Comparative effect of farm yard manure (FYM), Areca husk compost, and Coir pith compost on the growth performance and yield quality of baby corn (*Zeamays* L.)

ABSTRACT

A field experiment has been conducted during *rabi* 2023 at College of Agriculture, Navile, Shivamogga. The experiment was laid out in Randomized Block Design with thirteen treatments and replicated thrice and treatment consist of twelve organic nutrition treatments and an inorganic treatment which followed the standard package of practice (150:75:40 kg N:P2O5:K2O ha-1). In organic treatments the organic manures FYM, Areca husk compost and Coir pith compost applied in combination and sole. Among the organic treatments, application of 50 percent N through FYM + 50 percent N through areca husk compost (T2) reported higher plant higher plant height (153.13 cm), Leaf area (48.49 dm2),Leaf area index (5.39), Length of babycorn (11.34 cm),Girth of babycorn (5.64 cm),Weight of babycorn (16.10 g),Husked (119.0 q ha-1), Dehusked (45.1q ha-1), and Green fodder yield of baby corn (29.0 t ha-1)which was on par with package of practice (T1). Quality parameters, crude protein (17.37 %), crude fibre (4.32 %) and starch content (8.96%) were significantly higher in 50 percent N through FYM + 50 percent N through areca husk compost (T2).

Keywords: Babycorn, farm yard manure, Areca husk compost, coir pith compost

INTRODUCTION

Growing maize for vegetable purposes, known as 'babycorn'. Babycorn is an unfertilized young cob harvested just after two or three days of silk emergence. It is rich in essential fibres and protein and is packed with vital anti-oxidants too. sThis nutrient rich vegetable is very low in calories (25 kcal), starch (6-7 %) and has a negligible amount of fat (0.3 g 100g-1). Babycorn is eaten both raw and cooked while the early harvest of the crop gives nutritious fodder for livestock. Improved production technology of babycorn can boost its productivity and help to achieve a higher economic return and high-quality product compared to grain maize (Ramchandrappa*et al.*, 2004).

Babycorn cultivation in Karnataka is approximately 10,000 hectares, with a production of about 75,000 metric tons. The productivity of baby corn in the state is around 7.5 tons per hectare. On a national scale, India has around 60,000 hectares dedicated to baby corn cultivation, yielding approximately 450,000 metric tons annually. The average productivity across the country is about 7.5 tons per hectare, similar to that of Karnataka. These figures reflect the growing interest and efforts in promoting baby corn as a valuable crop for both domestic consumption and export (Anon, 2023)

Organic farming is a holistic way of farming and is one of the several approaches suggested to meet the objective of sustainable agriculture [16,17]. Organic farming provides higher net profit to farmers compared to conventional farming, mainly due to the premium price of the certified organic produce. Since babycorn is preferred as a raw vegetable or in partially cooked form in soups, salads and Chinese food preparations, nutrient management with organic resources assumes more importance concerning its nutritive value, taste, and overall consumer preference (Anupama *et al.*, 2020).

Good health is considered an asset in any society and staying healthy through consumption of healthy and quality food is highly relevant in current times. Prospects are higher in organic cultivation of babycorn which is preferred as a raw vegetable in urban areas. However, the influence of organic nutrition in babycorn has not been studied so far in Karnataka to make an organic recommendation to the farmers [18,19].

With this background, the present study was conducted to see the effect of FYM, areca husk compost, and coir pith compost on growth, yield and quality of babycorn (*Zea mays* L.).

MATERIALS AND METHODS

Site description

The field experiment was conducted in B block of the College of Agriculture, Navile, Shivamogga during *rabi* 2023 The experimental field was situated at 13° 58' to 14° 1' N latitude and 75° 34' to 75° 42' E longitude with an altitude of 615 meters above mean sea level and is located under the southern transition zone of Karnataka. The soil was sandy loam in texture (74.86 % of sand, 17.43 % of silt, and 7.71 % of clay), acidic in nature (pH 5.23) with a low salt load (EC 0.32 dSm-1). It has a low status for organic carbon (4.63 g kg-1) and available nitrogen (243.72 kg ha-1), while the status of available phosphorous (61.08 kg ha-1) and available potassium (233.23 kg ha-1) were high and medium, respectively.

Experimental details

The experiment was laid out in a Randomized Block Design with 13 treatments replicated thrice with plot size 4.5 m x 4.0 m respectively. The treatments comprised twelve organic nutrition treatments and an inorganic treatment which followed the standard package of practice (150:75:40 kg N:P2O5:K2O ha-1). The treatments were T1- As per package of practice (150:75:40 kg N:P2O5:K2O ha-1), T2- 50 percent N through FYM + 50 percent N through areca husk compost, T3- 50 percent N through areca husk compost + 50 percent N through coir pith compost, T4- 50 percent N through coir pith compost + 50 percent N through FYM, T5- 75 percent N through FYM + 25 percent N through areca husk compost, T6- 75 percent N through FYM + 25 percent N through coir pith compost, T7- 75 percent N through coir pith compost + 25 percent N through FYM, T8- 75 percent N through coir pith compost + 25 percent N through areca husk compost, T9- 75 percent N through areca husk compost + 25 percent N through FYM, T10- 75 percent N through areca husk compost + 25 percent N through coir pith compost, T11- 100 percent N through FYM, T12- 100 percent N through areca husk compost, and T13- 100 percent N through coir pith compost. Compost was applied 15 days before sowing.

Table 1:- Nutrient content of the different composts.

Particulars	**FYM**	**AHC**	**CPC**
Total N (%)	0.61	1.29	1.06
Total P (%)	0.35	0.75	0.28
Total K (%)	0.52	1.59	0.75
C: N ratio	26.14	31.70	42.51

Collection of experimental data

For recording various biometric observations *i.e.*, plant height (cm), Leaf area (dm2),Leaf area index (LAI), Length of babycorn (cm),Girth of babycorn (cm),Weight of babycorn (g),Husked yield of babycorn (q ha-1), Dehusked yield of babycorn (q ha-1), and greenfodder yield (t ha-1)a sample consisting of five plants was selected at random and tagged in net plot of each treatment. Observations on growth parameters were recorded at 15, 30, 45 DAS and at the crop harvest. The same plants were also used to record the yield components atharvest. Observations on quality parameters like Crude protein content (%), Crude fibre (%) and Starch content (%) of cob were made.

Statistical analysis

The data recorded on various observations on growth and yield parameters were subjected to analysis of variance (ANOVA) as outlined by [10]. The level of significance used in the 'F' test was at 5 per cent. The critical difference (CD) values were given in the table at 5 per cent level of significance, wherever the 'F' test was significant. Otherwise against CD values abbreviation NS (Non-significant) was indicated.

RESULTS AND DISCUSSION

Growth attributes

Among different compost applications, 50 per cent N through FYM + 50 per cent N through areca husk compost (T2) was equally effective as a chemical fertilizer in promoting the growth of babycorn across various parameters. This treatment was as effective as inorganic fertilizer in improving plant height at 15, 30, 45 DAS and at harvest (25.95 cm, 79.92 cm, 152.08 cm and 153.13 cm, respectively), leaf area at 15, 30, 45 DAS and at harvest (5.56, 20.59, 45.04, 48.49 d m2, respectively), leaf area index (LAI) at 15, 30, and 45 DAS and at harvest (0.62, 2.28, 5.05 and 5.39, respectively).

The effectiveness of treatments incorporating farmyard manure (FYM) can be attributed to its lower carbon-to-nitrogen (C:N) ratio, which facilitates rapid nitrogen mineralization and mobilization, making nutrients readily available to the plant. This promotes early growth in babycorn, a finding consistent with the results of Anupama *et al.* (2020). The effectiveness of treatments incorporating areca husk compost (AHC) can be attributed to the development of humic substances resulting from the decomposition of AHC, which enhances the morphological features of the crop and subsequently increases plant height (Kevin *et al.*, 2021). The balanced nutrient supply from the combined use of FYM and AHC likely synchronized the nutrient demand and supply for babycorn. The combination of FYM, which has a narrow carbon-to-nitrogen (C:N) ratio, and AHC, with a wider carbon-to-nitrogen (C:N) ratio, may have improved native nitrogen mineralization and released growth regulators from AHC. Improved babycorn growth due to the combined use of FYM and AHC can also be linked to the rich nutrient content of AHC and the enhancement of soil physicochemical and biological properties (Babu *et al.*, 2020).

As a universal trend, the application of major nutrients through inorganic fertilizers produced higher growth parameters like plant height at 15, 30, 45 days after sowing (DAS) and at harvest (27.79 cm, 85.80 cm, 160.36 and 161.12 cm, respectively), leaf area at 15, 30, 45 days after sowing (DAS) and at harvest (5.93, 21.55, 47.04 and 50.91 dm2, respectively) and leaf area index (LAI) 15, 30, 45 days after sowing (DAS) and at harvest (0.66, 2.39, 5.23 and 5.66, respectively),compared to organic nutrient sources. These chemical fertilizers release nutrients more quickly than organic sources, allowing for more effective utilization during the early vegetative growth of the crop, as evidenced by the growth parameters. The beneficial effects of mineral fertilizers containing nitrogen, phosphorus, and potassium on the growth attributes and dry matter production of babycorn have been previously reported by Dadarwal*et al.* (2009) and Singh *et al.* (2010). The values are presented in Table 2 and 3.

Yield and yield attributes

The treatment involving 50 per cent N through FYM + 50 per cent N through areca husk compost (T2) demonstrated a significant positive impact on yield parameters, including a babycorn length of 11.34 cm, a girth of 5.64 cm, and a weight of 16.10 g, husked babycorn yield (119.0 q ha-1), dehusked babycorn yield (45.1 q ha-1), and green fodder yield (29.0 t ha-1). The superior yield observed in this treatment can be attributed to babycorn's enhanced growth and yield attributes, such as increased plant height, leaf area, and overall biomass production. The balanced nutrient supply from the combination of FYM and areca husk compost likely played a crucial role in improving nutrient availability and uptake during the critical growth stages of the crop. This improvement in yield parameters aligns with the findings of Babu *et al.* (2020) and Anupama *et al.* (2020) who highlighted the benefits of combining organic amendments for enhanced crop performance. Additionally, Kevin *et al.* (2021) demonstrated that the integration of different composts can lead to improved soil structure and microbial activity, further contributing to higher yields.

Despite the beneficial effects observed with organic composts, the application of inorganic treatments which followed the standard package of practice (T1) significantly enhanced the yield attributes and overall yield of babycorn. The quick nutrient release and balanced composition of chemical fertilizers provided an immediate supply of key nutrients like nitrogen, phosphorus, and potassium during critical growth stages, leading to the highest yields of husked and dehusked babycorn, as well as green fodder (129.6 q ha-1, 49 q ha-1, and 30.8 t ha-1, respectively). This treatment also produced superior babycorn length (11.92 cm), girth (6.03 cm), and weight (16.75 g) compared to organic alternatives. The positive impact of chemical fertilizers on crop performance have been well-documented in studies by Sahoo and Mahapatra (2004) in sweet corn, Dadarwal*et al.* (2009) in babycorn, and further supported by findings from Kumar *et al.* (2013), who demonstrated the significant yield improvements with inorganic nutrient sources in maize cultivation. The values are presented in Table 4.

Quality parameters of babycorn

The presence of humic substances in the compost can explain the higher crude protein content (17.37 %) reported in the treatment with 50 per cent N through FYM + 50 per cent N through areca husk compost (T2). These chemicals promote root growth and nutrient absorption, resulting in more effective nitrogen usage, which is required for protein synthesis in plants. Furthermore, the organic matter in FYM and areca husk compost enhances soil aeration and moisture retention, increasing microbial activity and nitrogen mineralization. This consistent nitrogen availability directly correlates to increased protein content in plant tissues. Singh *et al.* (2010) and Yadav *et al.* (2018) findings also support that organic amendments improve protein content and total crop production compared to inorganic cultivation.

The organic treatment which received 50 per cent N through FYM + 50 per cent N through areca husk compost (T2) recorded a lower fiber content in babycorn (4.32 %) which was significantly lower than the inorganic treatment which followed the standard package of practice (6.14 %). The decrease in the fiber content is because of the enhancement of soil structure and microbial activity caused by the application of organic manures which together boosted protein synthesis in babycorn reducing the fiber deposition as given by Nweke, 2017. The slow and steady release of nutrients from the organic manure resulted in lower fiber accumulation as given by the Singh *et al.* (2010). The beneficial effect of organic nutrients on cell wall construction and fiber content is in line with the findings of Vishwakarma *et al.* (2019).

The organic treatment which received 50 per cent N through FYM + 50 per cent N through areca husk compost (T2) recorded a higher starch content in babycorn (8.96%) which was significantly higher than the inorganic treatment which followed the standard package of practice (6.97 %). The increase in the higher starch content is because of the increased soil health and great microbial activities increased by the organic manure application and also it is because of the higher secondary metabolites compared to fertilizer application. The combination of FYM and areca husk compost release on a demand basis compared to the fertilizer application led to an increase in the starch level which supports the findings of Mahanta *et al.* (2014). Also, the organic manure increases the circulation and nitrogen utilization of the crop as given by Bhattacharyya *et al.* (2015). Ravindran *et al.* (2017) also reported an increase in starch content with the application of organic manures. The values are presented in Table 5.

CONCLUSION

Supplying 50 percent N through FYM + 50 percent N through areca husk compost has recorded higher growth and yield among the organic treatments and was on par to the inorganic practice which followed as per package of practices.Application of 50 percent N through FYM + 50 percent N through areca husk compost produced high quality babycorn with higher quality parameters like crude protein, starch, lower crude fiber content

REFERENCE

1. ANONYMOUS, 2023.*Raitamitra: Farmer service platform*. Available at: https://raitamithra.karnataka.gov.in.
2. RAMACHANDRAPPA, B. K., NANJAPPA, H. V. AND SHIVAKUMAR, H. V., 2004, Yield and quality of baby corn (*Zea mays* L.) as influenced by spacing and fertilization levels. *Acta Agron. Hung.*, **52**(3): 237-243.
3. ANUPAMA. A. AND G. RAJASREE., 2020, Effect of organic nutrition on quality and shelf life of baby corn (*Zea mays* L.). *Int. J. Chem. Stud*., **9**(1): 1077-1080.
4. KEVIN, O., J. JOYCE, LELEI, AND M. M. SAMUEL., 2021, Soil properties and maize (*Zea mays* L.) growth and yield response to water hyacinth (*Eichhornia crassipes*) compost application in lakeVictoria basin in kenya. *J. Soil Sci. Environ.*,**12**(1): 17–28.
5. BABU, S., SINGH, R., AVASTHE, R. K., YADAV, G. S., DAS, A., SINGH, V. K., MOHAPATRA, K. P., RATHORE, S. S., CHANDRA, P. AND KUMAR, A., 2020, Impact of land configuration and organic nutrient management on productivity, quality and soil properties under baby corn in Eastern Himalayas. *Sci. Rep.*, **10**(1):16129.

6. DADARWAL, R. S., JAIN, N. K. AND SINGH, D., 2009, Integrated nutrient management in baby corn (*Zea mays* L.). *Indian J. Agric. Sci*., **79**(1): 1023-1025.
7. SINGH, S., SINGH, V. AND PANDEY, R. K., 2010, Effect of organic and inorganic sources of nutrients on growth, yield and quality of baby corn (*Zea mays* L.). *Indian J. Agron*., **55**(2): 100-104.
8. SAHOO, S. C. AND MAHAPATRA. P. K., 2004, Response of sweet corn (*Zea mays*) to nitrogen levels and plant population. *Indian J. Agric Sci*., **74**(6): 337-338.
9. KUMAR, A., SHIVAY, Y. S. AND POONIYA, V., 2013, Integrated nutrient management in maize (*Zea mays*)–wheat (*Triticum aestivum*) cropping system for sustainable productivity. *Indian J. Agron*., **58**(1): 57-63.
10. YADAV, R. L., SINGH, R. K. AND SINGH, M. K., 2018, Integrated nutrient management for improving soil fertility, growth, yield, and quality of baby corn. *Int. J. Curr. Microbiol. Appl. Sci*., **7**(8): 3305-3312.
11. NWEKE, I. A., 2017, Effect of compost and earthworm production on soil properties, growth and dry matter yield of maize in crude oil degraded soil. *J. Soil Sci. Environ.*,**8**(1): 5-8.
12. VISHWAKARMA, S. K., SINGH, R. AND KUMAR, A., 2019, Effect of organic and inorganic fertilizers on growth, yield and quality of baby corn (*Zea mays* L.). *J. Pharmacognosy Phytother.*, **8**(3): 1497-1500.
13. MAHANTA, D., SAIKIA, M. AND GOGOI, M., 2014, Effect of organic manures on growth and yield of maize. *Agric. Res. J.*, **51**(1): 23-29.
14. BHATTACHARYYA, R., CHANDRA, S., SINGH, R. D. AND KUNDU, S., 2015, Organic amendments and soil management for improving crop productivity in India: A review. *Agric. Sci.*, **6**(2): 151-163.
15. RAVINDRAN, R., SEKAR, S. AND JANAKI, P., 2017, Impact of integrated nutrient management on growth and yield of maize under organic farming conditions. *IJCMAS*., **6**(3): 251-258.
16. Shah, S.H., M.B. Hussain, G. Haider, T.U. Haq, Z.A. Zahir, S. Danish, B.A. Paray and C. Kammann. 2023. Acidified manure and nitrogen-enriched biochar showed short-term agronomic benefits on cotton-wheat cropping systems under alkaline arid field conditions. Sci. Rep. 13: 22504. https://doi.org/10.1038/s41598-023-48996-4
17. Alotibi, M.M., N.M. Alotaibi, G.S. Hussain, S. Hussain, S.H. Shah, A.M. Ghoneim, K. Dawar and M. Hareem. 2023. Use of zinc quantum dot biochar and AMF for alleviation of Cd stress in maize: Regulation of physiological and biochemical attributes. Plant Stress. 10: 100262. https://doi.org/10.1016/j.stress.2023.100262

18. Sri ,Satti Ramya Suma, Victor Debbarma, and Singi Reddy Keerthana Reddy. 2023. "Effect of Organic Manures and Bio-Fertilizers on Growth and Yield of Baby Corn". International Journal of Plant & Soil Science 35 (20):436-42. https://doi.org/10.9734/ijpss/2023/v35i203824.
19. Sri SR, Debbarma V, Reddy SR. Effect of Organic Manures and Bio-fertilizers on Growth and Yield of Baby Corn. International Journal of Plant & Soil Science. 2023 Sep 23;35(20):436-42.

Table 2: Plant height (cm) and leaf area (dm2) recorded at various growth phases (15, 30, 45 days after sowing (DAS) and at harvest) as influenced by FYM, areca husk compost and coir pith compost.

Treatment	Plant height (cm)				Leaf area (dm2)			
	15 DAS	30 DAS	45 DAS	At harvest	15 DAS	30 DAS	45 DAS	At harvest
T1	27.79	85.80	160.36	161.12	5.93	21.55	47.04	50.91
T2	25.95	79.92	152.08	153.13	5.56	20.59	45.04	48.49
T3	20.17	65.62	123.93	124.89	4.59	17.43	33.13	37.15
T4	20.10	65.31	124.28	124.95	4.59	17.86	36.20	40.07
T5	24.07	73.37	143.05	143.72	5.30	19.53	41.77	45.39
T6	21.98	69.16	133.59	136.30	4.88	18.46	38.05	41.92
T7	20.02	65.25	123.56	124.26	4.59	17.38	32.07	36.21
T8	19.10	62.23	117.18	118.17	4.33	16.40	30.95	34.93
T9	22.52	70.57	135.91	137.04	4.82	18.48	39.32	43.19
T10	20.54	67.50	130.03	131.03	4.59	17.92	37.04	41.10
T11	23.86	72.47	141.75	142.98	5.17	19.09	41.07	45.06
T12	21.03	67.93	130.44	131.71	4.67	18.44	37.20	41.07
T13	17.46	56.70	105.72	106.58	4.05	15.49	29.55	33.77
S.Em±	**0.94**	**2.71**	**5.28**	**5.63**	**0.14**	**0.55**	**1.63**	**1.70**
C.D. at 5%	**2.73**	**7.92**	**15.42**	**16.43**	**0.43**	**1.61**	**4.76**	**4.96**

Table 3:- Leaf area index (LAI) recorded at various growth phases (15, 30, 45 days after sowing (DAS) and at harvest) as influenced by FYM, areca husk compost and coir pith compost in babycorn.

Treatment	Leaf area index (LAI)			
	15 DAS	30 DAS	45 DAS	At harvest
T1	0.66	2.39	5.23	5.66
T2	0.62	2.28	5.05	5.39
T3	0.51	1.93	3.68	4.13
T4	0.51	1.98	4.02	4.45
T5	0.59	2.15	4.64	5.04
T6	0.54	2.05	4.23	4.66
T7	0.51	1.93	3.56	4.02
T8	0.48	1.82	3.44	3.88
T9	0.54	2.05	4.37	4.80
T10	0.51	1.99	4.12	4.57
T11	0.57	2.12	4.56	5.01
T12	0.52	2.05	4.13	4.56
T13	0.45	1.72	3.28	3.75
S.Em±	**0.02**	**0.06**	**0.18**	**0.19**
C.D. at 5%	**0.05**	**0.18**	**0.53**	**0.55**

Table 4:- The Length of babycorn (cm), girth of babycorn (cm), weight of babycorn (g), husked yield of babycorn (q ha-1), dehusked yield of babycorn (q ha-1) and green fodder yield of babycorn (t ha-1) as influenced by FYM, areca husk compost and coir pith compost in babycorn.

Treatment	Length of babycorn (cm)	Girth of babycorn (cm)	Weight of babycorn (g)	Husked yield of babycorn (q ha-1)	Dehusked yield of babycorn (q ha-1)	Green fodder yield of babycorn (t ha-1)
T1	11.92	6.03	16.75	129.6	49.0	30.8
T2	11.34	5.64	16.10	119.0	45.1	29.1
T3	8.99	4.65	12.94	94.7	35.4	23.2
T4	9.60	4.68	13.68	98.2	36.4	23.8
T5	10.53	5.28	15.48	110.2	43.1	27.7
T6	10.02	4.87	14.60	101.7	38.8	24.9
T7	9.09	4.31	12.67	89.8	33.6	22.2
T8	8.82	4.28	12.39	86.8	32.6	21.6
T9	10.16	5.05	15.09	104.8	40.8	27.1
T10	9.67	4.71	13.91	99.1	37.0	23.9
T11	10.34	5.14	15.39	107.4	42.0	27.3
T12	9.84	4.76	14.25	99.6	37.4	24.1
T13	8.29	4.18	11.74	83.6	31.4	21.1
S.Em±	**0.42**	**0.23**	**0.40**	**5.16**	**1.78**	**0.77**
C.D. at 5%	**1.23**	**0.68**	**1.17**	**15.07**	**5.19**	**2.26**

Table 5:- Crude protein (%), Crude fibre (%) and Starch (%) as influenced by FYM,

Treatment	Crude protein (%)	Crude fibre (%)	Starch (%)
T1	13.20	6.14	6.97
T2	17.37	4.32	8.96
T3	15.28	5.36	8.13
T4	15.58	5.17	8.15
T5	15.44	5.23	8.09
T6	14.69	5.72	7.89
T7	14.43	5.85	7.69
T8	15.39	5.31	8.28
T9	16.11	4.88	8.61
T10	15.65	5.14	8.19
T11	16.34	4.63	8.70
T12	16.49	4.54	8.83
T13	14.37	5.99	7.60
S.Em±	**0.57**	**0.16**	**0.21**
C.D. at 5%	**1.66**	**0.46**	**0.62**

areca husk compost and coir pith compost in babycorn.