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Baby Corn Yield Performance on Silty Clay Loam Soil as Impacted by Organic Nutrient Management Practises of Coimbatore

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A field experiment was conducted during the rabi season of 2022 in the farm of Karunya Institute of Technology and Sciences, Coimbatore to study the effect on organic nutrient management on yield and economic returns of baby corn which was grown in silty clay loam soil. Among all the treatment 12.5 t FYM + groundnut cake equivalent to 60 kg fertilizer N provided much better outcomes in terms of yield attributing character and cob yield followed by vermi-compost equivalent to N in 12.5 t FYM + groundnut cake equivalent to 60 Kg fertilizer N. B:C ratio was found higher in 60-30-30 kg NPK through fertilizer alone.

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1. INTRODUCTION

Baby corn (*Zea mays L*.) is an off shoot of maize, and is also known as young corn, cornlets or baby sweetcorn. Baby corn is grown for its young, fresh, finger like green ears, harvested at the time of silk emergence and before pollination and fertilization [1]. It is a vegetable with a low calorie count and high fibre content [2].Thailand is the main exporter of baby corn in the world. The major states which are producing baby corn in India are Punjab, Karnataka, Haryana, Maharashtra, Gujarat, Western Uttar Pradesh, Andhra Pradesh and Meghalaya. In India, baby corn is a dual-purpose crop that is produced all year round Ranjan and Sow [3]. The yield of baby corn depends on the variety but an average yield of baby corn for tender cob or baby corn is about 6700 kg per hectare and for green fodder is about 33 tonnes per hectare. A soil rich in organic matter and essential plant nutrients is a pre requisite for higher yield of baby corn. Organic products are higher in nutrients and have less pesticide residues and chemicals Hammed et al. [4]. In 2019, India was the world's largest producer of organic food Willer et al. [5]. Using chemical fertilizers can be deemed beneficial as it gives maximum yield of baby corn but keeping in mind the present scenario of sustainability, soil and public health, a dire urgency is nowadays felt to standardize green technology for safe baby corn production through supplementation of the nutrient requirement through biofertilizers and organic manures. To protect future generations from harmful chemical fertilizers effects, it is necessary to encourage organic farming and restore and maintain soil fertility on a sustainable basis Geissen et al. [6]. The demand for nitrate and pesticide free food is ever increasing in the world. Different alternative form of agriculture instead of conventional farming is being tried everywhere. Among the alternative forms of agriculture, organic farming is the most sustainable one. In organic farming, inorganic inputs like fertilizers, pesticides are not permitted. Manuring should be done only through organic manures.

2. MATERIALS AND METHODS

A field experiment was conducted in Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu during the rabi season (2022) to study the effect of "Organic nutrient management on yield and economic returns of baby corn". The site of the field was located at $10^{o}56$'N latitude and 76^{o} 44'E longitude at an elevation 474 m above mean sea level. The soil of the experimental site was silty clay loam soil with pH of 6.7, EC (0.31 dSm^{-1}), OC (0.39 %), available nitrogen (257 kg ha^{-1}), phosphorus (61 kg ha^{-1}) and potassium (200 kg ha^{-1}).

The experiment was laid out in Randomised blocked design (RBD) with three replications and 10 treatments. The Baby corn variety G 5414 was used for this experiment. The treatments consists of T1 - 60-30-30 kg NPK through fertilizer alone, T2 - application of FYM @ 12.5t ha^{-1}, T3 - vermi-compost equivalent to N in 12.5 t FYM alone, T4 - poultry manure equivalent to N in 12.5 t FYM alone, T5 – FYM + vermi-compost + poultry manure equivalent to supply $1/3^{rd}$ N each in 12.5 t of FYM, T6 - 12.5 t FYM + groundnut cake equivalent to 60 kg fertilizer N, T7- vermi-compost equivalent to N in 12.5 t FYM + groundnut cake equivalent to 60 kg fertilizer N, T8 - Poultry manure equivalent to N in 12.5 t FYM + groundnut cake equivalent to 60 kg fertilizer N, T9- FYM + vermi-compost + poultry manure equivalent to supply 1/3 rd N each in 12.5 t FYM + groundnut cake equivalent to 60 kg fertilizer, T10 - 12.5 t FYM + 60-30-30 NPK kg ha^{-1} through fertilizers. All the yield parameters were recorded as per the regular practise.

3. RESULTS AND DISCUSSION

3.1 Yield Attributing Characters and Yield

In most of the yield attributing characters, viz cob length, number of rows of kernels cob^{-1} and number of kernels row^{-1} were the highest in the treatment receiving application of 12.5 t FYM + Groundnut cake equivalent to 60 kg fertilizer N (T6) as seen in Table 1. However T6 was on par with T3, T4, T5, T7, T8 and T9 means cob length, number of rows of kernel cob^{-1} and number of kernels row^{-1} increased at the rate of 28, 22.6 and 20 per cent respectively over control (T10). Sixty kg nitrogen supplied to baby corn through fermented groundnut cake twice at 10 and 30 DAS gave better results than 60 kg nitrogen applied through urea.

Table 1. Effect of organic nutrient management in baby corn on yield attributing character

Treatment	Cob length at harvest (cm)	No. of rows of kernel cob^{-1}	No. of kernels per row of cob	Cob yield at harvest with husk (t ha^{-1})
T1- 60-30-30 kg NPK through fertilizer	12.7	11.1	38.7	3.90
T2- Application of FYM @12.5t ha^{-1}	12.0	10.8	38.3	3.70
T3- Vermi-compost equivalent to N in 12.5 t FYM	13.0	11.3	39.9	4.10
T4- Poultry manure equivalent to N in 12.5 t FYM	14.4	12.6	43.0	4.80
T5-FYM+Vermicompost+Poultrymanure equivalent to supply 1/3rd N each in 12.5 t of FYM	14.0	12.4	42.7	4.50
T6- 12.5 t FYM + Groundnut cake equivalent to 60 Kg fertilizer N	14.9	13.0	45.8	6.50
T7- Vermi-compost equivalent to N in 12.5t FYM + Groundnut Cake equivalent to 60 Kg fertilizer N	14.6	12.8	44.5	6.30
T8- Poultry manure equivalent to N in 12.5 t FYM + Groundnut Cake equivalent to 60 Kg fertilizer N	13.4	11.5	41.2	4.00
T9- FYM + Vermi-compost + Poultry manure equivalent to supply 1/3 rd N each in FYM +Groundnut cake equivalent to 60 Kg fertilizer	13.8	11.6	42.5	4.20
T10- PoP: 12.5 t FYM + 60-30-30 NPK kg ha^{-1} through fertilizers	11.6	10.6	38.2	3.20
SEm ±	0.9114	0.8217	2.2767	0.3983
CD (0.05)	1.9041	1.7167	4.7561	0.8321

Highest cob yield was (6.5 t ha^{-1}) obtained in application of 12.5 t FYM + groundnut cake equivalent to 60 kg fertilizer N (T6) and was in par with T7. Cob yield in T6 and T7 were significantly superior to all the other treatments. The results indicated that 60 kg nitrogen supplied by fermented groundnut cake at 10 and 30 DAS in treatment receiving FYM @ 12.5 t ha^{-1} and vermicompost equivalent to nitrogen in 12.5 t ha^{-1} gave excellent results this maybe due to supply of nutrient from FYM and vermicompost by fermented groundnut cake at 10 and 30 DAS. Additionally groundnut cake contains high nitrogen per cent which helps in higher growth and yield of the crop. The available nitrogen and phosphorus in soil were the highest in T6.

The increased in cob yield ha^{-1} in T6 and T7 over control (T10) was at the rate of 103 and 97 per cent respectively. Third highest yield of cob obtained in T4 was higher by 50 % over control (T10). Treatment 4 received poultry manure to supply nitrogen equivalent to what supplied by 12.5 t ha^{-1} of FYM. Similar findings were found by Karche et al. [7] where the highest yield of baby corn was reported from the application of poultry manure alone. Babu et al. [8] in their study of nutrient management practices also observed similar results where the combined application of FYM 6 t ha^{-1}+ VC 2 t ha^{-1} was found to be beneficial in terms of improving growth, productivity, profitability, and quality of baby corn. It also resulted in taller baby corn plants, higher DMA, cob length, cob girth, and weight than the control treatment. Studies by Khan et al. [9] correlated with this study where the beneficial effect of organic manures like biogas slurry resulted in higher growth and yield of baby corn. Wahab Hekmat and Abraham [10] in their field trial found similar results where the application of poultry manure alone or in combination with FYM and goat manure was found to be the best treatment for obtaining higher yield of babycorn. The results of the study is also supported by the findings of Chandel et al. [11] where he reported application of N as vermi compost at 3.33 t ha^{-1} in baby corn recorded more cobs $plant^{-1}$, maximum cob weight with husk, maximum cob length, maximum cob yield.

4. ECONOMICS OF CULTIVATION

Table 2. Effect of organic nutrient management in baby corn on economic analysis

Treatment	Gross income (Rs ha^{-1})	Cost of cultivation (Rs ha^{-1})	Net income (Rs ha^{-1})	BCR
T1- 60-30-30 kg NPK through fertilizer	1,56,000	44,259	1,11,741	3.5
T2- Application of FYM @12.5 t ha^{-1}	1,48,000	64,675	83,325	2.3
T3- Vermi-compost equivalent to N in 12.5 t FYM	1,64,000	73,011	90,989	2.3
T4- Poultry manure equivalent to N in 12.5 t FYM	1,92,000	60,305	1,31,695	3.2
T5-FYM+Vermi-compost+Poultrymanure equivalent to supply 1/3rd N each in 12.5 t of FYM	1,80,000	58,481	1,21,519	3.1
T6- 12.5 t FYM + Groundnut cake equivalent to 60 Kg fertilizer N	2,60,000	82,425	1,77,575	3.2
T7- Vermi-compost equivalent to N in 12.5 t FYM + Groundnut Cake equivalent to 60 Kg fertilizer N	2,52,000	92,425	1,59,575	2.8
T8- Poultry manure equivalent to N in 12.5 t FYM + Groundnut Cake equivalent to 60 Kg fertilizer N	1,60,000	81,055	78,945	2.0
T9- FYM + Vermi-compost + Poultry manure equivalent to supply 1/3 rd N each in FYM + Groundnut Cake equivalent to 60 Kg fertilizer	1,68,000	86,501	81,499	2.0
T10- PoP: 12.5 t FYM + 60-30-30 NPK kg ha^{-1} through fertilizers	1,28,000	69,956	58,044	1.9

In this study, cost of cultivation was found highest in T7 i.e. vermi-compost equivalent to N in 12.5 t FYM + groundnut cake equivalent to 60 Kg fertilizer followed by T6 i.e. application 12.5 t FYM + groundnut cake equivalent to 60 kg fertilizer N (Table 2). This is due to the high cost of producing vermicompost and high cost of groundnut cake. The lowest cultivation cost was observed in T1 where no organic manure was applied. Highest gross return (Rs. 2,60,000 ha^{-1}) and net return (Rs. 1,77,575 ha^{-1}) were found in application of 12.5 t FYM + groundnut cake equivalent to 60 kg fertilizer N (T6). But the B:C ratio was found to be low in T6. The highest B:C ratio (3.5) was found in T1 i.e. application of 60-30-30 kg NPK through fertilizer alone because of the lower cost of manuring in the absence of organic manure.

5. CONCLUSION

Application of 12.5 t FYM + groundnut cake equivalent to 60 Kg fertilizer N in baby maize resulted in the maximum cob yield with husk (6.5 t ha^{-1}) followed by application vermi-compost equivalent to N in 12.5 t FYM + groundnut cake equivalent to 60 Kg fertilizer (6.3 t ha^{-1}). T1 which received only recommended dose of NPK without any organic manure instead of fertilizer had the highest B:C ratio in terms of economics. Alternative manures can be chosen for more affordable and nutritious baby corn production given the greater cost of some organic manures.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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