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Research Article

Effect of Sucker Weight on Quality of Banana (*Musa* spp.) cv. Barjahaji (AAA)

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ABSTRACT

A field experiment was undertaken at the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat during 2003-2004. The experiment was set in Randomized Block Design (RBD) consisting of three replications and eight treatments. The treatments comprised of T_1: ≤500 g, T_2: >500-1000 g, T_3: >1000-1500 g, T_4: >1500-2000 g, T_5: >2000-2500 g, T_6: >2500-3000 g, T_7: >3000-3500 g and T_8:>3500-4000 g.The results revealed that the quality parameters attributes were non significantly influenced by the treatments. It was evident that T_4 showed highest weight pulp (73.41gm), non-reducing sugar (9.69%) and total sugar (13.13%), T_5 highest peel weight (42.66gm), titrable acidity (0.23%), T_1highest fruit moisture (74.17%) and reducing sugar (3.81%), T_7 Highest pulp-peel ratio (1.79), T_6 Total soluble solids(22.21%), T_2 Sugar acid ratio (59.38).

Keywords: *Sucker, Sugar, TSS, Moisture*

INTRODUCTION

Banana is one of the most favourite fruits in India. Banana has a long period of domestication in India with its mention in Kautilya's "Arthasastra" (250-300 B.C.) as well as in the paintings and sculptures of Ajanta and Ellora (300-400 B.C.) In many parts including Assam, the fruits as well as the plants are exclusively used in all auspicious occasions such as wedding, festivals and for worshipping God. It provides a more balanced diet than many other fruits, containing sufficient amount of carbohydrate, the source of energy and as such it is called the wholesome fruit. Owing to its multifaceted usesand high economic returns, banana is referred as 'Kalpataru' (a plant of virtue) in India. Banana is also employed as medicine for curing many ailments in NE region. An acre of banana yields fifteen million calories of energy as compared to one million calories of energy produced by wheat (Madhava Rao, 1984).

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It contains 61.4 per cent moisture, 1.2 per cent protein, 0.3 per cent fat, 0.7 per cent mineral matters, 27.0 per cent carbohydrate, 80 ppm Ca, 290 ppm P, 6 ppm Fe. It also contains traces of Vit-A, 150 mg Vit-B, 0.5 mg Nicotinic acid, 30 mg Riboflavin, 1 mg Vit-C and 67-137 calorific value per 100 g of pulp (Anon, 1979). Considering the nutritive value and fruit value of banana, it could be considered as "poor man's apple".

India is considered the largest producer of banana in the world producing 15.07 million tonnes from an area of 0.49 million hectares (Chadha, 2001). Assam holds the fourth rank with an annual production of 600.8 thousand tonnes occupying an area of 43.3 thousand hectares (Bhattacharyya, 2001).The commercial banana is parthenocarpic and effectively seed sterile and is propagated by vegetative methods. Sucker is the major planting material for commercial expansion of banana. The weight of sucker has marked effect on crop duration, growth and yield. However information on the effect of sucker weight on banana fruit quality is not adequate under the agroclimatic condition of Assam.

MATERIALS AND METHODS

The experiment was undertaken in the Experimental Farm of Department of Horticulture, Assam Agricultural University, Jorhat-785013, during the year 2003-2004. The experimental soil was sandy loam in texture, well drained and having pH 5.5. The experiment was set out in Randomized Block Design (RBD) consisting of eight treatments replicated three times. The area of the experimental plot was 915.84 sq.m. and that of the individual plot was 5.4 m x 5.4 m (29.16 m^2). Suckers were planted at a spacing of 1.8 m x 1.8 m. The suckers of different weight range were considered as the treatments. The treatments consisted of T1 ($\leq$500), T2 (>500-1000), T3 (>1000-1500), T4 (>1500-2000), T5 (>2000-2500), T6 (>2500-3000), T7 (>3000-3500) and T_8 (>3500-4000). "Barjahaji", a high yielding commercial variety of banana in Assam was identified as the material for this study. Fingers are long and green even at ripening. Flesh is soft and smooth. Healthy suckers of uniform age (about 3 month) and different weights were selected as the planting material. Before planting the top portion of the selected suckers were removed at 30 cm from the corm. The weighed suckers were pared and pralinaged by dipping them in a clay slurry with Carbofuran 3G @ 40 g per sucker. The treated suckers were kept over night for suberization and planted in the field on April 8, 2003. Nitrogenous and Potassic fertilizers @ 240 g Urea (46% N) and 600 g Muriate of potash (60% K_2O) per plant respectively were applied in three splits in third, fifth and seventh month after planting. The whole amount of phosphatic fertilizer @ 210 g Single Super Phosphate (16% P_2O_5) per plant was applied in third month after planting.

Observations on the fruit quality

Determination of fruit moisture

For determining moisture of the fruit, the middle fingers from the second hand were selected. The whole weight of the fruit was noted. Representative sample of about 20 g was taken and subjected to oven drying as per the method of Ranganna (1986). The difference between the initial and final weights of the sample gave the moisture content of the fruit and was expressed in percentage.

Pulp and peel weight

Mean weight of pulp and peel of five uniformly ripe fruits was recorded separately and expressed in gram (g).

Pulp-peel ratio

Pulp-peel ratio was calculated by the following formula.

$$\text{Pulp - peel ratio} = \frac{\text{Pulp weight (g)}}{\text{Peel weight (g)}}$$

Total soluble solids (TSS)

TSS of the fruits was determined by the Zeiss Hand juice Brix Refractometer and the result was expressed in per cent (%).

Titrable acidity

Titrable acidity, reducing sugar, total sugar and non-reducing sugar were estimated by adopting the standard method of A.O.A.C (1975).

For estimation of titrable acidity, 10 g pulp was ground in mortar and added 100 ml of distilled water and filtered. Ten ml of filtrate was titrated against 0.1 N NaOH using phenolphthalein as indicator. Titrable acidity was expressed in percentage in terms of anhydrous citric acid.

$$\text{Titrable acidity } (\%) = \frac{\text{Titre value x Normality of alkali x Volume made up x Equivalent weight of citric acid}}{\text{Weight of the sample x Aliquot taken x 1000}} \text{ X 100}$$

Reducing sugar

Four ml of saturated lead acetate and 2g of potassium oxalate were added to 10 g pulp which was already ground in a mortar and the volume was made upto 100 ml with distilled water, centrifuged and then filtered. The filtrate was titrated against 10 ml boiling Fehling's solution mixture (5 ml of Fehling's solution A+ 5 ml of Fehling's solution B) using methylene blue as indicator. Deep brick red colour of the solution indicated the end point and the value was expressed in percentage.

$$\text{Reducing sugar} = \frac{\text{Factor x Volume made up}}{\text{Titre value x Weight of the sample}} \text{ X 100}$$

Where, factor = 0.05 (mg of invert sugar)

Total sugar

From the solution of 100 ml made up for reducing sugar estimation, 25 ml of the solution was taken and 2.5 ml of concentrated HCl was added to it and kept overnight. The solution was then neutralized with 1 N NaOH, made upto 75 ml with distilled water and titrated against 10 ml boiling Fehling's solution. From the titre value, percentage of total sugar was calculated as follows –

Total sugar = (% sucrose + % reducing sugar)

Sucrose% = (% Total inverted sugar - % Reducing sugar) x 0.95

$$\%\,\text{Total inverted sugar} = \frac{\text{Factor x Volume made up x Volume of stock solution}}{\text{Titre value x Weight of the sample x Aliquot taken}} \text{ X 100}$$

Factor = 0.05 (mg of invert sugar)

Non-reducing sugar

Non reducing sugar was calculated from the difference between the total and reducing sugars.

Sugar-acid ratio

The sugar acid ratio was calculated by dividing the value of total sugar by titrable acidity.

$$\text{Sugar - acid ratio} = \frac{\text{Total sugar (\%)}}{\text{Titrable acidity (\%)}}$$

RESULTS

Determination of fruit moisture

The data on fruit moisture are furnished in the Table 1. It revealed the non-significant differences in fruit moisture due to effect of various treatments. The highest fruit moisture content was recorded in T_1 (74.17%) followed by T_7 (73.99%). The lowest fruit moisture content was recorded in T_2 (72.25%) and followed by T_3 (72.46%) which was at par.

Weight of pulp and peel

The data on weight of pulp and peel are presented in Table 1.It was found to be non-significant due to various treatments. The highest pulp weight was recorded in T_4 (73.41g) followed by T_1 (73.39g) which were *at par*. The lowest pulp weight was recorded in T_3 (71.73g) and followed by T_6 (72.36g). Similarly the highest peel weight was recorded in T_5 (42.66g) followed by T_4 (42.53g) and were *at par* with each other. The lowest peel

weight was recorded in T_7 (40.80g) and followed by T_6 (40.97g).

Pulp-peel ratio

The data on pulp-peel ratio of fruit are presented in Table 1. It showed non significant differences due to different treatments. The highest pulp-peel ratio was recorded in T_7 (1.79) and followed by T_2 (1.77) and T_6 (1.77). The lowest pulp-peel ratio was recorded in T_5 (1.70) followed by T_4 (1.73).

Total soluble solids (TSS)

The data on total soluble solids (TSS) are furnished in Table 1. The effect of sucker weight on TSS was found to be non significant. The highest TSS was recorded in T_6 (22.21%) followed by T_2 (22.19%) and T_4 (22.18%). The lowest was recorded in T_7 (20.45%).

Titrable acidity

The data on titrable acidity are presented in Table 1. The treatments showed non-significant differences on titrable acidity. T_3 (0.20%) showed the reduced titrable acidity of the fruit which was of similar magnitude with T_8. The highest titrable acidity was recorded in T_5 (0.23%) which was followed by T_4 (0.22%).

Reducing sugar

The data on reducing sugar are shown in Table 1. It indicated non significant variation due to different treatments. The highest reducing sugar content was recorded in T_1 (3.81%) followed by T_4 (3.44%) while T_3 (3.10%) recorded the lowest reducing sugar content.

Non-reducing sugar

The data on non-reducing sugar are given in Table 1.It showed non significant influences due to effect of different treatments. T_4 (9.69%) produced the highest non-reducing sugar content followed by T_5 (9.44%) while T_3 (8.07%) treatment gave the lowest non-reducing sugar content among all the treatments.

Total sugar

The data on total sugar are presented in Table 1.It had non-significant influence on total sugar content in fruits. The highest total sugar content was recorded in T_4 (13.13%) and followed by T_5 (12.76%). The lowest total sugar content was recorded in T_3 (11.17%).

Sugar-acid ratio

The data on total sugar-acid ratio are furnished in Table 1.Non- significant differences in sugar-acid ratio were recorded due to different treatments. The highest sugar-acid ratio was observed in T_2 (59.38) treatment followed by T_8 (58.72) and T_4 (58.71) which were *at par* while T_7 (54.16) treatment registered the lowest sugar-acid ratio.

Table 1: Fruit quality

Treatments	Fruit moisture (%)	Pulp weight (g)	Peel weight (g)	Pulp-peel ratio	Total soluble solids (TSS) (%)	Titrable acidity (%)	Reducing sugar (%)	Total sugar (%)	Non reducing sugar (%)	Sugar-acid ratio
T_1	74.17	73.39	42.25	1.76	21.28	0.22	3.81	12.68	8.87	57.41
T_2	72.25	72.47	41.09	1.78	22.19	0.20	3.13	12.05	8.92	59.38
T_3	72.46	71.73	41.17	1.75	21.63	0.20	3.10	11.17	8.07	54.62
T_4	73.62	73.41	42.53	1.73	22.18	0.22	3.44	13.13	9.69	58.71
T_5	72.46	72.64	42.66	1.71	20.66	0.23	3.32	12.76	9.44	55.26
T_6	73.57	72.36	40.97	1.78	22.21	0.21	3.19	11.93	8.74	56.23
T_7	73.99	72.78	40.80	1.79	20.45	0.22	3.34	12.14	8.80	54.16
T_8	73.07	73.28	41.87	1.76	21.18	0.20	3.21	11.87	8.66	58.73
S.Ed. ±	4.90	4.23	4.33	0.12	3.08	0.03	1.60	2.92	1.39	5.72
$CD_{0.05}$	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

DISCUSSION

Effect on fruit quality

It is interesting to note that the sucker weight did not exhibit any significant effect on the quality of fruit. In the present study, the TSS, pulp weight, reducing sugar, total sugar, titrable acidity, non reducing sugar and sugar-acid ratio were not significantly influenced by sucker weight. Lower reducing sugar may be due to low conversion of sugars from starch under such environmental condition. The acidity was due to slow conversion of organic acid to sugar while TSS was due to slow deposition of solids and also slow conversion of organic acid to sugar. Low sugar acid ratio might be due to low proportional assimilation of acid to sugar in the fruits.

Data from the experiment revealed that the treatment T_4 obtained the highest pulp weight (73.41g), non-reducing sugar (9.69%) and total sugar content (13.13%). This result is supported by the findings of Norman (1976) in pineapple and Rodriguez and Irrizarry (1979) in banana. Prasanna and Aravindakshan (1985) had similarly noticed that the fruit quality characters namely TSS, acidity, total sugar, reducing sugar, non reducing sugar and sugar-acid ratio were not influenced by the sucker weight in banana cv. Palayankodan.

CONCLUSION

From the experiment it could be concluded that use of suckers weighing 1500-2500 g would be profitable proposition for good fruit quality of Barjahaji banana under the agro-climatic condition of Jorhat, Assam, India.

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