Effect of FYM, areca husk compost and coir pith compost on yield, quality and soil properties in baby corn cultivation (*Zea mays* L.)

ABSTRACT

A field experiment was conducted during *rabi* 2023 at the College of Agriculture, Navile, Shivamogga. The experiment was laid out in Randomized Block Design with thirteen treatments and replicated thrice and treatment consisted of twelve organic nutrition treatments and aninorganic treatment which followed the standard package of practice (150:75:40 kg $N:P_2O_5:K_2O$ ha^{-1}). In organic treatments, the organic manures FYM, Areca husk compost, and Coir pith compost are applied in combination and sole, and among the organic treatments, application of 50 percent N through FYM + 50 percent N through areca husk compost (T_2) reported higher Husked yield of babycorn (119.0 q ha^{-1}), Dehusked yield of babycorn (45.1q ha^{-1}), and green fodder yield (29.0 t ha^{-1})which was on par with a package of practice (T_1). Quality parameters, total soluble sugars, reducing sugars, non-reducing sugars, and sensory evaluation were significantly higher in 50 percent N through FYM + 50 percent N through areca husk compost (T_2). Also, soil properties like available N, P_2O_5, and K_2O and soil microbial count were increased by the different compost applications over the inorganic fertilizer application.

Keywords: babycorn, FYM, Areca husk compost, coir pith compost, yield, quality, and soil

INTRODUCTION

Baby corn (*Zea mays* L.), a versatile and nutrient-dense crop, is increasingly cultivated for its economic potential and high demand in both local and international markets. This immature form of maize is valued not only for its culinary applications but also for its nutritional content, making it an essential component in food production and value-added agricultural products. The yield and quality of baby corn are directly influenced by soil fertility and crop nutrition, making the selection of fertilization strategies crucial in achieving optimal results. Traditionally, chemical fertilizers are used to meet the nutrient demands of baby corn due to their fast action and availability. However, there is growing interest in sustainable and ecofriendly agricultural practices that prioritize soil health and reduce environmental impact (Mydhili et al., 2021).

Organic composts, such as farmyard manure (FYM), areca husk compost, and coir pith compost, have emerged as viable alternatives to chemical fertilizers. These organic amendments not only supply essential nutrients but also contribute to the long-term improvement of soil structure, microbial activity, and nutrient-holding capacity. FYM is well-known for its balanced nutrient profile and positive effect on soil fertility, while areca husk compost and coir pith compost are increasingly popular due to their organic matter content and potential for enhancing soil aeration and moisture retention (Neupane et al., 2017).

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. Organic agriculture improves the soil quality by making sufficiently high amounts of nutrients available to the crops by enhancing microbial activity in the soil. Organically produced crops have more demand compared to conventional crops. 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 and Rajasree, 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.

With this background, the present study was conducted to see the effect of FYM, areca husk compost, and coir pith compost on the 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 (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 sizes 4.5 m x 4.0 m respectively. The treatments comprised twelve organic nutrition treatments and aninorganic treatment which followed the standard package of practice (150:75:40 kg N:P_2O_5:K_2O ha^{-1}). The treatments were T_1:As per package of practice(150:75:40 kg N:P_2O_5:K_2O ha^{-1}),T_2:50 percent N through FYM + 50 percent N through areca husk compost, T_3:50 percent N through areca husk compost + 50 percent N through coir pith compost, T_4:50 percent N through coir pith compost + 50 percent N through FYM, T_5:75 percent N through FYM + 25 percent N through areca husk compost, T_6:75 percent N through FYM + 25 percent N through coir pith compost, T_7: 75 percent N through coir pith compost + 25 percent N through FYM, T_8: 75 percent N through coir pith compost + 25 percent N through areca husk compost, T_9: 75 percent N through areca husk compost + 25 percent N through FYM, T_{10}:75 percent N through areca husk compost + 25 percent N through coir pith compost, T_{11}:100 percent N through FYM, T_{12}:100 percent N through areca husk compost, and T_{13}: 100 percent N through coir pith compost. Compost was applied 15 days before sowing.

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

Table 1: - Nutrient content of the different composts.

Collection of experimental data

For recording various yields*i.e.*Husked yield of babycorn (q ha^{-1}), Dehusked yield of babycorn (q ha^{-1}), and green fodder yield (t ha^{-1})a sample consisting of five plants were selected at random and tagged in net plot of each treatment. Observations on quality parameters like total soluble sugars (%), reducing sugars (%), non-reducing sugars (%)and sensory evaluationof cob were made.The composite soil sample was collected from 0 to 15 cm depth before starting the experiment. The soil samples were air-dried, powdered, passed through a 2 mm sieve, and analyzed for physicochemical properties, and the population of microbes (Bacteria, Fungi, andActinomycetes) in the soil was estimated using the serial dilution technique.

Statistical analysis

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

RESULTS AND DISCUSSION

Yield and yield attributes

The treatment involving 50 percent N through FYM + 50 percent N through areca husk compost (T_2) demonstrated a significant positive impact on yield parameters, including a husked babycorn yield (119.0 q ha^{-1}), de-husked babycorn yield (45.1 q ha^{-1}), and green fodder yield (29.0 tha^{-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) andAnupama and Rajasree (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 (T_1) 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 30.8t 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 has 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.

Quality parameters of babycorn

Treatment with 50 percent N through FYM + 50 percent N through areca husk compost (T_2) resulted in greater reducing sugar, non-reducing sugar, and total soluble sugar levels (0.082, 0.336, and 0.418%, respectively)compared to inorganic fertilizer application. It is due to the significantly higher nutritional composition of organic manure compared to fertilizer, which only includes primary nutrients such as N, P, and K, but organic manure contains micronutrients such as calcium, magnesium, zinc, iron, and organic carbon and other useful chemicals. So organic manure will provide a consistent supply of nutrients, aiding in enzyme activation and glucose metabolism (Goyal *et al*. 1999). Battacharya*et al*. (2010) observed that the application of organic manure, which contains more organic carbon, improves soil microbial activity and provides a consistent supply of nutrients, which supports sugar synthesis in the plant. Also, Manna *et al*., 2007 and Kumar and Verma(2011) reported the same conclusion that organic manure application increased the sugar content while inorganic fertilizer application was linked to worse crop quality.

The application of 50 percent N through FYM + 50 percent N through areca husk compost (T_2) produced higher evaluations for taste, juiciness, and overall acceptability (4.03, 3.25, and 4.10, respectively). As reported by Stonel and Sidel (2002), organoleptic evaluation is the scientific method used to evoke, analyze, and interpret sensory responses, such as those perceived through smell, touch, sight, or taste. The organoleptic study revealed that sensory parameters like taste, juiciness, and overall acceptability were influenced by different treatments, with organic treatments scoring significantly higher in these areas compared to inorganic treatments that followed the standard package of practices. The organic treatment led to higher total soluble sugar and crude fiber content, which likely contributed to the greater acceptance of babycorn in the organoleptic study. Worthington (2001) also reported that crops grown using organic practices contain higher levels of vitamin C, iron, magnesium, and phosphorus, with lower nitrate levels, which enhances quality and consumer acceptance. Also, Kavya (2017) and Anupama and Rajasree (2020) observed higher sensory values in babycorn cultivated with manurial combinations that included biofertilizers.

The usage of inorganic fertilizers followinga standard package of practice produced lower evaluations for taste, juiciness, and overall acceptability (2.89, 2.45, and 3.22, respectively). This treatment included the application of a significant quantity of nitrogen (150 kg) from an inorganic source, which most likely harmed the sensory quality of the fresh fruit. Raese *et al.* (2007) and Anupama and Rajasree (2020) on babycorn found that too much nitrogen can harm crop appearance and sweetness.

Soil available nutrient status and microbial population

There was an increase in the soil available nitrogen by using the organic manure and the treatment with 100 percent N through coir pith compost (330.90 kg ha^{-1}) compared to the inorganic treatment which followed the standard package of practice (263.02 kg ha^{-1}). The inorganic fertilizer releases the nutrients faster and more rapidly than the coir pith compost supply the nitrogen very slowly and steadily over time. In the plant's early stage, the release from the compost was very slow, leading to lower uptake and leaving more nitrogen in the soil. Chatterjee *et al*. (2017) and Singh *et al*. (2018) reported the same findings that applying organic manure increased the soil available nitrogen and ensured good plant growth for a long-term soil fertility benefit.

The application of organic treatments increased the soil available phosphorous compared to the soil available phosphorous in the treatments that were treated with inorganic fertilizer, which followed the standard package of practices. The treatment with 100 percent N through areca husk compostreported higher soil available phosphorous in the soil (86.50 kg ha^{-1}). This is primarily due to the organic manure's slow delivery of phosphorous to the plants and soil.

Organic manure also enhances the soil microbial population, which will play an important role in phosphorus mineralization, thereby increasing the available phosphorous in the soil. Also, compost tends to increase the soil texture, leading to more phosphorus-holding capacity of the soil. These findings were in line with the findings of Kumar *et al.* (2019)and Ghosh *et al*. (2015), who reported that organic manure application will increase the soil's available phosphorus and fertility in the long term.

The application of organic treatments increased the soil available potassium compared to the soil available potassium in the treatments that were treated with inorganic fertilizer, which followed the standard package of practices. The treatment with 100 percent N through areca husk compost reported higher soil available potassium (293.05 kg ha^{-1}) because of the higher potassium content present in the compost. Also, the areca husk compost tends to show improved soil structure and cation exchange capacity which led to an increase in the soil holding capacity of potassium by gradually supplying the potassium to the plants. Compost application also tends to increase the long-term soil available fertility of the soil as reported by Prajapati *et al*. (2013) and Patel *et al.* (2017).

The bacterial count was higher in the treatments where the organic manure was applied compared to inorganic treatment which followed the standard package of practices. In the organic manure application, the treatment with 100 percent N through coir pith compost (T_{13}) reported a higher bacterial count (61.06 x 10^7 CFU g^{-1} soil). It is mainly because of the large source of carbon which actsas a carbon source for the microorganisms mainly bacteria by decomposing the organic material which becomes the energy source for the bacteria. Also, organic manure increases soil aeration, and soil structure creating a favorable environment for the microorganisms to grow. Choudhary *et al*. (2013) and Kumar *et al.* (2018) supported the fact that the organic manure with the higher carbon increased the bacterial count in the soil.

In the case of the fungal count, the organic manure reported a higher fungal count compared to the inorganic treatment which followed the standard package of practice. The treatment with 100 percent N through coir pith compost (T_{13}) reported a higher fungal count (18.03x 10^5 CFU g^{-1} soil) this can be because the coir pith was rich in lignocellulosic content which the fungi are particularly proficient at decomposing. The higher lignin and cellulose content present in the coir pith compost promoted the growth of fungi in the coir pith treated plot which was earlier reported by Kumar *et al*. (2016).

Organic treatments also led to an increase in the actinomycetes count compared to inorganic treatment which followed the standard package of practice. In the organic manure application, the treatment with 100 percent N through coir pith compost (T_{13}) reported higher actinomycetes count (21.10 x 10^4 CFU g^{-1} soil). Actinomycetes which are essential for the decomposition of chitin and cellulose increased in the presence of lignin-rich coir pith compost. Also, the higher carbon content and enhanced soil aeration helped in the actinomycetes growth in the soil these results were supported by Babalola, (2010).

CONCLUSION

Supplying 50 percent N through FYM + 50 percent N through areca husk compost has recorded a higheryield among the organic treatments and was on par with 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 total soluble sugars, reducing sugars, non-reducing sugars,and sensory evaluation of cob. Application of 100 percent N through coir pith compost recorded a higher population of soil microbes (Bacteria, Fungi, andActinomycetes).

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Table 2:-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	**Husked yield of babycorn (qha^{-1})**	**Dehusked yield of babycorn (qha^{-1})**	**Green fodder yield of babycorn (t ha^{-1})**
T_1	129.6	49.0	30.8
T_2	119.0	45.1	29.1
T_3	94.7	35.4	23.2
T_4	98.2	36.4	23.8
T_5	110.2	43.1	27.7
T_6	101.7	38.8	24.9
T_7	89.8	33.6	22.2
T_8	86.8	32.6	21.6
T_9	104.8	40.8	27.1
T_{10}	99.1	37.0	23.9
T_{11}	107.4	42.0	27.3
T_{12}	99.6	37.4	24.1
T_{13}	83.6	31.4	21.1
S.Em±	**5.16**	**1.78**	**0.77**
C.D. at 5%	**15.07**	**5.19**	**2.26**

Table 3:- Reducing sugars, non reducing sugars and total sugars as influenced by FYM, areca husk compost, and coir pith compost inbabycorn.

Treatment	Reducing sugars (%)	NonReducing sugars (%)	Total sugars (%)
T_1	0.063	0.271	0.334
T_2	0.082	0.336	0.418
T_3	0.068	0.291	0.359
T_4	0.066	0.285	0.351
T_5	0.069	0.297	0.367
T_6	0.068	0.293	0.361
T_7	0.067	0.289	0.356
T_8	0.066	0.285	0.351
T_9	0.075	0.324	0.400
T_{10}	0.075	0.321	0.396
T_{11}	0.076	0.327	0.403
T_{12}	0.077	0.333	0.410
T_{13}	0.065	0.282	0.347
S.Em±	**0.003**	**0.01**	**0.01**
C.D. at 5%	**0.009**	**0.04**	**0.03**

Table 4:-Appearance, colour, taste, texture, juiciness, and overall acceptabilityof baby corn cob as influenced by FYM, areca husk compostand coir pith compost in babycorn.

Treatment	Appearance	Colour	Taste	Texture	Juiciness	Overall acceptability
T_1	2.93	3.25	2.89	3.19	2.45	3.22
T_2	3.68	3.72	4.03	3.41	3.25	4.10
T_3	3.45	3.57	3.68	3.34	3.00	3.65
T_4	3.52	3.61	3.79	3.36	3.08	3.85
T_5	3.29	3.48	3.44	3.30	2.83	3.60
T_6	3.24	3.46	3.37	3.28	2.78	3.55
T_7	3.39	3.54	3.59	3.32	2.94	3.71
T_8	3.51	3.61	3.77	3.36	3.07	3.84
T_9	3.47	3.59	3.72	3.35	3.03	3.80
T_{10}	3.39	3.53	3.59	3.32	2.94	3.71
T_{11}	3.66	3.68	3.99	3.40	3.23	4.04
T_{12}	3.65	3.66	3.97	3.40	3.22	4.01
T_{13}	3.31	3.50	3.49	3.30	2.86	3.63
S.Em±	**0.15**	**0.08**	**0.12**	**0.04**	**0.04**	**0.04**
C.D. at 5%	**NS**	**NS**	**0.36**	**NS**	**0.13**	**0.13**

Table 5:- Soil available nitrogen, phosphorous, potassium(kg ha^{-1}), Bacteria, Fungai, and Actinomycetes count asinfluenced by FYM, arecahusk compost and coir pith compost.

Treatment	**Available N (kg ha^{-1})**	**Available P_2O_5 (kg ha^{-1})**	**Available K_2O (kg ha^{-1})**	**Bacteria(10^7CFUg^{-1} soil)**	**Fungai(10^5CFUg^{-1} soil)**	**Actinomycetes(10^4CFUg^{-1} soil)**
T_1	263.02	64.05	233.54	49.65	11.88	15.30
T_2	284.54	75.20	267.61	55.41	15.81	17.19
T_3	306.81	75.09	266.38	56.73	16.63	18.45
T_4	307.97	69.35	248.24	56.88	16.62	17.91
T_5	285.03	70.55	254.21	55.74	16.19	17.39
T_6	296.29	69.52	250.53	55.95	16.54	17.57
T_7	318.96	68.39	244.63	60.49	17.76	20.08
T_8	322.19	67.90	242.23	58.77	17.49	20.53
T_9	292.24	83.82	288.22	55.02	15.72	17.16
T_{10}	306.42	81.12	281.11	54.91	15.71	17.78
T_{11}	285.81	71.94	259.65	56.31	16.77	19.21
T_{12}	300.03	86.50	293.05	54.83	15.61	17.07
T_{13}	330.90	67.45	239.29	61.06	18.03	21.10
S.Em±	**7.14**	**2.44**	**7.59**	**1.34**	**0.38**	**0.55**
C.D. at 5%	**20.83**	**7.13**	**22.15**	**3.92**	**1.10**	**1.61**