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Short communication

Organic farming practices for double-sucker planted banana

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ABSTRACT

An experiment was conducted at College of Agriculture, Vellayani, Kerala, during December 2009 to September 2012 to standardize organic farming practices for double-sucker planted tissue-culture raised banana var. *Nendran*. Treatments included three nutrient levels, (M_1-133, M_2-100 and M_3-75% of recommended dose for tissue culture banana as *organic), two times of application viz., T_1- in two splits- (basal and 2MAP), and T_2 in three splits (basal, 2 and 4 MAP) along with the Control (integrated nutrient management for double-sucker planted banana, i.e., FYM + 250:150:400g NPK pit^{-1}). The experiment was laid out in Factorial RBD with three replications. Results of the study indicated that though 33% of additional nutrients were required for double-sucker planting along with INM, 100% of the dose was sufficient under organic farming for realizing a reasonable yield. Pooled analysis of gross income and net income revealed that organic production practices are also profitable in double-sucker planted banana.

Key words: Double-sucker, organic farming, banana, yield

Banana is widely cultivated in India under varying agro-climatic regions and different systems of production. *Nendran* (*Musa* AAB) is the most popular commercial cultivar in Kerala owing to its adaptability to various environments, its yield stability, excellent fruit quality attributes and for fetching a sustained income. The fruit has multiple uses ranging from that as a valued food for infants and invalids, to culinary and table purposes, besides a diverse range of processed products. High productivity, disease-free nature and uniform harvest in tissue-culture raised plants has enhanced its acceptability among farmers.

High-density planting is considered a viable proposition for improving productivity of tissue-culture raised plants. Planting two suckers per pit, with wider spacing, enhances total yield and economic returns. Double-sucker planting is one of the approaches for reducing cost of cultivation and for increasing productivity without affecting quality of the fruit.

An imbalanced and unscientific use of chemical fertilizers and pesticides has aggravated environment degradation, making it imperative to focus on ecologically sound, viable and sustainable crop production practices. Long-term field experiments in various crops have brought to light the negative impact of continuous use of chemicals on soil health (Yadav, 2003). Sustainable crop husbandry approaches like organic farming are very important in crops like banana where farmers use a high quantity of fertilizers and plant protection chemicals for yield improvement.

Banana is grown extensively in the erstwhile paddy fields of Kerala. In this context, an experiment was undertaken to standardize organic farming practices for double-sucker planted tissue-culture raised banana variety *Nendran*.

The experiment was conducted during December 2009 to September 2012 at the organic farm attached to Department of Agronomy, College of Agriculture, Vellayani, Kerala. The treatments included three nutrient levels (M_1-133, M_2-100 and M_3-75% of recommended dose for tissue culture raised banana as *organic), two times application, viz., T_1- two splits- (basal and 2MAP) and T_2 - three splits (basal, 2 and 4 MAP), along with the Control (integrated nutrient management for double-sucker planted banana (FYM + 250:150:400g NPK pit^{-1}). The experiment was laid out in Factorial RBD, with three replications. General practices like use of uniform tissue-culture raised plants, basal application of *neem* cake @ 1kg pit^{-1}, *in situ* green manuring with cowpea, and application of FYM @ 20kg pit^{-1} at planting along with 20g *Azospirillum*, were followed irrespective of the treatment.

As this is an experiment in organic farming pest and

disease management was done organically. Prophylatic application of *neem* oil-garlic mixture (5%) to the pseudostem and leaf axil during third and fourth month was made to manage pseudostem borer.

Organic treatments were applied through a common organic source: 50% as farm yard manure + 25% as poultry manure + 25% as vermicompost. Additional K requirement was met using ash as the source of K.

For double-sucker planting, pits were dug at 3m x 2m spacing, and two suckers were planted in each pit with a distance of 15-20cm between suckers in a pit. Soil analysis of the experimental site revealed the soil to be moderately acidic, with pH 5.8, high in organic carbon, medium in N and P, and low in K. Observations were recorded on yield and yield attributes and economics were worked out. Based on results of the first year trial, 133% of the recommended nutrient-level was deleted and the treatments were modified

Table 1. Yield attributes and yield in double-sucker planted organic banana as influenced by nutrient levels and time of application

Treatment	I Year			
	No. of hands bunch^{-1}	No. of fingers bunch^{-1}	Bunch weight (kg plant^{-1})	Yield (t ha^{-1})
M_1 (133% RD)	4.42	44.25	7.08	23.58
M_2 (100% RD)	4.50	44.42	7.42	24.69
M_3 (75% RD)	4.50	45.00	7.71	25.72
F	0.07	0.09	0.89	0.92
CD *(P=0.05)*	NS	NS	NS	NS
T_1 (2 times)	4.33	44.50	7.14	23.77
T_2 (3 times)	4.61	44.61	7.67	25.56
F	1.86	0.01	1.90	1.94
CD *(P=0.05)*	NS	NS	NS	NS
M_1 T_1	4.33	44.67	6.92	23.03
M_1T_2	4.50	43.83	7.25	24.14
M_2 T_1	4.33	43.83	7.08	23.59
M_2T_2	4.67	45.00	7.75	25.80
M_3T_1	4.33	45.00	7.42	24.70
M_3T_2	4.67	45.00	8.00	26.74
Treatment mean	4.47	44.56	7.40	24.67
F	0.07	0.14	0.07	0.07
CD *(P=0.05)*	NS	NS	NS	NS
INM (Control)	5.00	48.00	8.82	29.36
F (Treatment vs. Control)	3.84	2.91	7.78	7.61
CD (P=0.05)	S	NS.	S	S

Treatment	II Year				III Year			
	No. of hands bunch^{-1}	No. of fingers bunch^{-1}	Bunch weight (kg plant^{-1})	Yield (t ha^{-1})	No. of hands bunch^{-1}	No. of fingers bunch^{-1}	Bunch weight (kg plant^{-1})	Yield (t ha^{-1})
M_1 (100% RD)	4.00	41.17	66.80	22.25	4.67	46.17	7.33	24.42
M_2 (75% RD)	3.50	33.67	4.92	16.40	4.33	41.83	6.33	21.09
M_3 (50% RD)	3.33	28.00	4.63	15.40	4.00	34.67	4.97	16.54
CD *(P=0.05)*	0.555	3.802	0.445	1.481	NS	4.077	0.464	1.544
T_1 (2 times)	3.56	34.00	5.30	17.65	4.33	40.11	6.32	21.05
T_2 (3 times)	3.67	34.56	5.52	18.39	4.33	39.67	6.10	20.31
CD *(P=0.05)*	NS	NS	NS	NS	NS	NS	NS	NS
M_1 T_1	4.00	41.33	6.97	23.20	4.67	47.33	7.47	24.86
M_1T_2	4.00	41.00	6.40	21.31	4.67	45.00	7.20	23.98
M_2 T_1	3.33	32.67	4.60	15.32	4.33	41.67	6.33	21.09
M_2T_2	3.67	34.67	5.25	17.48	4.33	42.00	6.33	21.09
M_3T_1	3.33	28.00	4.33	14.43	4.00	31.33	5.17	17.21
M_3T_2	3.33	28.00	4.92	16.37	4.00	32.00	4.77	15.88
INM (Control)	4.33	46.00	9.00	29.97	5.00	51.33	10.37	20.68
CD *(P=0.05)*	NS	NS	0.629	2.095	NS	NS	NS	NS
F (Treatment vs. Control)	6.89	38.68	264.38	264.94	5.76	32.08	326.79	326.76
CD *(P=0.05)*	S	S	S	S	S	S	S	S

as 100%, 75% and 50% of the recommended dose for the second and third years of study.

First year (2009) yield data revealed no significant variation among treatments. Soil analysis made after the first crop indicated high organic carbon (1.9-2.3%), high available N (288-301kg ha^{-1}) and medium P (18-22kg ha^{-1}) and K content (170-190kg ha^{-1}); pH also showed improvement, increasing from 5.8 to 6.2. Organic nutrition @ 133% of the recommended dose enhanced the pH to 6.2.

Based on these results, nutrient levels were modified as 100%, 75% and 50% of the recommended dose, and, the experiment was continued in the second (2010) and third year (2011).

Results of this two-year study (Table 1) revealed that nutrient level had a significant influence on number of fingers $bunch^{-1}$, bunch weight $plant^{-1}$, and total bunch yield. 100% of the recommended dose was significantly superior to the other two levels tested. Application of manure in two or three splits had no influence on yield parameters and yield. Interaction between nutrient level and the number of times of application was found to be significant in the first year only (2010).

A comparison of INM and organic practices showed that yield attributes and yield were significantly influenced in both the years, with INM registering the highest value. Most of the earlier studies on organic farming have showed such a decline in yield over INM during the initial years. Effect of treatments on marketable yield, worked out as 75% of the actual yield, followed the same trend as that in the yield. Pooled analysis of marketable yield indicated that 100% of the recommended dose, applied as the organic component, had a definite edge over the other two levels, while, time of application and interaction between nutrient levels and time of application, was observed to be insignificant. Pooled analysis (Table 2) of economic aspects like gross income and net income revealed that 100% of recommended dose as the organic component was more economical in double-sucker planted banana. The organic sources (farm yard manure, poultry manure and vermicompost) tested at 100% recommended dose can effectively supply nutrients required for the two banana plants in a pit, along with *in situ* green manuring. A slow release of nutrients from the organic sources, without any nutrient loss, can supply sufficiently to substitute chemical nutrients. Use of vermicompost as the organic source, along with incorporation of cowpea as the *in situ* green manure,

Table 2. Marketable yield and economic returns in double-sucker planted organic banana as influenced by nutrient level and time of application

Treatment	Marketable yield (t/ha) II Yr	Marketable yield (t/ha) III Yr	Marketable yield (t/ha) Pooled Mean	Gross income (Rs) Pooled mean	Net income (Rs) Pooled Mean	B:C ratio II Yr	B:C ratio III Yr
M_1 (100%RD)	16.69	18.31	17.50	840080	469725	2.17	2.38
M_2 (75%RD)	12.30	15.82	14.06	674880	321519	1.67	2.15
M_3 (50%RD)	11.55	12.41	11.97	575000	262985	1.67	1.79
CD (0.05)	1.086	1.0693	0.593	28670	428670	0.152	0.147
T_1 (2 times)	13.24	15.79	14.51	696667	350803	1.84	2.18
T_2 (3 times)	13.79	15.23	14.51	696640	338307	1.83	2.03
CD (*P=0.05*)	NS	NS	NS	NS	NS	NS	0.120
M_1 T_1	17.40	18.65	18.02	865040	502182	2.30	2.47
M_1 T_2	15.98	17.98	16.98	815120	437268	2.03	2.28
M_2 T_1	11.49	15.82	13.68	655440	309576	1.59	2.19
M_2 T_2	13.11	15.82	14.46	694320	333462	1.74	2.10
M_3 T_1	10.82	12.91	11.86	569520	240650	1.58	1.88
M_3 T_2	12.28	11.91	12.09	580480	244280	1.75	1.70
INM (Control)	22.48	25.96	24.22	968133	656591	2.89	3.33
CD (*P=0.05*)	0.887	NS	0.629	NS	NS	NS	NS
F (Treatment vs. Control)	6.89	38.68	264.38	264.94	5.76	32.08	326.79
CD (*P=0.05*)	S	S	S	S	S	S	S

Cost of cultivation in different treatments (Rs ha^{-1})

Treatment	Cost of cultivation	Treatment	Cost of cultivation	Sale price of banana
M_1T_1	3,54,858	M_1T_2	3,69,852	INM: Rs. 40kg^{-1}
M_2T_1	3,39,864	M_2T_2	3,54,858	Organic: Rs. 48ha^{-1}
M_3T_1	3,24,870	M_3T_2	3,32,200	
INM	3,11,542			

for enhancing yield in banana was reported earlier by Geetha and Nair (2000).

Although economic returns in organically-grown banana may be less than that in INM, application of 100% recommended dose can yield a B:C ratio of >2 considering that the price of organic produce is accounted as 20% extra over the INM produce. Moreover, all the inputs were considered as purchased, for calculating the economics. An organic farmer can be expected to have adequate organic inputs generated in his farm which, in turn, can enhance profit. Profitability of organic farming in single-sucker planted *Nendran* banana has already been reported by Pushpakumari *et al* (2009).

From our study, it is concluded that although 33% of additional nutrients are required for double-sucker planting with INM, 100% of the dose is sufficient under organic farming. Similar to that in INM, organic production practices are seen to be profitable in double-sucker planted banana in our study.

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