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Cultural methods of sucker activation techniques for salvaging underdeveloped suckers in banana cv. Nendran (AAB genomic group)

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Abstract
This experiment was taken up in the 'Central Orchard' situated in the main campus of the Kerala Agricultural University, with main aim of enhancing the quality sucker production and to standardize the sucker activation/ invigoration technique in banana cv. Nendran (AAB) using different graded doses of fertilizers. The treatment consisted of four different N equivalent (form 5, 10, 15, 20 g N equivalent clump^{-1}) in the form of Urea and 17: 17: 17 NPK mixture. This along with the control formed nine treatment, which were replicated five times in Completely Randomized Deign (CRD). The study revealed that application of NPK mixture (17: 17: 17) @ 5 and 10 g N equivalent clump^{-1} resulted in maximum number of total as well as quality suckers. B: C ratio and its increment over control was also the highest for NPK mixture (17: 17: 17) @ 5 g N equivalent clump^{-1}.

Keywords: Sucker activation techniques, Cultural methods, Quality suckers, B: C ratio

1. Introduction
Different techniques have been adopted to invigorate the underdeveloped suckers. All such techniques are sucker activation / invigoration 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. 2016) [1]. These techniques can broadly be classified as physical, cultural, hormonal methods and newer techniques. Different cultural methods are tried for sucker activation in banana such as Ascenso's method, use of organic manures, biofertilizers, chemical fertilizers and different micronutrients.
Ascenso (1967) [2] developed a simple technique for the rapid multiplication of Gros Michel banana. Mother plants were earthed up and fertilized with N @ 720 g ammonium sulphate plant^{-1} year^{-1} in four equal dressings to force suckering. By this method rapid multiplication rate of 15.5:1 was obtained in nine months. According to Ravichandran (1983) [3] sucker production could be stepped up through sustainable agrotechniques. He tried Ascenso's method and obtained a mean multiplication rate of 16.9:1.
Jambulingam *et al*. (1975) [4] in his study increased the K level by soil application of 360 g K_2O plant^{-1} and noticed that higher rates of K_2O significantly increased sucker production. Saad (1997) [5] reported that 400 g plant^{-1} year^{-1} was the optimum nitrogen dose for banana cv. 'Williams' as it greatly enhanced total number of suckers plant^{-1}. Saad and Atawia (1999) [6] in their study on cv. Grand Nain plants fertilized with four rates (400, 600, 800 and 1000 g K_2O plant^{-1}) of potassium sulfate (48 % K_2O) for two successive seasons reported that increasing K fertilizer upto 800 g plant^{-1} year^{-1} resulted in a significant increase in the number of suckers produced. El-Naby (2000) [7] in his experiment reported that treatment with banana compost + 75 per cent chemical fertilizer (NPK) + sulfur resulted in larger numbers of suckers' plant^{-1}.
Beena (1987) [8] in her experiment on split application of NPK @ 190: 115: 300, 240: 140: 360 and 300: 140: 450 g plant^{-1} in cv. Nendran reported that sucker production was not significantly affected by the various treatments. Kurien (2008) [9] working on sucker enforcement study, used different doses of N equivalent in form of urea and 17:17:17 mixtures. The application as basal dose but was at two intervals, at harvest and at a fortnight prior to harvest. The study was conducted as two different experiments in July and August months. It was concluded that, in both the experiments a small dose of mixture 17:17:17 at nitrogen equivalent of 10 g yielded maximum of six quality suckers and the same effect was also observed in the second experiment at a dose of nitrogen equivalent of 20 g compared to

control which yield only three suckers whereas, Athani *et al*. (2009) [10] reported that 100 per cent recommended dose of fertilizer (180: 108: 225 g NPK plant^{-1}) recorded significantly maximum number of suckers in cv. Rajapuri.

Chaichuay *et al*. (2013) [11] in their experiment inferred that three treatments; 20 kg plant^{-1} of chicken manure + 250 g plant^{-1} of 16:16:16 fertilizer mixture, 20 kg plant^{-1} of swine manure + 250 g plant^{-1} of 16:16:16 fertilizer mixture and 20 kg plant^{-1} of chicken manure recorded the best treatments for sucker production. Preliminary studies conducted at the centre revealed that a small manorial input could lead to the development of the small underdeveloped suckers. Based on this observation a study was undertaken with the objectives to standardise sucker invigoration/ activation techniques using cultural methods and also to ascertain its economic viability.

2. Material and methods

These experiment were conducted in the main campus of the Kerala Agricultural University, Thrissur 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.

Treatments were enforced at the time of harvest of the plants. Forty five uniform plants were selected from a large Nendran banana plantation with basic uniform characters and same number of suckers in each clump. Treatments were enforced by applying the different doses of urea and 17:17:17 mixture for each banana clump with proper earthing up and irrigation. The treatments enforced were as follows: T_1 - Application of N (urea) @ 5 g N equivalent clump^{-1}, T_2- Application of N (urea) @ 10 g N equivalent clump^{-1}, T_3 - Application of N (urea) @ 15 g N equivalent clump^{-1}, T_4 - Application of N (urea) @ 20 g N equivalent clump^{-1}, T_5 - Application of NPK mixture (17:17:17) @ 5 g N equivalent clump^{-1}, T_6 - Application of NPK mixture (17:17:17) @ 10 g N equivalent clump^{-1}, T_7- Application of NPK mixture (17:17:17) @ 15 g N equivalent clump^{-1}, T_8- Application of NPK mixture (17:17:17) @ 20 g N equivalent clump^{-1} and T_9 - Control (No application of any fertilizer). The treatments were replicated five times in a Completely Randomized Design (CRD). Observations were recorded initially at the time of enforcement of the treatments and later at 15th and 30th days after enforcement of each treatment. The observations recorded were as follows: 1. Total number of suckers, 2. Number of new suckers, 3. Number of quality suckers (30th day) and 4. Number of underdeveloped suckers (30th day).

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

3. Results

3.1. Effect of different cultural methods (manurial doses) of sucker activation techniques on total sucker production

The study involved four treatments each of 5 g, 10 g, 15 g and 20 g N equivalent per clump in two forms namely as urea and 17:17:17 mixture did not revealed any significant result for total number of suckers, till the fortnight after harvest. The data presented in Table 1 revealed that there was significant increase in total sucker production after one month of application of certain treatments. Application of NPK mixture at 20 kg N equivalent gave the highest number of total suckers which was at par with 15 g, 10 g and 5 g N equivalent involving mixtures and also with 15 g and 20 g N equivalent urea form.

3.2. Effect of different cultural methods (manurial doses) of sucker activation techniques on new sucker production

The data on new sucker production presented in Table 2 revealed that no significant differences were recorded fortnight after application of treatments. However, it is evident from the Table 40 that the higher N equivalent of 15 and 20 g clump^{-1} produces more number of new suckers. The critical analysis of data presented, 30 days after application of all the treatments revealed that NPK mixture @ 5 g, 10 g and 20 g N equivalent produces higher number of suckers but these treatments were at par with NPK mixture @ 15 g N equivalent and urea @ 15 g and 20 g N equivalent.

3.3. Effect of different cultural methods (manurial doses) of sucker activation techniques on quality sucker production

In fortnight generated observations on the contrary there was distinct and glaring results in terms of quality sucker production (Table 3) NPK @ 5 g and 10 g N equivalent produces the highest number of quality suckers but it was at par with a treatments involving higher equivalence of mixtures and also the one involving 20 g N equivalent in urea form.

3.4. Effect of different cultural methods (manurial doses) of sucker activation techniques on underdeveloped sucker production

In trend of the number of underdeveloped sucker the difference were statistically significant 30 days after application (Table 3). In an observation a month after application of treatments it was revealed that, the treatment involving 15 g N equivalent and 20 g N equivalent in urea form produces the maximum number of underdeveloped suckers but this was at par with the NPK mixtures at the same equivalents.

3.5. Effect of different cultural methods (manurial doses) of sucker activation techniques on dry weights of suckers

The effect of different cultural methods (manurial doses) of sucker activation techniques on dry weight of suckers in banana cv. Nendran is presented in Table 4. In case of 1st and 4th sucker application of NPK mixture (17: 17: 17) @ 5 g N equivalent clump^{-1} recorded the highest dry sucker weight but this was remain at par with next best application of NPK mixture (17: 17: 17) @ 10 g N equivalent clump^{-1} and again with third best application of NPK mixture (17: 17: 17) @ 15 g N equivalent clump^{-1}, all the treatments were at par with each other but found significantly superior over control.

In case of 2nd and 3rd sucker again trend for the highest sucker weights was similar as that in case of 1st sucker and also highest three treatments were found at par with each other and significantly superior over control. Application of N (urea) @ 5 g N and 10 g N equivalent clump were also significantly differ with rest other and control.

In case of 5th sucker there all the treatments except application of N (urea) @ 5 g N equivalent clump^{-1} remained at par with each other but superior over control. The trend for the highest dry sucker weight was also remained same. In case of 7th sucker trend was similar but application of N (urea) @ 5 g N equivalent clump^{-1} was also superior over control.

In case of 6th sucker all treatments were at par with each other but superior over control. The highest three were application of NPK mixture (17: 17: 17) @ 5 g, 20 g and 15 g respectively.

In case of 8th sucker the trend for highest three suckers was similar but control did not produce any sucker. In case of 9th and 10th sucker small peeper/ underdeveloped sucker development was noticed in most of the treatments except in the control. In case of 10th sucker, application of NPK mixture (17: 17: 17) @ 15 and 20 g N equivalent clump^{-1} only recorded the small peeper development.

3.6. Economics of production and B: C ratio for cultural methods (manurial doses) of sucker activation in banana

Table 5 represents the economics of production and B: C ratio for cultural methods (manurial doses) of sucker activation after harvest:

3.6.1. Economics of production per sucker basis

Cost of production was the lowest for the treatment T5- Application of 17: 17: 17 @ 5 g N equivalent clump^{-1} followed by T6 and T7 Application of 17: 17: 17 @ 10 g and 20 g N equivalent clump^{-1} respectively, this was because of lowest quantity of fertilizer incurred in the treatments but gave the better sucker yield from the same treatment, compared to other treatments and control. In case of increment in cost of production over control, it was negative in all the treatments. Gross return per sucker, was calculated at selling cost @ 10 □ per sucker for all the treatments as well as control. In case of B: C ratio, a similar trend was noticed as in case of per plant basis and there was zero increment was noticed in all the treatments.

3.6.2. Economics of production per plant basis

Cost of production was the lowest for the treatment Control because there was no fertilizer cost incurred in the enforcement of the treatment and this was followed by T1- Application of N (urea) @ 5 g N equivalent clump^{-1} and T2- Application of N (urea) @ 10 g N equivalent clump^{-1}. In case of increment in cost of production over the control, the lowest cost of production was incurred in the same treatments. Gross return and net return was highest in the treatments, application of NPK mixture (17: 17: 17) @ 5 g and 10 g N equivalent clump^{-1} because of highest number of suckers produced per plant. In case of increment in gross return over control a similar trend was noticed. Control recorded the lowest values in both cases because of lowest sucker production compared to other treatments. B:C ratio was the highest for the treatments, application of NPK mixture (17: 17: 17) @ 5 g N equivalent clump^{-1} followed by same fertilizer @ 10 g because of good sucker yield and comparative lower cost of production than the higher doses of 17: 17: 17 NPK mixture.

3.6.3. Economics of production per hectare basis

Cost of production was lowest for the treatment control because no fertilizer cost was involved in the same. This was highest in treatments T8- Application of 17:17:17 mixture @ 20 g N and T7- Application of 17:17:17 mixture @ 15 g N irrigation, this was because of highest quantity and cost of 17:17:17 incurred in these treatments, compared to other treatments. In case of increment in cost of production over control, again similar trend was followed. Gross return and net return per hectare was recorded highest in T5- Application of 17:17:17 mixture @ 5 g N and T6- Application of 17:17:17 mixture @ 10 g N because of highest sucker production compared to the control as well as other treatments and in case of increment over the control also a similar trend was noticed. B: C ratio per hectare was the highest in the application of 17:17:17 mixture @ 5 g N followed by application of 17:17:17 mixture @ 10 g N equivalent clump^{-1} and application of urea @ 20 g N equivalent clump^{-1}. Almost a similar trend was noticed in case of increment over the control, whereas B: C ratio was lowest in the control.

4. Discussion

The study was confined to N equivalent at four doses beginning from 5 to 20 g and in two forms one as N equivalent in Urea form and the other as N equivalent in 17: 17: 17 NPK mixture form.

The results revealed the overwhelming response of N equivalent @ 5 and 10 g using NPK mixture of 17:17:17 (Table 3). Though there was increase of quality suckers production with increase in N equivalent dose in urea form it was no way comparable with treatments involving 5 and 10 g N equivalent in the mixture form (Table 1).

The results can only be argued on the lines of synergistic effects of N, P and K together. As, N alone even the best treatment produced lesser quality suckers than the least effective NPK mixtures. Phosphorus is known to favour the growth of the underground portion mainly the roots and nitrogen generally favours a vegetative growth. Potassium is also linked with many aspects favouring propagule development. Thus an optimum concentration of the mixture activated or favoured the development of the underdeveloped as well as the peepers and miniature buds, which resulted in more quality sucker production. A similar finding on activation and invigoration of suckers has been reported by Kurien (2008). [9] A further probe into the economic aspects point to the fact that an input increase of 5 g N equivalent NPK in 17:17:17 resulted in 3.6 quality suckers plant^{-1} and 9000 hectare^{-1} (Table 2 and 5) into the additional net return of □ 34.84 plant^{-1} and □ 87110.00 hectare^{-1} (Table 5). The increment in B: C ratio over control in the case of the best treatment of 5 g NPK equivalent mixture form worked out to be 31.14 (Table 5).

5. Conclusion

With respect cultural methods (manurial doses) of sucker activation, application of NPK mixture (17: 17: 17) @ 5 and 10 g N equivalent clump^{-1} yielded maximum number of total as well as quality suckers, but the lower dose was found to be more economical based on B: C ratio.

Table 1: Effect of different cultural methods (manurial doses) of sucker activation techniques on total sucker production in banana cv. Nendran

Sl. No.	Application of treatment	Treatments	Days		
			0 Days	15 Days	30 Days
1.	At Harvest	Application of N (urea) @ 5 g N equivalent clump^{-1}	4.000 (2.000)	6.200 (2.577)	7.400 (2.807)
2.		Application of N (urea) @ 10 g N equivalent clump^{-1}	4.000 (2.000)	6.800 (2.695)	8.000 (2.913)
3.		Application of N (urea) @ 15 g N equivalent clump^{-1}	4.000 (2.000)	7.400 (2.802)	9.200 (3.110)

4.		Application of N (urea) @ 20 g N equivalent clump^{-1}	4.000 (2.000)	7.800 (2.874)	9.600 (3.177)
5.		Application of NPK mixture (17: 17: 17) @ 5 g N equivalent clump^{-1}	4.000 (2.000)	7.000 (2.736)	9.200 (3.112)
6.		Application of NPK mixture (17: 17: 17) @ 10 g N equivalent clump^{-1}	4.000 (2.000)	7.600 (2.840)	9.800 (3.209)
7.		Application of NPK mixture (17: 17: 17) @ 15 g N equivalent clump^{-1}	4.000 (2.000)	8.000 (2.907)	9.800 (3.207)
8.		Application of NPK mixture (17: 17: 17) @ 20 g N equivalent clump^{-1}	4.000 (2.000)	7.800 (2.874)	10.000 (3.239)
9.		Control (Without application of any fertilizer)	4.000 (2.000)	6.000 (2.540)	6.400 (2.622)
	F-value		0.00^{NS}	1.728^{NS}	12.740**
	C.D. (0.05)		-	-	0.174
	SEm. ±		0.00	0.10	0.06

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

Table 2: Effect of different cultural methods (manurial doses) of sucker activation techniques on new sucker production in banana cv. Nendran

Sl No.	Application of treatment	Treatments	Days		
			0 Days	15 Days	30 Days
1.	At Harvest	Application of N (urea) @ 5 g N equivalent clump^{-1}	0.000 (0.707)	2.200 (1.580)	1.200 (1.296)
2.		Application of N (urea) @ 10 g N equivalent clump^{-1}	0.000 (0.707)	2.800 (1.792)	1.200 (1.296)
3.		Application of N (urea) @ 15 g N equivalent clump^{-1}	0.000 (0.707)	3.400 (1.950)	1.800 (1.510)
4.		Application of N (urea) @ 20 g N equivalent clump^{-1}	0.000 (0.707)	3.800 (2.053)	1.800 (1.497)
5.		Application of NPK mixture (17: 17: 17) @ 5 g N equivalent clump^{-1}	0.000 (0.707)	3.000 (1.863)	2.200 (1.626)
6.		Application of NPK mixture (17: 17: 17) @ 10 g N equivalent clump^{-1}	0.000 (0.707)	3.600 (2.008)	2.200 (1.626)
7.		Application of NPK mixture (17: 17: 17) @ 15 g N equivalent clump^{-1}	0.000 (0.707)	4.000 (2.098)	1.800 (1.497)
8.		Application of NPK mixture (17: 17: 17) @ 20 g N equivalent clump^{-1}	0.000 (0.707)	3.800 (2.053)	2.200 (1.626)
9.		Control (Without application of any fertilizer)	0.000 (0.707)	2.000 (1.533)	0.400 (0.914)
	F-value		0.00^{NS}	1.690^{NS}	4.395**
	C.D. (0.05)		-	-	0.319
	SEm. ±		0.00	0.13	0.11

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

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

Sl. No	Application of treatment	Treatments	At 30 days	
			Quality Suckers	Underdeveloped suckers
1.	At Harvest	Application of N (urea) @ 5 g N equivalent clump^{-1}	5.800 (2.499)	1.600 (1.439)
2.		Application of N (urea) @ 10 g N equivalent clump^{-1}	5.800 (2.499)	2.200 (1.626)
3.		Application of N (urea) @ 15 g N equivalent clump^{-1}	6.200 (2.581)	3.000 (1.871)
4.		Application of N (urea) @ 20 g N equivalent clump $^{-1}$	7.000 (2.734)	2.600 (1.755)
5.		Application of NPK mixture (17: 17: 17) @ 5 g N equivalent clump^{-1}	8.400 (2.980)	0.800 (1.121)
6.		Application of NPK mixture (17: 17: 17) @ 10 g N equivalent clump^{-1}	8.400 (2.980)	1.400 (1.367)
7.		Application of NPK mixture (17: 17: 17) @ 15 g N equivalent clump^{-1}	7.400 (2.807)	2.400 (1.697)
8.		Application of NPK mixture (17: 17: 17) @ 20 g N equivalent clump^{-1}	7.400 (2.807)	2.600 (1.755)
9.		Control (Without application of any fertilizer)	4.800 (2.287)	1.600 (1.425)
	F-value		6.142**	7.113**
	C.D. (0.05)		0.290	0.261
	SEm. ±		0.10	0.09

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 cultural methods (manurial doses) 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	11
1.	At harvest	Application of N (urea) @ 5 g N equivalent clump^{-1}	1086.178 (3.027)	943.874 (2.973)	852.312 (2.930)	560.320 (2.739)	389.572 (2.484)	269.620 (2.269)	169.592 (1.729)	28.832 (0.973)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
2.		Application of N (urea) @ 10 g N equivalent clump^{-1}	1126.386 (3.050)	978.214 (2.989)	896.308 (2.952)	645.932 (2.809)	418.234 (2.546)	287.232 (2.314)	207.910 (2.082)	35.700 (1.320)	6.234 (0.303)	0.000 (0.000)	0.000 (0.000)
3.		Application of N (urea) @ 15 g N equivalent clump $^{-1}$	1210.808 (3.080)	1079.160 (3.029)	926.398 (2.966)	637.602 (2.800)	506.974 (2.698)	282.472 (2.332)	250.444 (2.262)	57.154 (1.716)	33.558 (1.046)	15.334 (0.846)	0.000 (0.000)
4.		Application of N (urea) @ 20 g N equivalent clump $^{-1}$	1234.778 (3.089)	1095.208 (3.037)	941.460 (2.974)	693.294 (2.837)	515.780 (2.703)	406.674 (2.604)	197.506 (2.159)	115.668 (1.916)	41.786 (1.328)	18.768 (0.633)	0.000 (0.000)
5.		Application of NPK mixture (17: 17: 17) @ 5 g N equivalent clump^{-1}	1425.688 (3.147)	1232.738 (3.086)	1077.120 (3.031)	820.590 (2.909)	666.400 (2.819)	526.456 (2.709)	389.436 (2.590)	303.280 (2.442)	223.040 (1.903)	37.468 (0.790)	0.000 (0.000)
6.		Application of NPK mixture (17: 17: 17) @ 10 g N equivalent clump^{-1}	1411.442 (3.143)	1218.186 (3.081)	1067.022 (3.027)	802.604 (2.900)	658.070 (2.813)	490.314 (2.680)	366.622 (2.564)	304.878 (2.442)	233.988 (2.257)	65.008 (1.527)	0.000 (0.000)
7.		Application of NPK mixture (17: 17: 17) @ 15 g N equivalent clump^{-1}	1387.540 (3.135)	1210.196 (3.078)	1070.592 (3.027)	769.352 (2.883)	629.340 (2.794)	498.882 (2.692)	318.614 (2.448)	245.446 (2.294)	72.658 (1.851)	42.568 (1.114)	7.208 (0.314)
8		Application of NPK mixture (17: 17: 17) @ 20 g N equivalent clump^{-1}	1365.032 (3.128)	1176.264 (3.067)	1030.948 (3.012)	768.230 (2.880)	620.874 (2.787)	471.274 (2.668)	321.708 (2.443)	242.658 (2.280)	66.164 (1.810)	48.484 (1.429)	7.446 (0.316)
9		Control (Without application of any fertilizer)	866.286 (2.936)	735.862 (2.867)	592.416 (2.767)	444.346 (2.568)	271.082 (2.297)	175.950 (1.752)	24.820 (0.973)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
	F-value		4.823**	6.751**	15.257**	2.983*	2.761*	2.586*	4.432**	14.713**	10.145**	3.262**	NS
	C.D. (0.05)		0.087	0.087	0.058	0.174	0.319	0.580	0.696	0.609	0.783	0.957	
	SE.m±		0.03	0.03	0.02	0.06	0.11	0.20	0.24	0.21	0.27	0.33	

** 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 cultural methods (manurial doses) of sucker activation in banana cv. Nendran

	Control T9	T1	Increment	T2	Increment	T3	Increment	T4	Increment	T5	Increment	T6	Increment	T7	Increment	T8	Increment
Economics of production per sucker basis																	
Cost of production	1.75	1.15	-0.60	1.21	-0.54	1.04	-0.71	0.80	-0.95	0.58	-1.17	0.71	-1.04	1.10	-0.65	1.26	-0.49
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	10.00	0.00	10.00	0.00
Net profit	8.25	8.85	0.60	8.79	0.54	8.96	0.71	9.20	0.95	9.42	1.17	9.29	1.04	8.90	0.65	8.74	0.49
B: C ratio	5.71	8.70	0.00	8.27	0.00	9.63	0.00	12.53	0.00	17.21	0.00	14.03	0.00	9.13	0.00	7.92	0.00
Economics of production per plant basis																	
Cost of production	1.40	2.07	0.67	2.18	0.78	2.29	0.89	2.39	0.99	2.56	1.16	3.14	1.74	3.72	2.32	4.29	2.89
Gross return	8.00	18.00	10.00	18.00	10.00	22.00	14.00	30.00	22.00	44.00	36.00	44.00	36.00	34.00	26.00	34.00	26.00
Net profit	6.60	15.93	9.33	15.82	9.22	19.71	13.11	27.61	21.01	41.44	34.84	40.86	34.26	30.28	23.68	29.71	23.11
B: C ratio	5.71	8.70	14.96	8.27	12.86	9.63	15.81	12.53	22.12	17.21	31.14	14.03	20.73	9.13	11.18	7.92	8.99
Economics of production per hectare basis																	
Cost of production	3500	5171.5	1671.5	5443.5	1943.5	5713.2	2213.25	5986.7	2486.7	6390.0	2890.0	7841.0	4341.0	9311.5	5811.5	10732	7232.0
Gross return	20000	45000.0	25000	45000	25000	55000	35000	75000	55000	110000	90000	110000	90000	85000	65000	85000	65000
Net profit	16500	39828.5	23328.5	39556	23056.5	49287	32786.7	69013	52513	103610	87110	102159	85659	75688	59188	74268	57768.0
B: C ratio	5.71	8.7	14.96	8.27	12.86	9.63	15.81	12.53	22.12	17.21	31.14	14.03	20.73	9.13	11.18	7.92	8.99

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