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Physical Methods of Sucker Activation Techniques for Enhanced Quality Suckers Production in Banana cv. Nendran (AAB Genomic Group)

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A B S T R A C T

K e y w o r d s Sucker activation techniques, Quality suckers, Physical methods, Nendran, banana, B: C ratio **Article Info** *Accepted:* 04 July 2018 *Available Online:* 10 August 2018	The present investigation was conducted in the 'Central Orchard' main campus of the Kerala Agricultural University with the major objective of enhancing quality sucker production as well as to standardise the most economical physical method of sucker activation technique in banana cv. Nendran (AAB). The treatments consisted of physical cuts given at different heights namely half pseudostem cut, entire cut and one that involving replanting entire clump in trenches in oblique manner. These all treatments enforced at two different stages of the mother plant namely at harvest and ten days after harvest. One control was also maintained by retaining entire mother plant. These seven treatments were replicated five times in a Completely Randomized Design (CRD) formed the experiment. The study convincingly proved that replanting the entire clump in trenches in oblique manner ten days after harvest produced maximum total number as well as quality suckers. Cutting the pseudostem at half height ten days after harvest was found to be more economical one compared to all other treatments based on B: C ratio.

Introduction

Different techniques have been adopted to invigorate the underdeveloped suckers. All such techniques are sucker activation techniques. The objective is to salvage the underdeveloped suckers and thereby to have more number of quality suckers from a mother plant, without affecting the bunch yield (Bhende and Kurien, 2015). These techniques can broadly be classified as physical, cultural, hormonal methods and newer techniques. Physical methods include cutting the pseudostem of mother plant at different heights or arresting the apical dominance or suppressing the growing point at different physiological stages.

Borel (1952) tried cutting back in Gros Michel at 0.6 m above the collar after fruiting for the development of underdeveloped suckers. The underlying physiology involved in these being 'increased flow of nutrients from mother plant to the daughter suckers'. Mathew *et al.,* (2000) reported that retention of un-topped parent pseudostem gave maximum height and girth

of the suckers. Cutting the parent pseudostem at a height of 200 cm could activate sucker growth (Daniells and O'Farrell, 1987; Rodriguez *et al.,* 2006). De Langhe (1961) studied sucker production in cv. Bousa and reported that 6 to 8 suckers can be obtained during a period of six months by cutting off six month old mother plants at the ground level and elimination of central bud. Noupadja (1995) reported that suckers harvested within nine months were significantly greater in natural suckering than that of total decapitation of pseudostem in plantain (*Musa* AAB). Weerasinghe *et al.,* (2003) decapitated four to five month-old plants and then suppressed the growing terminal point. Sucker emergence initiated at 7-10 days after decapitation and continued up to six weeks.

Noupadja (1995) subjected *in vitro*-cultured plantain cv. French Sombre to different decapitation treatments and noted that suckers harvested within nine months by false decapitation were significantly greater than suckers obtained by all other treatments. Doses of 0 to 240 g N and 0 to 2.2 g B plant^{-1} combined with pruning and without pruning of pseudostem tried in 'Pacovan' banana. Results revealed that pruning of the mother plant pseudostem with elimination of apical meristem and application of N increased sucker production (Nobrega *et al.,* 2010).

On the belief that there was translocation of nutrients from the mother plant after harvest to suckers in the clump, the practice of 'mattocking' was developed. After the harvest, the whole or a part of mother plant was retained so as to nurse the follower. Nayar *et al.,* (1956) found that the yield of ratoon crop was significantly higher than the parent when the mother pseudostem was half removed or untouched after harvest. According to Martin-Prevel (1964), the banana growers believed that one plant in a clump obtained water and nutrients from

another to varying extent and that the young developing plants were nourished by the older plants. This nursing continued until the young plant reached into developed one, after which they become independent. Morez (1960) reported that leaving a portion of the pseudostem attached to the mother corm resulted in lesser number of suckers but with longer and stouter shoots of around 26 % more leaf surface than suckers in all other methods, three months after harvest. Morez and Gullemot (1961) reported that sucker growth was improved by leaving 1.5 m of the pseudostem in Poyo banana. Walmsley and Twyford (1968) and Teisson (1970) revealed that there was transfer of ^{32}P from the mother plant and vice versa. Turner and Barkus (1973) mentioned the weekly loss of mineral from banana pseudostem after harvest. They opined that if the lost nutrients were translocated to young suckers, they would contribute more than 40 % of its requirements for all the elements, except Mg and Zn. Balakrishnan (1980) observed that intact pseudostem after harvest continued to translocate nutrients to the developing suckers in cv. 'Robusta'. Rajeevan (1985) studied the recovery of radioactivity in the leaf tissues of sucker in the early stages after inoculation of ^{32}P in cv. Palayankodan. He found that there was translocation of nutrients from mother plant to daughter sucker after harvest in both treatments involving cutting of half pseudostem and also in case of the retention of whole plant. He concluded that it was beneficial to retain the mother plant pseudostem for one month after harvest.

Kurien *et al.,* (1999) using ^{32}P confirmed that there is a definite allocatory pattern of nutrient cycling from mother plant to daughter sucker with the first formed suckers receiving more initially and last formed suckers receiving the major share with passage of time. Kurien *et al.,* (2002) studied the nutrient cycling from the mother plants to daughter suckers at

various physiological stages of the mother plant. A combination of three spacing with five stages of sucker retention, were the treatment combinations and another similar plot was maintained without suckers in Mysore syn. Palayankodan. It was concluded that both the spacing and sucker development phases have influence on the nutrient cycling pattern.

Nutrient cycling, if tapped efficiently, can result in reducing costly fertilizer inputs. Most importantly, the amount of tracer recovered from the neighboring border plants confirms beyond doubt that the tracer extruded out from the treated plant which in turn was absorbed by the neighboring plant. There is some form of nutrient sharing both within a clump and between clumps, confirming that, in banana, the system of giving recommendation on an individual basis needs to be coupled with a block or plot level.

Materials and Methods

Location

This experiment was conducted in the main campus of the Kerala Agricultural University, which is situated at 10.55 ^{o} North latitude and 76.28 ^{o} East longitude at an altitude of 22.52 m above mean sea level (msl). The area enjoys a warm humid tropical climate. The soil belongs to the order - Ultisol, Vellanikkara series with a pH of 5.3., during August-September 2013.

Experimental procedure

This experiment involved the cutting the pseudostem of mother plant at two stages. From among a large Nendran bulk planting a secondary selection was done for uniform plants and uniform number of suckers. The treatments which were basically different types of physical methods were enforced on

the mother plant at two different stages of the mother plant. Around 35 uniform plants were selected from among big Nendran banana plantation with uniform number of suckers for each mother plant. Physical cuts were given at different height for each banana plant according to the different treatment. The two stages of the mother plant, were i) the time of harvest and ii) 10 days after harvest. The treatments enforced were as follows: *i. At harvest* -T_1-Half pseudostem cut, T_2-Removal of entire pseudostem, T_3-Replanting the entire clump in trenches in oblique manner, *ii. 10 days after harvest:* T_4-Half pseudostem cut, T_5-Removal of entire pseudostem, T_6-Replanting the entire clump in trenches in oblique manner and T_7-Control (Retaining entire mother plant). The seven treatments were replicated five times in a Completely Randomized Design (CRD) formed the experiment.

Observation

Observations were recorded initially at the time of enforcement and later on at the 7th, 14th, 21st and 28th days after enforcement of the treatment. The observations recorded were as follows: 1. Total number of suckers produced, 2. Number of new suckers, 3.

Number of quality suckers (28th day) and 4. Number of underdeveloped suckers (28th day). The study was undertaken with the objectives to standardise sucker invigoration/ activation techniques using physical methods of sucker activation in banana.

Statistical analysis

The data on 'Sucker activation techniques' of physical methods were appropriately transformed using square root/ log transformation and the ANOVA techniques and analysed by SPSS (Standard Packages of Statistical Services, version 16.0).

Results and Discussion

Effect of different physical methods of sucker activation techniques on total sucker production

The observation recorded at weekly interval for four weeks revealed an interesting trend. Critical analysis of data presented in Table 1 revealed that replanting the entire clump in trenches in oblique manner ten days after harvest produced maximum number of suckers. This treatment was at par with the next best half pseudostem cut ten days after harvest at four week interval after enforcement of the treatment.

Effect of different physical methods of sucker activation techniques on new sucker production

From the data presented in Table 2, it can be inferred that in every week maximum number of new sucker production was observed when the entire clump were replanted in trenches in oblique manner ten days after harvest. This particular treatment was at par with a both treatments of half pseudostem cut and entire removal of pseudostem ten days after harvest and replanting entire clump in trenches in oblique manner at the time of harvest in the initial first week, whereas, at the end of second week it was statistically at par with the half pseudostem cut treatment ten days after harvest and the same method of treatment but applied at the harvest of bunch and replanting entire clump in trenches in oblique manner at the time of harvest. In the third week after application of treatment an identical trend similar to that at the end of second week was observed, whereas after four weeks the same treatment i.e. replanting the entire clump in trenches in oblique manner ten days after harvest gave the maximum number of new suckers but the differences were statistically non-significant.

Effect of different physical methods of sucker activation techniques on quality sucker production

The data on quality sucker production also revealed the similar trend four weeks after the enforcement of the treatments as in the case of total sucker production (Table 3).

Effect of different physical methods of sucker activation techniques on underdeveloped sucker production

In case of the number of underdeveloped suckers the data presented in Table 3. The removal of entire pseudostem ten days after harvest produced maximum number of underdeveloped suckers four weeks of application of the treatment. However, the results were not statistically significant

Effect of different physical methods of sucker activation techniques on dry weights of suckers

The data on effect of different physical methods of sucker activation techniques on dry weight in banana cv. Nendran is presented in Table 4. In case of 1st sucker and 6th sucker replanting the entire clump in trenches in oblique manner at ten day after harvest recorded the highest dry sucker weight but this was remained at par with next best half pseudostem cut, ten days after harvest and with third best replanting the entire clump in trenches in oblique manner at the time of harvest, all the treatments were at par with each other except removal of entire pseudostem, at the time of harvest and ten days after harvest which recorded the significantly lower values for dry sucker weights than all other treatments. The trend for highest three dry weight of suckers were remained same in almost all suckers. In case of 2nd and 3rd suckers, highest three treatments were found at par with each other but

significantly superior over all other treatments. In case of 4th and 5th sucker there was no significant difference was noticed among the treatment means and all the treatments remained at par with each other. In case of 7th sucker highest three treatments were found at par with each other but superior over removal of entire pseudostem ten days after harvest and Control (Retaining entire mother plant). In case of 8th and 9th sucker the highest two treatments were found at par with each other and in other treatments small peeper/ underdeveloped suckers were noticed. Only in replanting the entire clump in trenches in oblique manner at ten days after harvest a small peeper/ underdeveloped development was noticed, in case of 10th sucker.

Economics of production and B: C ratio for physical methods of sucker activation in banana

Table 5 represents the economics of production and B: C ratio for physical methods of sucker activation after harvest.

Economics of production per sucker basis

Cost of production was zero for the Control (Retaining entire mother plant) as no labours cost involved in the enforcement of the treatment and this was followed by half pseudostem cut ten days after harvest and at the time of harvest.

In case of increment also a similar trend was noticed. Gross return per sucker, was calculated at selling cost ₹ 10 per sucker for all the treatments as well as control. Net return was highest in the treatments, half pseudostem cut ten days after harvest followed by half pseudostem cut at the time of harvest because of better sucker yield and relatively less cost of production in the same treatment.

B: C ratio was the highest for the treatment half pseudostem cut at ten days after harvest followed by half pseudostem cut at the time of harvest and comparative lower B: C ratio was observed in replanting the entire clump in trenches in an oblique manner at harvest.

Table.1 Effect of different physical methods of sucker activation techniques on total sucker production in banana cv. Nendran

Sl. No.	Application of treatment	Treatments	Days (weekly interval)				
			0 Days	7 Days	14 Days	21 Days	28 Days
1.	At Harvest	Half pseudostem Cut	4.000 (2.000)	5.000 (2.334)	6.400 (2.623)	7.000 (2.736)	7.400 (2.807)
2.		Removal of entire pseudostem	4.000 (2.000)	5.000 (2.341)	5.400 (2.427)	5.800 (2.509)	5.800 (2.509)
3.		Replanting the entire clump in trenches in oblique manner	4.000 (2.000)	6.000 (2.546)	7.000 (2.736)	8.000 (2.913)	8.000 (2.913)
4.	10 days after harvest	Half pseudostem cut	4.000 (2.000)	6.200 (2.584)	7.200 (2.772)	8.200 (2.949)	8.600 (3.016)
5.		Removal of entire pseudostem	4.000 (2.000)	5.600 (2.468)	6.200 (2.587)	6.400 (2.625)	6.600 (2.663)
6.		Replanting the entire clump in trenches in oblique manner	4.000 (2.000)	6.200 (2.584)	7.200 (2.772)	8.200 (2.947)	9.000 (3.080)
7.		Control (Retaining entire mother plant)	4.000 (2.000)	4.800 (2.300)	5.800 (2.509)	6.600 (2.663)	7.000 (2.736)
	F-value		0.000 NS	2.988*	5.395**	12.376**	14.840**
	C.D.(0.05)		-	0.203	0.174	0.145	0.145
	SEm.±		0.000	0.07	0.06	0.05	0.05

Table.2 Effect of different physical methods of sucker activation techniques on new sucker production in banana cv. Nendran

Sl. No.	Application of treatment	Treatments	Days (Weekly interval)				
			0 Days	7 Days	14 Days	21 Days	28 Days
1.	At Harvest	Half pseudostem cut	0.000 (0.707)	1.000 (1.147)	1.400 (1.367)	0.600 (1.018)	0.400 (0.914)
2.		Removal of entire pseudostem	0.000 (0.707)	1.000 (1.192)	0.400 (0.914)	0.400 (0.914)	0.000 (0.707)
3.		Replanting the entire clump in trenches in oblique manner	0.000 (0.707)	2.000 (1.568)	1.000 (1.192)	1.000 (1.225)	0.000 (0.707)
4.	10 days after harvest	Half pseudostem cut	0.000 (0.707)	2.200 (1.626)	1.000 (1.225)	1.000 (1.192)	0.400 (0.914)
5.		Removal of entire pseudostem	0.000 (0.707)	1.600 (1.439)	0.600 (1.018)	0.200 (0.811)	0.200 (0.811)
6.		Replanting the entire clump in trenches in oblique manner	0.000 (0.707)	2.200 (1.625)	1.000 (1.225)	1.000 (1.225)	0.800 (1.121)
7.		Control (Retaining entire mother plant)	0.000 (0.707)	0.800 (1.121)	1.000 (1.225)	0.800 (1.121)	0.400 (0.914)
	F-value		0.00 NS	2.993 *	2.697 *	2.551*	2.103 NS
	C.D.(0.05)		-	0.384	0.261	0.290	-
	SEm. ±		0.00	0.088	0.09	0.10	0.10

Table.3 Effect of different physical methods of sucker activation techniques on quality (>1.25 kg/1250g) and underdeveloped sucker production (<1.25 kg/1250g) in banana cv. Nendran

Sl. No.	Application of treatment	Treatments	28 Days (4th week)	
			Quality Suckers	Underdeveloped sucker
1.	At Harvest	Half pseudostem cut	6.200 (2.587)	1.200 (1.296)
2.		Removal of entire pseudostem	4.800 (2.300)	1.000 (1.225)
3.		Replanting the entire clump in trenches in oblique manner	7.000 (2.736)	1.000 (1.225)
4.	10 days after harvest	Half pseudostem cut	7.400 (2.805)	1.200 (1.264)
5.		Removal of entire pseudostem	5.000 (2.341)	1.600 (1.439)
6.		Replanting the entire clump in trenches in oblique manner	8.000 (2.913)	1.000 (1.225)
7.		Control (Retaining entire mother plant)	6.000 (2.546)	1.000 (1.225)
	F-value		14.090 **	1.133 NS
	C.D. (0.05)		0.174	-
	SEm. ±		0.060	0.377

Figures in parenthesis indicate square root transformed values
** Significant at 1 per cent, *Significant at 5 per cent, NS- Non significant

Table.4 Effect of different physical methods of sucker activation techniques on dry sucker weight (g) in banana cv. Nendran

Sl. No.	Application of treatment	Treatments	Sucker Number									
			1	2	3	4	5	6	7	8	9	10
1.		Half pseudostem cut	1247.640 (3.095)	995.070 (2.997)	815.010 (2.909)	636.600 (2.789)	401.820 (2.596)	324.060 (2.510)	104.790 (1.865)	15.450 (0.379)	10.020 (0.342)	0.000 (0.000)
2.	At harvest	Removal of entire pseudostem	1058.190 (3.024)	852.120 (2.929)	673.380 (2.825)	493.950 (2.683)	279.510 (2.363)	22.470 (1.112)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
3.		Replanting the entire clump in trenches in oblique manner	1285.500 (3.108)	1066.260 (3.026)	857.640 (2.932)	694.980 (2.826)	422.040 (2.617)	347.670 (2.540)	282.210 (2.385)	95.040 (1.534)	12.960 (0.364)	0.000 (0.000)
4.	10 days after harvest	Half pseudostem cut	1331.640 (3.124)	1098.480 (3.040)	989.020 (2.952)	701.190 (2.831)	445.380 (2.641)	367.050 (2.564)	285.360 (2.387)	182.610 (2.109)	94.980 (1.248)	0.000 (0.000)
5.		Removal of entire pseudostem	1122.930 (3.049)	890.190 (2.943)	724.320 (2.857)	534.330 (2.716)	370.410 (2.471)	153.600 (2.027)	15.270 (0.634)	6.630 (0.307)	0.000 (0.000)	0.000 (0.000)
6.		Replanting the entire clump in trenches in oblique manner	1369.680 (3.136)	1156.710 (3.063)	949.230 (2.977)	725.070 (2.849)	474.480 (2.669)	394.650 (2.596)	367.890 (2.566)	285.660 (2.407)	118.800 (1.650)	17.01 (0.387)
7.		Control (Retaining entire mother plant)	1207.290 (3.081)	974.490 (2.988)	795.270 (2.897)	625.710 (2.781)	397.470 (2.593)	267.240 (2.312)	94.590 (1.538)	12.570 (0.361)	0.000 (0.000)	0.000 (0.000)
	F-value		5.645**	6.792**	4.718**	1.159[NS]	1.241[NS]	11.892**	16.994**	11.460**	4.390**	-
	C.D. (0.05)		0.058	0.058	0.058	0.174	0.290	0.464	0.696	0.841	0.928	
	SE. m±		0.02	0.02	0.02	0.06	0.10	0.16	0.24	0.29	0.32	-

** Significant at 1 per cent, *Significant at 5 per cent, NS- Non significant, Figures in parenthesis indicate log transformed values

Table.5 Economics of production and B: C ratio for physical methods of sucker activation in banana cv. Nendran

Economics of production per sucker basis												
	Control T9	T1	Increment	T2	Increment	T3	Increment	T4	Increment	T5	Increment	T6	Increment
Cost of production	0.00	1.42	1.42	3.91	3.91	4.96	4.96	0.92	0.92	3.13	3.13	3.72	3.72
Gross return	10.00	10.00	0.00	10.00	0.00	10.00	0.00	10.00	0.00	10.00	0.00	10.00	0.00
Net profit	10.00	8.58	-1.42	6.09	-3.91	5.04	-4.96	9.08	-0.92	6.87	-3.13	6.28	6.28
B: C ratio	-	7.04	0.00	2.56	0.00	2.02	0.00	10.88	0.00	3.20	0.00	2.69	0.00
Economics of production per plant basis												
Cost of production	0.00	3.13	3.13	3.13	3.13	14.87	14.87	3.13	3.13	3.13	3.13	14.87	14.87
Gross return	20.00	22.00	2.00	8.00	-12.00	30.00	10.00	34.00	14.00	10.00	-10.00	40.00	20.00
Net profit	20.00	18.88	-1.13	4.88	-15.13	15.13	-4.87	30.88	10.88	6.88	-13.13	25.13	25.13
B: C ratio	-	7.04	0.64	2.56	-3.84	2.02	0.67	10.88	4.48	3.20	-3.20	2.69	1.35
Economics of production per hectare basis												
Cost of production	0.00	7812.50	7812.50	7812.50	7812.50	37166.67	37166.67	7812.50	7812.50	7812.50	7812.50	37166.67	37166.67
Gross return	50000.00	55000.00	5000.00	20000.00	-30000.00	75000.00	25000.00	85000.00	35000.00	25000.00	-25000.00	100000.00	50000.00
Net profit	50000.00	47187.50	-2812.50	12187.50	-37812.50	37833.33	-12166.67	77187.50	27187.50	17187.50	-32812.50	62833.33	12833.33
B: C ratio	-	7.04	0.64	2.56	-3.84	2.02	0.67	10.88	4.48	3.20	-3.20	2.69	1.35

Economics of production per plant basis

Cost of production was zero for the treatment Control (Retaining entire mother plant) because no labour cost was incurred in the enforcement of the treatment and this was followed by half pseudostem cut, entire cut at the time of harvest and ten days after harvest. In case of increments, also a similar trend was noticed. Gross return and net return was highest in the treatments, replanting the entire clump in trenches in oblique manner and half pseudostem cut both ten days after harvest because of higher sucker yield from the same. In case of increment in gross return and net return over control a similar trend was noticed. B: C ratio was the highest for the treatment half pseudostem cut at ten days after harvest followed by half pseudostem cut at the time of harvest and comparative lower B: C ratio was observed in replanting the entire clump in trenches in an oblique manner at harvest. In case of increment in B:C ratio over the control half pseudostem cut at ten days after harvest was the highest followed by entire clump in trenches in an oblique manner ten days after harvest.

Economics of production per hectare basis

Cost of production was zero for the treatment Control (Retaining entire mother plant) because of no labours were incurred in the enforcement of the treatment and this was followed by half pseudostem cut, entire cut at the time of harvest and ten days after harvest. Cost of production was highest in treatments replanting the entire clump in trenches in oblique manner at harvest and ten days after harvest, this was because of highest number of labours wages involved in the enforcement of the treatment, compared to all other treatments. In case of increment in cost of production over control, again a similar trend was followed. Gross return was highest in the treatments, replanting the entire clump in

trenches in oblique manner, followed by half pseudostem cut both ten days after harvest because of higher sucker yield. But net return was the highest from the treatment half pseudostem cut ten days harvest because of comparatively lower cost of production involved in the same treatment. In case of increment in gross return and net return over control a similar trend was noticed. B: C ratio was the highest for the treatments, half pseudostem cut at ten days after harvest and at the time of harvest and comparative lower B: C ratio was observed in replanting the entire clump in trenches in oblique manner at harvest. In case of increment in B: C ratio over control, half pseudostem cut at ten days after harvest was the highest followed by replanting the entire clump in trenches in oblique manner ten days after harvest.

The corm of a mother plant at harvest present a series of daughter suckers in different stages of initiation and development, the few first formed suckers which would have become independent or nearing independence, a second set, which is fairly developed and fit for replanting, a third set, that can comprise of quality as well as underdeveloped sucker, the fourth group necessarily comprising of followers either in its miniature stage or peepers or a small buds or eye on the corm. The first and second in full and sometime a part of third could form the quality suckers which serve as a quality planting units. The rest have the potential to develop into quality sucker, if ideal salvaging techniques are applied. A closer scrutiny of the treatments reveals the possible technique of invigorating the underdeveloped suckers applied at two defined stages, the first at harvest and second ten days after harvest. Studies conclusively proved that replanting the entire clump in trenches in oblique manner ten days after harvest produced the maximum quality suckers (Table 3). This can be interpreted from different angles. The oblique planting in

trenches and filling the trenches provided an optimum environment for activation of the underdeveloped sucker. Secondly, the oblique positioning of the mother plant should have necessarily favoured maximum nutrient recycling. Thirdly, it would have favoured hastening of nutrient cycling from the mother plant to the daughter suckers. Though this treatment yielded the highest number of quality suckers, it was statistically at par with the treatment of cutting the pseudostem at half height ten days after harvest (Table 3).

On working out economics of cultivation this treatment yielded a better cost benefit ratio implying that this is a more feasible method of activation and invigoration of underdeveloped suckers (Table 3). Basically all these treatments can only be explained in terms of nutrient recycling, whether it is the retention of the full plant or cutting the pseudostem at half height. Two basic studies on nutrient cycling using ^{32}P have confirmed that the nutrient recycling do take place from the mother plant to daughter suckers and the only point of confirmation that it requires validation is the intensity of hastening of this process.

There are few studies in this line of work. Borel (1952), Morez and Gullemot (1961), Daniells and O'Farrell (1987) and Mathew *et al.,* (2000). All this work had the same basic objectives of either increasing the yield or hastening the crop cycle of the followers. But the aim of the present study is solely focused on increasing production of quality suckers by invigorating or activating underdeveloped suckers.

A simple practice of retention of half pseudostem (cutting the pseudostem to half height) led to an increment of 1.4 quality suckers plant^{-1} and 3500 hectare^{-1} (Table 3 and 5). A minor input of additional laboures for topping the pseudostem at half height has

resulted in an additional net return of ₹ 10.88 plant^{-1} and ₹ 27187.50 hectare^{-1} with B: C ratio of 4.48 (Table 5), which is by all means a big gain or boost the banana farmers.

In case of physical methods of sucker activation replanting the entire clump in trenches in oblique manner ten days after harvest produced maximum total number as well as quality suckers which performed equally well with the next best treatment of cutting the pseudostem at half height ten days after harvest. However, the latter treatment was the most economical one.

Acknowledgement

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