International Journal of Farm Sciences **5(4)** : 127-131, 2015

Impact of organic inputs on apple quality in cashew, *Annacardium occidentale* L

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ABSTRACT

Cashew, *Annacardium occidentale* L has been emerging as one of the most important dollar earning plantation crops having very significant role to play in Indian economy hence there is need to produce organic cashew for export purpose. Besides the nut yield cashew apple or cashew pseudo-fruits are rich source of vitamin C, organic acids, minerals, carbohydrates with many medicinal properties. The present investigation on use of organic inputs in cashew was carried out under All India Coordinated Research Project on Cashew (ICAR) of OUAT, Bhubaneswar, Odisha, India. Eight treatments of different organic inputs including recommended doses of fertilizers and FYM as control were used by adopting RBD replicated thrice in recommended cashew variety BPP-8. The results recorded during 2013-14 revealed significant variations among different treatments for various cashew apple quality parameters. Invariably integrated application of fertilizers and manures as control recorded significantly maximum cashew apple weight (59.17 g), TSS (13.87°Brix) and juice recovery (65.42%) as well as statistically at par pulp content (32.89%), acidity (0.58%) and total sugar (11.49%) with respective highest values than rest of the treatments. Among the sole application of organic inputs application of 100 per cent nitrogen either through vermicompost + bio-fertilizers 200 g or through FYM + bio-fertilizers 200 g or 25 per cent N each as FYM + recycling of organic residue + in situ green manuring/green leaf manuring + bio-fertilizers @ 200 g were proved to be significantly better for various cashew apple parameters indicating the scope of organic cashew cultivation for quality apple production and utilization

Keywords: Cashew apple; bio-fertilizers; FYM; organic inputs; vermicompost

INTRODUCTION

Cashew, *Anacardium occidentale* L nut is now treated as a healthy friendly nut (Fernandez 2001). This is primarily due to presence of high fat ie 47 per cent out of which 82 per cent is in unsaturated form and the proportion of the monosaturated fatty acid and polysaturated fatty acid is 4:1 (Rao and Venkataraman 1995) that reduces the cholesterol and is good for heart of human beings .The high dietary fiber

and high monosaturated fatty acid lower the blood glucose and improve insulin resistance (Sacks and Franks 1999). As a whole cashew nuts are becoming established as a food item that can protect human beings against major diseases including heart diseases, diabetics, cancer etc with its rare combination of fats, carbohydrates and proteins. Cashew kernel is a rich source of high energy and a snack of great taste. Hence in order to compete with international market India has to go for organic cultivation of cashew.

Besides the valuable kernel in cashew the apple which is treated as pseudo-fruit has 3-6 times increased vitamins C content than orange. Cashew apple is formed by an enlarged peduncle and the true fruit a kidney shaped (reniform) achene is about 3 cm long with a hard grey–green pericarp (Costa et al 2009). Cashew apple juice is treated as rich source of vitamin C and sugar (Akinwale 2000) and also presents functional properties such as prevention of bacteria, *Helicobacter pillory* that causes severe gastritis (Carvalho et al 2006) besides preserving antioxidant properties. In recent years the economic value of cashew apple juice has increased primarily due to its low cost and large availability. It has been used as an alternative raw material for the production of various industrially important products in many cashew growing countries of the world. As majority of cashew apples rot in the plantation itself hence there is need to develop suitable technologies for proper utilization of cashew apple.

The objective of the present study was to investigate the possibility of the cashew apple wasted in the plantation through determination of basic constitution of cashew apple under different organic inputs.

MATERIAL and METHODS

The experiment was carried out at Cashew Research Station, Ransinghpur, Bhubaneswar under All India Coordinated Research Project on Cashew of Orissa University of Agriculture and Technology, Odisha (latitude 20°45''N, longitude 86°10'' E and altitude 60 m amsl) during 2007 to 2013. Eight treatments viz T_1 (100% N as FYM), T_2 (100% N as FYM + bio-fertilizers (*Azatobacter* + *Azospirillum* + PSB 200 g), T_3 (50% N as FYM + bio-fertilizers 200 g), T_4 (100% N as vermicompost + bio-fertilizers 200 g), T_5 (recycling of organic residue with the addition of 20% cow dung slurry (20.0% weight of organic residue as cow dung), T_6 (in situ green manuring/green leaf manuring to meet 100% N), T_7 (25% N as FYM + recycling of organic residue + in situ green manuring/green leaf manuring + bio-fertilizers 200 g) T_8 (recommended doses of fertilizers + 10 kg FYM as control) were used in the study by adopting RBD replicated thrice having four plants per treatment. The details of the treatment schedule are presented in Table 1. The

grafted plants of recommended cashew varieties for Odisha BPP-8 were transplanted during 2007 with a normal spacing of 7.0 x 7.0 m by adopting the recommended package of practices uniformly to all the treatments except the nutrient management.

The average cashew apple weight was recorded by taking the apple randomly from each tagged panicle. The total soluble solid (°Brix) of fruit pulp was determined with the help of digital refractrometer; titrable acidity (%) was calculated by titrating the pulp extract with N/10 NaOH as per the standard produce suggested by Ranganna (1986) using phenopthalene as the indicator. The pH of extracted juice was calculated by pH meter and total sugar by titrimetric procedures. The recorded observations were calculated statistically by adopting standard procedure suggested by Sukhatme and Amble (1995).

RESULTS and DISCUSSION

The data presented in Table 1 on cashew apple parameters revealed significant variations among the different organic treatments including control. The cashew apple parameters such as apple weight, TSS and juice recovery were significantly highest (59.17 g, 13.87°Brix and 65.42% respectively) in the control plots which received recommended dose of fertilizer + FYM @ 10 kg/plant than rest of the treatments. However invariably the treatments such as T_2 (100% N or FYM + bio-fertilizers), T_4 (100% N as vermicompost + bio-fertilizers) and T_7 (25% N each as FYM + recycling of organic residue + in situ green manuring + bio-fertilizers) were statistically at par with T_8 the highest value of parameters under study. On the other hand the plants receiving 100 per cent N through green manuring crop (T_6) recorded significantly minimum cashew apple weight (38.70 g), TSS (11.51°Brix) and juice recovery (49.60%).

Regarding other cashew apple parameters such as pulp content (33.42%), cashew apple juice acidity (0.60%) and total sugar (12.95%) content the results revealed significantly highest values in the cashew plants receiving 100 per cent N through vermicompost along with bio-fertilizers @ 200 g/plant than rest of the treatments. However statistical parity was observed in the plants receiving 100 per cent nitrogen as FYM + bio-fertilizers (33.02, 0.60 and 10.75%), 25 per cent nitrogen as FYM + recycling of organic residue + in situ green manuring + bio-fertilizers (33.24, 0.62 and 11.91%) as well as control plots receiving RDF + FYM 10 kg/plant (32.89, 0.58 and 11.49%) respectively. The pH of the cashew apple juice showed non-significant variations among different treatments which ranged from 4.98 in T_1 to 5.20 in T_4.

The results of present study indicate that integrated application of chemical fertilizers and organic manure as FYM

Table 1. Impact of organic inputs on cashew apple quality parameters

Treatment	Apple weight (g)	TSS (°Brix)	Juice recovery (%)	Pulp content (%)	pH	Acidity (%)	Total sugar (%)
T1	45.57	12.33	53.80	29.53	4.98	0.53	9.32
T2	54.53	13.36	62.16	33.02	5.13	0.60	10.75
T3	49.20	12.24	49.56	28.39	5.19	0.51	9.21
T4	50.73	13.30	60.85	33.42	5.20	0.60	12.95
T5	54.53	11.66	57.92	28.75	5.14	0.54	10.71
T6	38.70	11.51	49.60	28.57	5.09	0.52	9.36
T7	53.93	12.84	63.46	33.24	5.15	0.62	11.91
T8	59.17	13.87	65.42	32.89	5.02	058	11.49
Mean	50.80	12.64	53.80	29.53	5.11	0.57	10.71
SEm±	3.45	0.45	3.13	0.92	0.18	0.03	0.76
$CD_{0.05}$	10.46	1.37	9.50	2.78	NS	0.09	2.32

T_1 (100% N as FYM), T_2 (100% N as FYM + bio-fertilizers (*Azatobacter* + *Azospirillum* + PSB 200 g), T_3 (50% N as FYM + bio-fertilizers 200 g), T_4 (100% N as vermicompost + bio-fertilizers 200 g), T_5 (recycling of organic residue with the addition of 20% cow dung slurry (20.0% weight of organic residue as cow dung), T_6 (in situ green manuring/green leaf manuring to meet 100% N), T_7 (25% N as FYM + recycling of organic residue + in situ green manuring/green leaf manuring + bio-fertilizers 200 g) T_8 (recommended doses of fertilizers + 10 kg FYM as control)

showed better cashew apple quality. Among the sole source of organic inputs the study demonstrated the superiority of integrated application both vermicompost with bio-fertilizers and FYM with bio-fertilizers. Similar report of superior fruit quality with organic manure in guava was observed by Pereira and Mitra (1999). The improvement in quality might be attributed to the improvement in soil physical properties like water holding capacity, structure, porosity, bulk density, hardiness and chemical as well as biological properties (bacteria, fungi, actenomycetes and earthworm activities) (Lal et al 2011). The better efficacy of organic manure towards quality improvement has also been reported by Ali et al (2003) for FYM and Khalid et al (2013) for vermicompost.

ACKNOWLEDGEMENTS

The financial assistance provided by Directorate of Cashew Research (ICAR), Puttur, Karnataka, India under All India Coordinated Research Project on Cashew is duly acknowledged.

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Received: 26.4.2015 ***Accepted: 23.6.2015***