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# Economics and quality of banana (Musa spp., AAA) var. Grand Naine as influenced by sucker retention in Terai Zone of West Bengal

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***Abstract:*** *An experiment was conducted to study the sucker retention time on worked out of economics and estimation of quality at Instructional farm, U.B.K.V., Pundibari, West Bengal during the year 2012-2014. The yield (66.81 tha$^{-1}$) and benefit cost ratio (2.23) were highest at no sucker retain till harvest treatment. The quality parameters like TSS (22.7 $^{o}$Brix), total sugar (17.2 %), reducing sugars (12.3 %), pulp weight (93.4 g), peel weight (57.9 g) and sugar acid ratio (167.2) were also highest at no sucker retained treatment whereas the pulp to peel ratio was highest (2.4) at one sucker retained at shooting. In the view of raising ratoon crop, a farmer unable to remove all the suckers till harvest should however try to retain one or two suckers either at shooting or after 5$^{th}$ month of planting still is able to realize profit with a cost benefit ratio of 1.92-1.94 or 1.76 with acceptable quality of fruit.*

***Key words:*** *banana, desuckering, benefit cost ratio, quality.*

## INTRODUCTION

With the increasing demand and vast export potential coupled with the farmers desire to grow banana on a large area, it is necessary that systematic and sustained sucker management practices as a planting material be adopted. Initial sucker growth depends on supply of nutrients, water and photosynthesis products from the mother plant (Shanmugavelu *et al.*, 1992). In banana simple practice like de-topping of sucker or desuckering at different intensity, the stage at which it is done and its used as planting materials have been found to effect yield parameters and yield qualitatively and quantitatively (Odeke *et al.*, 1999). Planting geometry, age/height of removed suckers and method of desuckering have a direct effect on bunch size as a result of inter- and intra-mat competition (Robinson, 1995). Higher number of suckers increase sink competition which reduces the bunch weight significantly (Obiefuna *et al.*, 1982, Tenkouano *et al.*, 2007). Still, though, it is one of the most neglected aspects in resource limited farmers fields (Bananuka and Rubaihayo, 1994) as was also observed in Terai region of West Bengal. Hence, the number of suckers per stool and right stage of retaining them to plant will give rise to optimum number of medium sized bunches and to establish the best system of desuckering in order to gain higher profits and to shorten the ratoon crop cycle.

## MATERIALS AND METHODS

An experiment was conducted at Instructional farm, U.B.K.V., Pundibari, West Bengal during the year 2012-2014 in tissue culture banana var. Grand Naine planted at a spacing of 2 x 2 m. The suckers were cut horizontally at ground level and a depression

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was made at the centre of the cut surface and kerosene was directly poured at this point. The volume of kerosene applied for one stamp was 20 ml. Agronomic practices were carried out as needed including regular irrigation, fertilizer application, weeding and earthing-up. The experiment was laid out in a randomised complete block design with three replications. The treatments were retaining first emerging one sucker, retaining first emerging two suckers, retaining one sucker after five months, retaining two suckers after five months, retaining one sucker at shooting, retaining two suckers at shooting, retaining no sucker till harvest and control (retaining of all suckers). The suckers were deeply removed from the base from their emergence to maintain the required number. The data worked out on yield, cost of cultivation, benefit cost ratio along with estimated quality (TSS, sugars (Lane and Eynon, 1923), acidity (Ruck, 1969), pulp to peel ratio and sugar acid ratio) parameters. The methods employed for estimating acidity The significance of results of the data was subjected to analysis of variance given by Gomez and Gomez (1984) employing the 'op-stat' software package.

## RESULTS AND DISCUSSION

Retaining all suckers as and when they emerge had a yield reduction of 54.95% cannot be regarded as total crop failure. Retaining first one or two suckers or at 5$^{th}$ month of planting and at shooting are comparatively better with yield reduction of 13.14-29.9% with a cost benefit ratio of 1.54-1.94 (table 1). Sucker management in banana is a crucial cultural practice in which unwanted suckers developing from the base of the mother rhizome is removed, keeping a suitable sword sucker to produce the ratoon crop (Mahdi *et al.*, 2014). The strategy is to remove the surplus suckers that compete with mother plant. Sword suckers, with the same size, on the most open side in the same direction are usually selected as followers; otherwise the system becomes unmanageable (Daniells, 1984). The suckers remain physiologically dependent on the mother plant until the latter is in bloom or harvested (Wybou, 1974), thus competing with the mother plant for photosynthates, mineral nutrients and water. The yield potential of banana plantation is maximized by retaining correct number of suckers per mat as higher densities reduce growth and yield (Robinson, 1995; Oluwafemi, 2013). Thus for Terai zone of West Bengal no suckers should be retained during the cropping period or till shooting for realizing optimum yield and quality with maximum benefits at benefit cost ratio of as high as 2.23

The quality parameters TSS, acidity, total sugar, reducing sugar, pulp to peel ratio and sugar acid ratio showed mixed response on effects of sucker management as TSS and pulp to peel ratio were not significant while acidity, total sugars, reducing sugar, pulp weight, peel weight and sugar acid ratio were significantly influenced by sucker management (table 2). The values estimated for TSS, total sugars and pulp to peel ratio with different practices of sucker management were statistically at par indicating that these quality parameters are independent of number of suckers retained irrespective of the stage when it is done. The values ranged from 17.55-22.68 $^{o}$Brix for TSS, 15.26-17.22% for total sugars and 10.36-12.32% reducing sugars, lowest and highest when all and no suckers retained, respectively except for the peel to pulp ration where highest ratio was recorded when one sucker was maintained at shooting. Rest of the quality parameter however significantly improved depending on the number and time of sucker retained. When none of the suckers were retained the fruits produced by the mother plants were least acidic (0.11%), highest reducing sugar (12.32%), highest proportion of sugar than acid (167.21) indicating sweetness, highest pulp (93.41 g) and peel (57.89 g) and vice versa was recorded when all the suckers were retained i.e. qualitatively inferior fruits were produced. Bhagat (2012) also reported that detopping of suckers significantly influenced the fruit quality parameters like TSS, sugar, acidity and sugar acid ratio though not following a regular trend i.e. highest with maximum number of detopping.

The fruit quality also depends on translocation of photosynthates from photosynthetic apparatus to the fruits and finally their metabolism inside the fruit. Retaining no suckers till harvest results no intra mat completion and all the metabolites translocated to the fruit and thus metabolized to

**Table 1**
**Effect of sucker management on economics and quality of banana var. Grand Naine**

| *Suckers retained* | *Yield (tha$^{-1}$)* | *Cost of cultivation (lakh ₹ ha$^{-1}$)* | *Benefit cost ratio* | *TSS ($^o$ Brix)* | *Titrable acidity (%)* |
|---|---|---|---|---|---|
| All | 30.10 | 1.14 | 1.02 | 17.5 | 0.27 |
| One (1$^{st}$ emerging) | 47.83 | 1.17 | 1.59 | 18.7 | 0.22 |
| Two (1$^{st}$ emerging) | 46.38 | 1.17 | 1.54 | 18.6 | 0.25 |
| One (after 5 MAP) | 53.03 | 1.17 | 1.76 | 21.7 | 0.18 |
| Two (after 5 MAP) | 52.94 | 1.17 | 1.76 | 20.7 | 0.20 |
| One at shooting | 58.03 | 1.17 | 1.94 | 21.8 | 0.13 |
| Two at shooting | 57.63 | 1.17 | 1.92 | 21.6 | 0.15 |
| None till harvest | 66.81 | 1.17 | 2.23 | 22.7 | 0.11 |
| **CD$_{P=0.05}$** | 16.96 | - | - | NS | 0.07 |

MAP- month after planting

**Table 2**
**Effect of sucker management on quality of banana var. Grand Naine**

| *Suckers retained* | *Total sugars (%)* | *Reducing sugars (%)* | *Pulp wt (g)* | *Peel wt (g)* | *Pulp to peel ratio* | *Sugar acid ratio* |
|---|---|---|---|---|---|---|
| All | 15.3 | 10.4 | 37.1 | 20.5 | 1.8 | 56.6 |
| One (1$^{st}$ emerging) | 15.5 | 10.7 | 70.7 | 32.2 | 2.2 | 75.3 |
| Two (1$^{st}$ emerging) | 15.9 | 11.0 | 73.6 | 36.1 | 2.0 | 64.1 |
| One (after 5 MAP) | 16.1 | 11.8 | 70.4 | 39.0 | 1.8 | 89.5 |
| Two (after 5 MAP) | 16.4 | 11.7 | 80.6 | 35.6 | 2.3 | 83.6 |
| One at shooting | 16.4 | 11.9 | 88.3 | 36.3 | 2.4 | 129.0 |
| Two at shooting | 16.4 | 12.2 | 86.5 | 42.3 | 2.0 | 113.8 |
| None till harvest | 17.2 | 12.3 | 93.4 | 57.9 | 1.6 | 167.2 |
| **CD$_{P=0.05}$** | 0.38 | 1.2 | 17.6 | 12.6 | NS | 46.4 |

MAP- month after planting

desired TSS, sugars, acidity, quantity of pulp and peel and ratio of sugar to acid and pulp to peel. Overall better quality of fruits was produced by these mother plants. From this experiment it can be concluded that a farmer not able to retain no suckers till harvest should however try to retain one or two suckers either at shooting or after 5$^{th}$ month of planting still is able to realize profit with a cost benefit ratio of 1.92-1.94 or 1.76 with acceptable quality of fruit.

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