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EFECT OF INTEGRATED NUTRIENT MANAGEMENT PRACTICES ON THE NUTRIENT CONTENT AND ORGANOLEPTIC PROPERTIES OF BABY CORN (*Zea mays* L.)

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ABSTRACT

A field experiment was conducted from February-April 2018 at College of Agriculture, Vellayani, to investigate the influence of integrated nutrient managementpractice on the nutrient content and organoleptic properties of fresh baby corn cob. The treatment includes four organic sources for N substitution on N equivalent basis and biofertilizer treatments.The highest ascorbic acid content (10.67 mg g^{-1}) was recorded when 25% of N was substituted through vermicompost (s_2). Application of biofertilizer (b_1) produced significantly higher total soluble sugar (6.86^{o}Brix), reducing sugar (2.89%) and ascorbic acid content (10 mg g^{-1}) in cob compared to $b_{0.}$ The INM practice in which50% N substituted through poultry manure (25%) and vermicompost (25%) with PGPR-1 (s_4b_1) or 25% N substituted through vermicompost alone with PGPR-1 (s_2b_1), combined with remaining N, full P and K through chemical source recorded the highest mean score and mean rank values in organoleptic study.

Key words: Baby corn, biofertilizer, organoleptic properties, poultry manure, vermicompost

INTRODUCTION

Maize plays a significant role as food, feed and fodder in the global agricultural economy and is called as the “Queen of Cereals” due to its higher yield potential. The maize products *viz*., corn starch, corn flakes, fresh cob, sweet corn, and baby corn are widely consumed in several parts of the world. The baby cob is the female inflorescence (ear) harvested within 2-3 days of silk emergence which is 6-7 cm long, unfertilized and yellow in colour (Saha*et al*., 2007).The sweet, and succulent baby corn is a part of several preparations like soups, salads and Chinese foods. Though the application of chemical fertilizers may produce more yields in baby corn due to early availability of nutrients, that may result in accumulation of toxic compounds in the soil and the produce. Meeting the nutrient requirement solely from the organic sources is not feasible in a crop like baby corn which completes its duration within a short span of time. Since baby corn is mainly consumed in the raw form, the consumers especially the urban people who are more conscious of the ill effects on health would prefer a high quality produce without compromising the price. Thus, the INM in baby corn seems to be highly relevant in this back drop.

MATERIALS AND METHODS

The field experiment was conducted at the Instructional Farm, College of Agriculture, Vellayani in Thiruvananthapuram District of Kerala. The field was laid out in Randomized Block Design with 8 treatment combinations and a control (135:65:45 kg NPK ha^{-1} through chemical fertilizer only), with 3 replications. The treatments comprised four types ofnitrogen (N) substitution with organic sources (s_1- 25 per cent N substitution through poultry manure; s_2- 25 per cent N substitution through vermicompost; s_3-12.5 per cent N substitution through poultry manure + 12.5 per cent N substitution through vermicompost and s_4- 25 per cent N substitution through poultry manure + 25 per cent N substitution through vermicompost) and biofertilizer treatments (b_0- without biofertilizer and b_1-seed treatment and soil application of PGPR-1).A basal dose of farm yard manure at the rate of 12.5 t ha^{-1} was given at the time of land preparation. The recommended dose of nutrients were givenat 135:65:45 kg NPK ha^{-1} as per the nutrient dose standardized for baby corn in southern Kerala (Mavarkar, 2016). Organic manures, poultry manure (1.87% N) and vermicompost (1.31% N) were substituted on N equivalent basis as per the treatments and P and K were given through chemical sources. Organic manures for N substitution and full P were given as basal dose. Chemical sources of N (urea) and K (Muriate of potash) were given in 2 split doses, ½ as basal + ½ at 25 DAS. The biofertilizer PGPR-1 used was a consortium of *Azospirillumlipoferum, Azotobacterchroococcum, Bacillus megaterium,* and *Bacillus sporothermodurans*(Gopi *et al*., 2019).Seed treatment with PGPR-1 was done by moistening the seeds and treating the seeds with PGPR-1 at the rate 30 g kg^{-1} of seeds followed by soil application at the rate of 110 g m^{-2} area (mixture of dry cow dung and PGPR-1) at sowing and 15 days after sowing in the respective treatments. For organoleptic study, baby corn cob was harvested within 48-49 days after sowing. It was dehusked and then washed in running water. The cob was salted and kept for 3 minutes and then steam boiled for 5 minutes. The hedonic scale rating was applied for the parameters such as appearance, colour, taste, flavor, texture and overall acceptability. The scoring was done at the Food science laboratory of College of Agriculture, Vellayani by a panel of judges. The judges were requested to taste the samples and mark their scores based on their likeness in the score card.

RESULTS AND DISCUSSION

Nutrient content

The N substitution with organic sources had a significant effect on the ascorbic acid content of baby corn cob. The highest ascorbic acid content (10.67 mg g^{-1}) was recorded when 25 per cent of N was substituted through vermicompost (s_2) which was superior to other main effects of N substitution (Table 1). The content of ascorbic acid is a function of the content of ascorbic acid oxidase enzyme and zinc and manganese concentrations have key roles in enabling the ascorbic acid oxidase enzyme (Bybordi and Malkouti, 2007). Since vermicompost has sufficient amount of these elements, its application to the soil (especially high amount vermicompost) might have resulted in improvement in the uptake and utilization of Zn and Mn, increasing the activity of the ascorbic acid oxidase enzyme resulting in more concentration of vitamin C. In addition to that, presence of biologically active metabolities particularly gibberlins, cytokinin, auxin and group B vitamins might have contributed for the better quality of vermicompost treatment (Bano*et al*., 1987). Similar findings have been reported by Aminifard and Bayat (2016) in bell pepper.

Application of biofertilizer (b_{1-} PGPR-1 as seed treatment and soil application) produced significantly higher total soluble sugar (6.86 ^{o}Brix), reducing sugar (2.89 per cent) and ascorbic acid content (10 mg g^{-1}) in cob compared to no biofertilizer application (Table 1). This might be due to the better uptake of NPK and increased photosynthetic activity with subsequent accumulation of carbohydrate in plant (Kavya, 2017). Carbohydrate acts as the precursor for the synthesis of ascorbic acid (Brar *et al.*, 2015) and hence it would have enhanced the ascorbic acid content. As reported by EL-Hamid *et al.* (2006), improved sugar content in the cob would have

Treatments	**Total soluble sugar (^{0}B)**	**Reducing sugar (%)**	**Ascorbic acid (mg g^{-1})**
N substitution with organic sources (S)			
s_1 (25 % N through PM)	6.43	2.49	8.67
s_2 (25 % N through VC)	6.56	2.63	10.67
s_3 (12.5% N through PM + 12.5 % N through VC)	6.67	2.76	9.56
s_4 (25% N through PM + 25 % N through VC)	6.62	2.63	8.67
SEm (±)	0.12	0.24	0.50
CD (0.05)	NS	NS	1.522
Biofertilizer (B)			
b_0 (Without biofertilizer)	6.28	2.36	8.78
b_1 (PGPR-1 seed treatment + soil application)	6.86	2.89	10.00
SEm (±)	0.08	0.17	0.35
CD (0.05)	0.258	0.526	1.076

been due to the synergistic effect of *Azotobacter* and *Azospirillum*present in the PGPR consortium.These results are in agreement with the findings of Golda *et al.* (2013) in baby corn.

The interaction between N substitution with organic source and biofertilizer could not significantly influence the nutrient content of baby corn cob.

Table 1. Effect of N substitution with organic sources and biofertilizer total soluble sugar, reducing sugar and ascorbic acid content of baby corn cob.

Organoleptic study

The highest mean rank value (MRV) and mean score for appearance of fresh baby corn cob (MRV 179 and mean score 8.56) were recorded with s_4b_0 (50 per cent RDN +25 per cent N substitution through poultry manure + 25 per cent N substitution through vermicompost) and was on par with s_2b_1, $s_2b_0$and s_4b_1. In case ofcolour, significantly higher MRV (182.55) with a mean score of 8.3 was registered for s_4b_1 (50 per cent RDN + 25 per cent N substitution through poultry manure + 25 per cent N substitution through vermicompost + PGPR-1) and was on par with s_2b_0, s_2b_1 and control.As per the flavour evaluation, the MRV and the score were significantly higher (186.5 and 8.3 respectively) for $s_4b_1$but did not vary from s_2b_1 and s_1b_0. The taste of the fresh baby corn cob was assessed in the organoleptic study and found that, higher mean rank value (184.7) was obtained for $s_4b_1$and was on par with s_2b_1 and s_3b_1. The treatment s_4b_1 exhibited the highest mean rank value (196.1) and mean score (8.3) for texture that was on par with s_2b_1 only. In the case of appearance, the highest mean rank value (164.8) and mean score (7.9) were secured by $s_4b_1$and was on par with s_3b_1, s_2b_1, s_2b_0 and s_3b_0(Table 2). The preference by the consumers is often based on the taste, flavor, sweetness and juiciness of the fresh steamed baby corn. Significantly higher total soluble sugar, reducing sugar and ascorbic acid content were produced with the application of biofertilizer that might have contributed for the sweetness and taste. As reported by Worthington (2001), crops raised by organic practices contain more vitamin C, Fe, Mg, P and less nitrates than conventional crops and the reduced nitrate level leads to higher quality and better consumer acceptance. Kavya (2017) reported higher sensory values of baby corn with combined application of biofertilizer and chemical sources.

Table 2. Effect of integrated nutrient management on sensory parameters of fresh baby corn cob.

Treatment	Appearance		Colour		Flavour		Taste		Texture		Overall acceptability	
	MS	MRV	MS	MRV	MS	MRV	MS	MRV	MS	MRV	MS	MRV
s_1b_0	7.90	113.90	7.60	103.35	8.00	155.00	7.70	116.30	7.50	112.00	7.50	114.00
s_1b_1	7.83	102.80	7.30	89.85	7.90	145.25	7.80	118.55	7.60	123.60	7.60	126.70
s_2b_0	8.24	155.90	8.10	160.50	7.60	111.50	7.50	85.25	7.90	152.60	7.80	144.40
s_2b_1	8.45	166.40	8.10	155.35	8.10	167.00	8.30	173.90	8.00	167.10	7.80	148.25
s_3b_0	8.00	116.90	7.70	115.05	7.50	107.75	7.80	118.55	7.40	114.30	7.70	130.78
s_3b_1	7.91	115.40	7.80	128.10	7.60	111.50	8.30	173.90	7.00	78.20	7.70	152.47
s_4b_0	8.56	179.00	7.90	138.45	7.70	123.50	7.70	107.75	7.50	118.95	7.40	109.45
s_4b_1	7.94	144.20	8.30	182.55	8.30	186.50	8.40	184.70	8.30	196.10	7.90	164.80
C	7.92	125.00	8.00	150.15	7.60	111.50	8.00	140.60	7.80	143.90	7.60	129.33
K value	34.73*		47.70*		65.66*		60.27*		44.67*		17.99*	
CD (0.05)	34.82											

(MS – Mean score, MRV - Mean rank value) *significant at 5%

CONCLUSION

50 per cent N substitution through poultry manure and vermicompost (25 per cent N from each source)combined with 75 per cent RDN @ 135 kg ha^{-1} and recommended dose of P and K (at the rate of 65 kg P_2O_5 and 45 kg K_2O) through chemical sources along with PGPR-1 or substituting 25 % N through vermicompost alone with PGPR-1 application could be recommended for realising improved organoleptic characters of fresh baby corn cob.

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