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Effect of Integrated Nutrient Management on Baby Corn (*Zea mays* L.) Under Gangetic Alluvial Land after Rice

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Abstract

A field experiment was conducted during the pre-kharif season of 2018 and 2019 at the Experimental farm of Calcutta University after harvest of main season rice on gangetic alluvial soil to study the effect of integrated nutrient management on baby corn (***Zea mays*** L.). The experiment was laid out in randomized block design, with three replication, application of 75% recommended dose of fertilizer, 2.5 tonnes of vermicompost/ha along with seaweed extract at 2.4 litre/ha revealed maximum corn yield of 2126.16 kg/ha associated with maximum fresh corn weight. The same treatment also exhibited greater improvement in diameter of corn and length of cob over 100% recommended dose of N, P, K fertilizers.

Key words: Baby corn, integrated nutrient management

Introduction

In vast Gangetic alluvial land in eastern India due to high rainfall receipt in monsoon season from June to September rice is grown in majority of Gangetic alluvial soils, under such Gangetic alluvial land rice is grown in June-July to November-December every year and after harvest of rice particularly traditional aman rice (photosensitive) and late receiving of water from low-lying situation it becomes difficult to plant any winter season crop following rice. However, with advent of knowledge and technology it has been possible to grow many wide adaptable crops following even in late season after rice among many crops feasible for growing under such situation after rice it has been thought baby corn (***Zea mays*** L.) may be fitted with existing cropping pattern with rice in Gangetic alluvial region. Maize has the highest production potential among the cereals (Mahapatra *et al*., 2018). For crop diversification and value addition of maize as well as growth of food processing industries, recent development is growing maize as baby corn. It is used as ingredient in most food preparations. Attention is now being made to explore the potential of growing baby corn after the harvest of rice in Gangetic alluvial land in eastern India. Productivity and quality of baby corn are affected by cultural management applied to the crop especially fertilizer application. Judicious uses of fertilizers from different sources on baby corn will maintain the environmental sustainability for generations without affecting the environmental health. However, integrated nutrient management is a judicious application of nutrients from different sources to a field in order to maintain environmental sustainability and to increase crop productivity. Hence, the study was aims to evaluate the impact of integrated nutrient management on yield and economics of baby corn production in Gangetic alluvial land.

Materials and Method

The experiment was conducted during the spring season of 2018 and 2019 on clay loam soil at the Agricultural Experimental Station of Calcutta University, Baruipur with 1.3 m altitude. The soil had average value of organic carbon 0.62%, 0.078% total N, 34 Kg/ha available P and 260 Kg/ha available K with pH 6.2 after harvest of rice. The experiment was laid out in a Randomized Block Design (RBD) with three replications having eight integrated nutrient management treatments viz. (i) 100% recommended dose of NPK (RDF: N 120 Kg/ha,

P_2O_5 60 Kg/ha and K_2O 60 Kg/ha); (ii) 75% of NPK + 2.5 tonnes of vermicompost/ha + seaweed extract spray @ 2.4 litre/ha ; (iii) 75% NPK + 5 tonnes FYM/ha + 2 tonnes vermicompost/ha; (iv) 50% NPK + 2.5 tonnes FYM/ha + humic acid spray @ 1.5 litre/ha ; (v) 75% NPK + seaweed extracts @ 4.5 litre/ha ; (vi) 75% NPK + 2.5 tonnes of vermicompost + humic acid @ 2.4 litre/ha; (vii) Neem pellets @ 0.2 tonnes/ha + 7.5 tonnes/ha of FYM + 2.5 tonnes vermicompost + 2 litre/ha of seaweed extract ; (viii) Control Plot.

Recommended dose of fertilizer, proportionate amount of fertilizer along with desired quantity of FYM and vermicompost were applied after final land preparation before planting of baby corn as per treatment. Seaweed extract in total used was 8.9 litre/ha.

Baby corn variety KSP-1224 was sown during 1st fortnight of January in both the years. The crop was sown with a plant density of 45cm x 25 cm. In all three sprays of seaweed extract and humic acid at the rate of 8.9 litres and 3.9 litres per ha dissolved in 500 litres of water for each spray were given at 15 days, 30 days and 45 days through knapsack sprayer after growth of the crop. The crop was irrigated whenever there was a need. Biometric observation was recorded on ten randomly selected plants. Yield was estimated on harvest per plot and then converted to hectares. Economics were calculated on the basis of prevailing prices of input and outputs. The market price of baby corn was estimated at Rs. 55 and Rs. 60 per kg and of grain fodder at Rs.0.6 and Rs. 0.7 per kg in 2018 and 2019 respectively. Statistical analysis of the data collected during experimentation was calculated following the methods as suggested by Gomez and Gomez (1984).

Results and Discussion

Growth parameters

The statistical analysis of the data in respect of growth parameters presented in (Table 1), revealed significant variation due to various treatments. Application of 75% of NPK + 2.5 tonnes of vermicompost/ha + seaweed extract spray at 2.4 litre/ha improved plant height, dry matter production/plant, leaf number/plant and leaf area index (LAI) of baby corn. The higher plant height and large number of leaves/plant favoured higher canopy development under integrated nutrient management. It might have increased the light interception, absorption and utilization of solar radiation thus estimating photosynthesis which reflected in LAI and dry matter production. The reason for superior plant growth of baby corn is probably due to synergistic effect of integration of inorganic fertilizers, organic manures and of spray of seaweed extract that resulted in increased availability and absorption of primary and micronutrients along with cytokinins and amino acids. The promoting effect of integrated nutrient management on growth parameters of baby corn were also reported by workers like Ajaz *et al.,* (2013). Integration of 75% of NPK + 2.5 tonnes of vermicompost/ha + seaweed extract spray @ 2.4 litre/ha proved better than integrated use of 75% NPK + 5 tonnes FYM/ha + 2 tonnes vermicompost/ha possibly on account of contribution of many micronutrients, secondary nutrient like sulphur and different acids and cytokinins derived from seaweed extract.

Effect on yield parameters

The combined application of 75% of recommended NPK fertilizer with 2.5 tonnes of vermicompost/ha along with spray of seaweed extract spray at 2.4 litre/ha remarkably augmented the yield attributes like length of cob, diameter of cob, fresh cob weight and fresh corn weight of baby corn. Increase in yield attributes noted with integrated application of inorganic, organic and seaweed extract is due to improvement in crop growth parameters resulted in better translocation, utilization and partitioning of photosynthates. Moreover improvement in physio-chemical and biological properties with integrated use of nutrients resulted in better availability, absorption and utilization of nutrients thereby enhanced yield attributes.

Effect on yield

Integrated nutrient management treatments exhibited profound effect on yield of Baby corn

TABLE 1. Effect of nutrient management on plant growth parameters

Treatments	Plant Height (in cm)	Leaf Area Index	No. of leaves	Barren percentage (%) of baby corn	Dry matter accumulation
T_1- 100% NPK	170.24	5.42	11.14	1.61	62.39
T_2- 75% of NPK + 2.5 tonnes of vermicompost/ha + seaweed extract spray @ 2.4 litre/ha	183.51	6.1	11.74	1.55	66.97
T_3- 75% NPK + 5 tonnes FYM/ha + 2 tonnes vermicompost/ha	165.65	5.02	10.36	1.65	61.23
T_4- 50% NPK + 2.5 tonnes FYM/ha + humic acid spray @ 1.5 litre/ha	169.45	5.14	10.77	1.71	62.93
T_5- 75% NPK + seaweed extracts @ 4.5 litre/ha	177.20	5.55	10.81	1.25	61.93
T_6- 75% NPK + 2.5 tonnes of vermicompost + humic acid @ 2.4 litre/ha	169.83	5.31	10.96	1.49	61.40
T_7- Neem pellets @ 0.2 tonnes/ha + 7.5 tonnes/ha of FYM + 2.5 tonnes vermicompost + 2 litre/ha of seaweed	163.32	9.02	11.03	1.57	60.89
T8- Control Plot	159.04	3.81	10.23	1.7	55.77
SE (m)	0.07	0.12	0.19	0.14	1.16
CD at 5%	0.15	0.35	0.57	0.21	3.40

TABLE 2. Effect of nutrient management on green cob, green fodder, biological yield and harvest index of baby corn

Treatments	Green cob (Kg/ha)	Green fodder (Kg/ha) (Kg/ha)	Biological yield	Harvest Index
T_1- 100% NPK	2048.25	23598.88	25576.13	0.08
T_2- 75% of NPK + 2.5 tonnes of vermicompost/ha + seaweed extract spray @ 2.4 litre/ha	2126.16	24916.18	27009.84	0.08
T_3- 75% NPK + 5 tonnes FYM/ha + 2 tonnes vermicompost/ha	1787.12	18284.28	20174.9	0.085
T_4- 50% NPK + 2.5 tonnes FYM/ha + humic acid spray @ 1.5 litre/ha	1487.25	19935.39	21421.4	0.13
T_5- 75% NPK + seaweed extracts @ 4.5 litre/ha	1755.62	22434.41	24190.03	0.07
T_6- 75% NPK + 2.5 tonnes of vermicompost + humic acid @ 2.4 litre/ha	1793.56	20900.08	22693.64	0.08
T_7- Neem pellets @ 0.2 tonnes/ha + 7.5 tonnes/ ha of FYM + 2.5 tonnes vermicompost + 2 litre/ha of seaweed	1958.83	22885.21	24844.04	0.265
T8- Control Plot	1459.79	15315.17	16774.96	0.085
SE (m)	0.428	0.551	-	-
CD at 5%	1.297	1.672	-	-

(Table 2). The favourable effect of integrated nutrient supply with 75% NPK, 2.5 tonnes vermicompost and spray of seaweed extract in improving the yield components of baby corn resulted in enhancement of baby corn yield, green fodder and biological yields. Baby corn yield was boosted with use of integrated nutrient supply due to favourable effect in increase in crop growth. The combined effect of inorganic nutrient, organic manure of vermicompost along with spray of seaweed extract having greater source of micronutrients sulphur and cytokinins had synergistic effect in availability of nutrients in soluble form throughout the growing period which facilitated the effective utilization of nutrients thus increased the sink capacity and higher nutrient uptake. These might have lead to better assimilation of photosynthates and their efficient translocation from source to sink resulting in an improvement in overall yield. The results are in accordance with findings of Thavaprakash *et al.*, (2005). The harvest index of baby corn was found to be variable among the treatments possibly due to variation in yield in years however; it indicated certain edge in integrated nutrient supply system indicating better partitioning of assimilates in sink.

Economics

The results revealed that the highest gross return of mean Rs. 138648.97 was obtained with conjunctive use of 75% RDF + 2.5 tonnes vermicompost along with spray of seaweed extract. It was followed by 100% RDF in baby corn production. However, the results on net return of baby corn showed quite contradiction where 100% RDF exhibited the highest mean net return followed by integrated use of 75% RDF + 2.5 tonnes vermicompost and spray of seaweed extract (Table 3). This was possibly due to appreciable increase in cost of cultivation with the use of seaweed extract. Hence higher benefit: cost ratio was registered under 100% RDF compared to integrated nutrient supply system. The enhancement in economics of baby corn with integrated use of RDF + vermicompost and micronutrient source was represented earlier by Ashoka *et al*., (2008), Mahapatra *et al*., (2013).

Conclusion:

It was concluded that incorporation of seaweed extract with integration of inorganic fertilizers and organic manures are most effective in increasing the growth parameters, yield attributes and yield of baby corn grown after rice in Gangetic alluvial land. The results further indicated that 75% recommended dose of fertilizer along with 2.5 tonnes of vermicompost and 2.4 litre/ha of seaweed spray exhibited maximum green fodder and biological yield of baby corn which were statistically higher over 100 % recommended fertilizer dose.

Literature Cited

1. Lone, Ajaz A., Allai, B.A., Nehvi, F.A. 2013. Growth, yield and economics of baby corn (*Zea mays* L.) as influenced by Integrated Nutrient Management (INM) practices. *African Journal of Agricultural Research*, **8**(37):4537-4540.

2. Mahapatra, A., Barik, A.K., Mishra, G.C. 2018. Integrated Nutrient on Baby Corn (*Zea mays* L.). *International Journal of Bio-resource and Stress Management*, **9**(1):044-048.

3. Basavaraja, P.K., Yogendra, N.D., Zodape, S.T., Prakash, Ravi., Ghosh, Arup. 2018. Effect of seaweed sap as foliar spray on growth and yield of hybrid maize. *Journal of Plant Nutrition*, **41**(14):1851-1861.

4. Sharma, Harshita., Pyare, Ram., Verma, V.K., Singh, Dhananjay. 2021. Effect of hybrid varieties and seaweed extracts (SoilGro Gr) with nitrogen management on yield and economics of maize (*Zea mays* L.). *International Journal of Chemical Studies*, **9**(1): 2500-2502.

5. Wailare, Auwal Tukur. 2012. Effect of Integrated Nutrient Management on Baby corn (*Zea mays* L.). *International Journal of Science and Research*, **3**(6):2218-2220.

6. Ghosh, Mainak., Maity, Swapan Kumar., Gupta, Sanjeev Kumar., Roy Chowdhury, Arnab. 2017. Performance of Baby Corn under Different Plant Densities and Fertility Levels in Lateritic Soils of Eastern India. *International Journal of Pure and Applied Bioscience*, **5**(3):696-702.

7. Pal, Ashok., Dwivedi, Sanjay Kumar., Maurya, Pradip Kumar., Kanwar, Poolchand. 2015. Effect of seaweed saps on growth, yield, nutrient uptake

TABLE 3. Effect of nutrient management on economics of the treatments

Treatments	Green cob (Kg/ha)	Green fodder (Kg/ha)	Gross Return (Rs./ha)	Total cost of cultivation (Rs./ha)	Common cost (Rs./ha)	Treatment cost (Rs./ha)	Net profit (Rs./ha)	B:C Ratio
T_1- 100% NPK	2048.25	23598.88	133281.71	58356.5	53249.5	5107	74925.215	2.281
T_2- 75% of NPK + 2.5 tonnes of vermicompost/ha + seaweed extract spray @ 2.4 litre/ha	2126.16	24916.18	138648.97	75235.45	53249.5	21985.95	63395.2	2.222
T_3- 75% NPK + 5 tonnes FYM/ha + 2 tonnes vermicompost/ha	1787.12	18284.28	114532.34	85583.45	53249.5	32333.95	28948.896	1.337
T_4- 50% NPK + 2.5 tonnes FYM/ha + humic acid spray @ 1.5 litre/ha	1487.25	19935.39	99274.78	62863	53249.5	9613.5	36451.7865	1.58
T_5- 75% NPK + seaweed extracts @ 4.5 litre/ha	1755.62	22434.41	115987.13	59243.45	53249.5	5993.95	56743.687	1.958
T_6- 75% NPK + 2.5 tonnes of vermicompost + humic acid @ 2.4 litre/ha	1793.56	20900.08	117016.45	78379.45	53249.5	25129.95	38637.006	1.493
T_7- Neem pellets @ 0.2 tonnes/ha + 7.5 tonnes/ha of FYM + 2.5 tonnes vermicompost + 2 litre/ha of seaweed	1958.83	22885.21	127675.30	96559.5	53249.5	43310	31115.8005	1.322
T_8- Control Plot	1459.79	15315.17	93736.06	53249.5	53249.5	43552	40486.569	1.988

and economic improvement of maize (sweet corn). *Journal of Applied and Natural Science*, **7**(2): 970-975.

8. Golada, Shankar Lal., Sharma, Ganpat Lal., Jain, H.K. 2013. Performance of baby corn (*Zea mays* L.) as influenced by spacing, nitrogen fertilization and plant growth regulators under sub humid condition in Rajasthan, India. *African Journal of Agricultural Research*, **8**(12):1100-1107.

9. Muthukumar, V.B., Velayudham, K., Thavaprakaash, N. 2005. Growth and Yield of Baby Corn (*Zea mays* L.) as Influenced by Plant Growth Regulators and Different Time of Nitrogen Application, *Research Journal of Agriculture and Biological Sciences*, **1**(4):303-307.

10. Mahadevaiah, K., Sagar, G. Karuna. 2014. Effect of Integrated Weed Management Practices on Yield, Nutrient Uptake and Economics of Baby Corn, *Agric. Sci. Digest*., **34**(4): 303-306.

11. Gomez, K.A. and Gomez, A.A. 1984. Statistical Procedure for Agricultural Research. *John- Wiley and Sons Inc., New York*, P. 680.

12. Muthukumar, V.B., Velayudham, K. and Thavaprakash, N. 2005. Growth and yield of baby corn (*Zea mays* L.) as influenced by plant growth regulators and different time of nitrogen application. *Research Journal of Agriculture and Biological Sciences* **1**(4): 303-307.