Yield Performance of Organic Baby Corn (*Zea Mays* L.) as Influenced by Nutrient Management and Moisture Conservation Practices in Sandy loam Soils of Assam

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ABSTRACT

A field experiment was conducted during the *rabi* season of 2016-17 to study the effect of nutrient management and moisture conservation practices on yield attributing characters, yield and economic return of organic baby corn grown in a sandy loam soil under rainfed condition. The experiment was laid out in RBD factorial design with three replications. PAC 321 was used as the test variety of baby corn. Among the treatments enriched compost @ 2.5 t ha\(^{-1}\) has shown the significantly better results with respect to yield attributing characters and cob yield followed by application of FYM @ 2.5 t ha\(^{-1}\) + lime + ash (1000:10:1). Treatments with straw mulch @ 2 t/ha recorded significantly higher results with respect to different yield attributing characters, cob yield, green fodder yield and high monetary return with B:C ratio.

Key words: B: C ratio, Baby corn, Enriched compost, Mulch, Organic, Yield.

INTRODUCTION

Maize (*Zea mays* L.) is the third most important cereal crop in India as well as in the world next to rice and wheat. For diversification and value addition of maize, a recent development is of growing maize for the vegetable purpose, which is commonly known as baby corn. Baby corn is the small (6-7 cm long), young, unfertilized corn ear harvested at the stage of silk emergence (i.e. within 2-3 days of silk emergence). It is a profitable crop that allows diversification of production, aggregation of value and increased income (Pandey *et al.*, 2000). In India, even though it is being widely cultivated in several areas, but baby corn production is not a popular venture among the Indian farmers mainly due to lack of awareness about the production package, economic importance and use of baby corn. In the present scenario, the use of chemical fertilizers may help in achieving maximum yield of baby corn but they pose a serious health hazard and it is a big threat to the sustainability of agriculture. Development of organic production technology for baby corn is necessary for realizing higher yield and economic returns (Galinat, 1985).

In Assam, baby corn is rather a new introduction, so efforts are required to standardize and economize its cultivation. Therefore, the need was felt to standardize organic production technology for baby corn through supplementation of the nutrient requirement through organic manures and biofertilizers. Moisture conservation in agriculture is also very essential in this dynamic climate change. Due to very scanty rainfall during *rabi* season in Assam, the need for soil moisture conservation was felt. Viable nutrient management is very important for bringing more area under organic crop production.

MATERIALS AND METHODS

A field experiment was conducted at Assam Agricultural University, Jorhat during the year 2016-17. The experiment was laid out in RBD factorial design with three replications. Baby corn variety PAC 321 was used as the test crop. The soil of experimental field was loamy sand, acidic in soil reaction (5.5), medium in organic carbon (0.52 %), low in available N (190.24 kg ha\(^{-1}\)), low in available P (20.03 kg ha\(^{-1}\)) and medium in available K (160.30 kg ha\(^{-1}\)). The experiment consisted of two different factors i.e. nutrient management [(Control (N\(_1\)), enriched compost @ 2.5 t ha\(^{-1}\) (N\(_2\)), vermicompost @ 2 t ha\(^{-1}\) incubated with biofertilizers (N\(_3\)), poultry manure @ 2 t ha\(^{-1}\) incubated with biofertilizers (N\(_4\)), FYM @ 2.5 t ha\(^{-1}\) incubated with biofertilizers (N\(_5\)), FYM @ 2.5 t ha\(^{-1}\) + lime + ash (1000:10:1) (N\(_6\))] and moisture conservation [No mulch (M\(_1\)) and Mulch with paddy straw @ 2 t ha\(^{-1}\) (M\(_2\))]. In treatments N\(_5\), N\(_6\) and N\(_7\), the manures were incubated for 15 days with *Azotobacter* and Phosphorous solubilizing bacteria (PSB) @ 0.2 % (w/w) each and moisture was maintained at about 25 ± (w/w) (Borah *et al.*, 2014). Incubated manures (FYM, poultry manure and vermicompost) and enriched compost were applied at a specified rate as per the treatments mentioned above. The crop was sown on 21\(^{st}\) November, 2016 and the first harvest was started on 23\(^{rd}\) February 2017 and completed on 11\(^{th}\) March 2017. Yield attributing factors were recorded from...
the five tagged plants from each plot and averaged. Cob yield, corn yield and green fodder yield were recorded from the net plot area and expressed in t ha⁻¹. The cost of inputs, labour charges and prevailing market rates of farm produce were taken into consideration for working out gross and net returns per hectare. The benefit-cost ratio was worked out for various treatments by dividing the gross returns by cost of cultivation.

RESULTS AND DISCUSSION

Yield attributing characters and yield: In most of the yield attributing characters, viz., number of cobs plant⁻¹, length of the cob (with and without husk), weight of the cob (with and without husk) application of Enriched compost @ 2.5 t ha⁻¹ (N₂) exhibited significantly highest values (Table 1). This may be due to the subsequent release of nitrogen after application of manures under this treatment. The length of the baby corn cob, number of cobs per plant and baby corn weight without husk increased significantly with the increase in nitrogen levels (Gossavi and Bhagat, 2009). Similar reports were also given by Panchanathan et al. (1987) and Sahoo and Panda (1999).

The highest cob yield and corn yield was obtained under treatment N₂, where enriched compost was applied @ 2.5 t ha⁻¹, which might be due to the positive combined effect of yield attributing characters, like number of cobs plant⁻¹, weight of the cob (with and without husk) and length of the cob (with and without husk) (Table 2). Improvement of marketable cob yield could be attributed to the higher photosynthetic rates at enriched compost @ 2.5 t ha⁻¹ (N₂) resulting from better light interception, light absorption and radiation use efficiency. This is in consonance with the findings of Madhavi et al. (1995) and Thavaprakash et al. (2005). Since the yield of the crop is a function of several yield components which are dependent on the complementary interaction between the vegetative and reproductive growth of the crop. Increased nutrient availability and uptake with organic N had increased

| Treatments | No. of cobs plant⁻¹ | Length of cob (cm) | Weight of individual cob (g) |
|------------|---------------------|--------------------|-----------------------------|
|            | With husk | Without husk | With husk | Without husk |
| A. Nutrient management (N) | | | | |
| N₁: Control | 1.23 | 16.40 | 6.49 | 41.06 | 8.82 |
| N₂: Enriched compost @ 2.5 t ha⁻¹ | 1.67 | 23.38 | 9.20 | 53.24 | 13.55 |
| N₃: Vermicompost @ 2 t ha⁻¹ | 1.52 | 21.43 | 8.87 | 51.65 | 12.42 |
| N₄: Poultry manure @ 2 t ha⁻¹ | 1.47 | 20.88 | 8.47 | 49.98 | 11.47 |
| N₅: FYM @ 2.5 t ha⁻¹* | 1.34 | 19.00 | 7.82 | 43.46 | 9.64 |
| N₆: FYM @ 2.5 t ha⁻¹ + lime + ash (1000:10:1) | 1.56 | 22.29 | 9.09 | 52.45 | 12.98 |
| S. Em (+) | 0.04 | 0.20 | 0.09 | 0.76 | 0.18 |
| CD (5 %) | 0.11 | 0.59 | 0.27 | 2.23 | 0.52 |
| B. Moisture conservation (M) | | | | |
| M₁: No Mulch | 1.38 | 19.81 | 8.19 | 47.36 | 11.15 |
| M₂: Mulching (Paddy straw @ 2 t ha⁻¹) | 1.55 | 21.32 | 8.46 | 49.91 | 11.80 |
| S. Em (+) | 0.02 | 0.12 | 0.05 | 0.44 | 0.10 |
| CD (5 %) | 0.06 | 0.34 | 0.16 | 1.28 | 0.30 |
| Interaction (N x M) | NS | NS | NS | NS | NS |

| Treatments | Cob yield with husk (q ha⁻¹) | Corn yield (q ha⁻¹) | Green fodder yield (t ha⁻¹) | Harvest index (%) |
|------------|-----------------------------|---------------------|-----------------------------|------------------|
| A. Nutrient management (N) | | | | |
| N₁: Control | 36.90 | 5.21 | 18.69 | 2.69 |
| N₂: Enriched compost @ 2.5 t ha⁻¹ | 81.65 | 13.98 | 36.47 | 3.01 |
| N₃: Vermicompost @ 2 t ha⁻¹ | 64.79 | 10.76 | 33.57 | 2.73 |
| N₄: Poultry manure @ 2 t ha⁻¹ | 56.17 | 9.12 | 32.03 | 2.46 |
| N₅: FYM @ 2.5 t ha⁻¹* | 64.95 | 11.00 | 34.34 | 3.12 |
| N₆: FYM @ 2.5 t ha⁻¹ + lime + ash (1000:10:1) | 56.97 | 9.12 | 32.03 | 2.46 |
| S. Em (+) | 2.07 | 0.50 | 0.50 | 0.25 |
| CD (5 %) | 6.07 | 1.47 | 1.46 | NS |
| B. Moisture conservation (M) | | | | |
| M₁: No Mulch | 54.31 | 9.08 | 29.34 | 2.93 |
| M₂: Mulching (Paddy straw @ 2 t ha⁻¹) | 61.72 | 10.01 | 31.35 | 3.02 |
| S. Em (+) | 1.19 | 0.29 | 0.29 | 0.14 |
| CD (5 %) | 3.50 | 0.85 | 0.84 | NS |
photosynthetic rate and net assimilation rate, which has resulted in more cob yield. Similar observations were reported by Raja (2001) and Kar et al. (2006) who reported an increase in baby corn yield due to nitrogen application. Green fodder yield of baby corn also reflected the superiority for the treatment N_2, where enriched compost was applied @ 2.5 t ha^{-1} (Table 2). Since green fodder yield is a function of plant height, number of leaves and leaf area index and this might have realized in higher green fodder yield in enriched compost @ 2.5 t ha^{-1} (N_3). Kar et al. (2006) and Dadarwal et al. (2009) also reported an increase in fodder yield with a successive increase in nitrogen application.

There was a significant influence of mulching on yield attributes and yield of cob, corn and green fodder (Table 2). The treatment with mulch (M_j) recorded the highest yield attributes and yield. Highest cob yield (81.65 q/ha) was obtained with the application of 2 t/ha of enriched compost. Green fodder yield was also highest (36.26 q/ha) in this treatment and a similar trend was recorded in corn yield also. This may be attributed to higher soil moisture status and consequently to better water balance in the plant system at reproductive stage in mulched plots, which might have resulted in higher growth and yield attributes of the crop (Kumar et al., 2015).

**Economics of cultivation:** In this study, the cost of cultivation was the least for control treatment which was obvious. Highest gross return (Rs. 1,76,270.00 ha^{-1}) and net return (Rs. 1,29,570.00 ha^{-1}) were obtained in case of enriched compost @ 2 t/ha incubated with biofertilizer (N_j), but owing to its high cost of production, the B:C ratio was recorded to be low. Whereas the highest B:C ratio (4.25) was obtained in the application of FYM @ 2.5 t ha^{-1}+lime+ash (N_2), this might be due to lower cost of ingredients like lime and ash as compared to ingredients used in enriched compost production (Table 3). Highest gross return (Rs. 1,31,450.00ha^{-1}), net return (Rs. 95,278.00 ha^{-1}) and B:C ratio (2.63) were obtained when paddy straw mulch (M_j) was applied. The highest B:C ratio (4.21) was recorded in FYM @ 2.5 t ha^{-1}+lime+ash when mulching @ 2 t ha^{-1} paddy straw was applied to the crop (Table 3).

**CONCLUSION**

Application of enriched compost @ 2.5 t ha^{-1} in baby corn produced highest cob yield with husk (81.65 q ha^{-1}) followed by FYM @ 2.5 t ha^{-1}+lime+ash (64.95 q ha^{-1}). Mulching with paddy straw @ 2 t ha^{-1} recorded the higher cob yield (61.72 q ha^{-1}) over no mulch condition (54.31 t ha^{-1}). From the economic point of view, highest B:C ratio value (4.21) was recorded in FYM @ 2.5 t ha^{-1}+lime+ash when paddy straw mulching @ 2 t ha^{-1} was done to the crop. Considering the high cost of enriched compost, an alternative manure prepared from FYM with low-cost materials like lime and ash may be selected as a cheaper option for organic baby corn production.

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