3 and 10.5%) during first and second year of study, respectively was recorded with the application of $N_{90}P_{20}K_{25}$ + BC equivalent to 30 kg N/ha being at par with N_{120} $P_{26}K_{33}$. The N, P and K uptake in different plant components *viz*. baby corn, husk and fodder and the total N, P and K uptake in baby corn was highest with N_{90} P_{20} K_{25} + BC equivalent to 30 kg N/ha which recorded 145.1%, 223.4 % and 119.8 % higher N, P and K in 2007; and 120.4 %, 123.7% and 93.2 % N, P and K in 2008 over control, respectively. This was due to rapid availability of applied nutrient to the plants in BC applied treatments. Consequently the NPK being involved in physico-chemical reaction of plant body of baby corn did behave according to their effect on plant system and enhanced the values of quality parameters.

Table 1 Effect of nutrient management practices on yield and quality of baby corn fodder

Treatment	Fodder yield (t/ha)				Protein content (%)		N content (%)		P content (%)		K content (%)	
	Green		Dry									
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
Control	15.53	16.17	3.04	3.64	7.92	7.40	1.25	1.18	0.17	0.22	1.57	1.59
N_{120} $P_{26}K_{33}$	23.00	23.58	5.31	5.52	8.96	10.33	1.63	1.65	0.26	0.28	1.84	1.86
N_{60} $P_{13}K_{17}$ + FYM (60 kg N/ha)	18.09	18.37	3.76	4.36	8.79	8.54	1.40	1.37	0.21	0.24	1.71	1.73
N_{60} $P_{13}K_{17}$ + BC(60 kg N/ha)	20.50	20.83	4.49	4.94	9.02	9.58	1.44	1.53	0.23	0.27	1.76	1.78
N_{90} $P_{20}K_{25}$ + FYM (30 kg N/ha)	20.83	21.01	4.61	5.01	9.17	9.88	1.47	1.58	0.24	0.29	1.81	1.85
N_{90} P_{20} K_{25} + BC (30 kg N/ha)	23.33	24.35	5.66	5.74	9.33	10.52	1.67	1.68	0.30	0.30	1.85	1.91
SEm ±	**0.64**	**0.63**	**0.14**	**0.15**	**0.25**	**0.30**	**0.05**	**0.05**	**0.01**	**0.01**	**0.03**	**0.04**
LSD(P=0.05)	**2.01**	**1.99**	**0.44**	**0.47**	**0.79**	**0.95**	**0.14**	**0.15**	**0.02**	**0.02**	**0.10**	**0.13**

Conclusion

Based on findings of present investigation, it may be concluded that substitution of recommended dose of fertilizer through organic sources like BC and FYM in nutrient exhaustive system of baby corn-potato–mungbean high productivity and superior quality baby corn fodder, under substitution of 25% RDN by BC (N_{90} P_{20} K_{25} + BC equivalent to 30 kg N/ha) in baby corn over control and found at par to 100% NPK (N_{120} $P_{26}K_{33}$) was obtained.

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