

# Effect of Pre-harvest Treatments on Storage and Quality of Banana cv. Robusta

Pijush Kanti Biswas<sup>1</sup> and C. S. Jayachandran Nair<sup>2</sup>

<sup>1</sup>Krishi Vigyan Kendra, Tawang, Tawang - 790 104, Arunachal Pradesh, India

<sup>2</sup>Department of Pomology and Floriculture, Kerala Agricultural University, Vellayani Campus,

Thiruvananthapuram - 695 522, Kerala, India

E-mail: [pjushhorti@gmail.com](mailto:pjushhorti@gmail.com)

(Received on 20 December 2011 and accepted on 05 March 2012)

**Abstract** - A field experiment was conducted at the research farm of the department of Pomology and Floriculture, College of Agriculture, Vellayani, Thiruvananthapuram, India during 2008-2009 to evaluate the effect of pre-harvest treatments on quality and storage in banana (*Musa* AAA Robusta) with various combinations of growth regulators (GA 50 ppm and NAA 25 ppm) and organic sprays (vermi-wash, cow's urine, coconut water) as well as cultural practices (dehanding one or two apical hands, bunch cover using polythene tube) along with a control. The growth regulators and organic sprays were applied one month after emergence of the bunch. Sugar content of the banana fruits had been increased by the application of the treatment i.e., removing one apical hand and spraying 50 ppm GA, one month after bunch emergence. On the other hand, TSS content and shelf life increased but acidity decreased with the treatment i.e., removal of two apical hands and spraying of 50 ppm GA one month after bunch emergence was imposed.

**Keywords:** Banana, GA, Vermi-wash, TSS, Dehanding, Acidity, Shelf life

## I. INTRODUCTION

Banana is one of the most important commercial tropical fruit crops of India covering 658 thousand hectare (NHB, 2008) India is the largest producer of banana contributing 17.30% to the global production (52580 thousand metric tonnes). The demand for this fruit in the international market is increasing and it fetches substantial foreign exchange to the tropical region. The performance of banana as a commercial crop depends on the environment. The banana growing areas in India have varied agro-climatic conditions, ranging from the rainfed hill slopes of Tamil Nadu and North-Eastern states, the wet paddy lands of Andhra Pradesh and Kerala, to the heavy rainfall areas of the West coast, the relatively dry South-East coast and to the Central arid / Semi-arid zones of Andhra Pradesh and Maharashtra. As a consequence, the performance of the crop, in terms of growth, production and quality has varied greatly.

To meet the market demand it is inevitable to increase the production without deterioration in edible qualities. Studies on the use of plant growth regulator studies conducted in banana have shown the immense possibilities for improving storage life and quality without much investment. The plant growth regulators like, GA, NAA, 2,4-D, Ethrel, 2,4,5-T are useful in banana cultivation for improving shelf life and quality. The cultivars differ in their response to growth regulators. Among the different cultivars of banana, Robusta (*Musa* AAA group) is one of the popular varieties cultivated in the homesteads of Kerala. The variety is assuming importance in commercial cultivation because of its export potential due to high edible quality. The cultivar is having high yield potential and can withstand drought to a certain extent. In the light of the above facts, the present investigation was undertaken to optimize the pre-harvest treatments for improving fruit qualities and storage life of banana var. Robusta.

## II. MATERIALS AND METHODS

A field experiment was conducted during 2008-2009 to evaluate the effect of pre-harvest treatments on quality and storage in banana (*Musa* AAA Robusta). The investigation was undertaken at the Department of Pomology and Floriculture, College of Agriculture, Vellayani, Thiruvananthapuram. The location is situated at 8° 5' North latitude, 77° 1' East longitude and at an altitude of 29 m above the mean sea level. Soil of the experimental site is red loam belonging to 'Vellayani series'. The land was cropped with banana prior to the commencement of the present investigation. Sword suckers of uniform size and age were selected as a planting material. The variety used was Robusta. The experiment consist of thirteen different treatments viz. T<sub>0</sub> ( Control), T<sub>1</sub> ( Dehanding of one apical hand), T<sub>2</sub> (Dehanding of two apical hands), T<sub>3</sub> (Bunch cover using polythene tube), T<sub>4</sub> (Dehanding of one apical hand + vermi-wash spray on the bunch at one month after emergence), T<sub>5</sub> (Dehanding of two apical hands + vermi-wash spray on the bunch at one month after emergence), T<sub>6</sub> (Dehanding of one apical hand + Cow's

TABLE I: EFFECT OF PRE-HARVEST TREATMENTS ON DIFFERENT QUALITY CHARACTERS AND STORAGE LIFE OF BANANA CV. ROBUSTA

Treatments	TSS (%)	Acidity (%)	TSS : Acid Ratio	Total Sugars (%)	Reducing Sugars (%)	Non Reducing Sugars (%)	Shelf Life (days)
T <sub>0</sub> (Control)	19.10	0.53	36.69	15.64	11.87	3.77	9.25
T <sub>1</sub> ( Dehanding of one apical hand)	20.02	0.48	42.40	16.48	12.38	4.10	10.12
T <sub>2</sub> (Dehanding of two apical hands),	22.26	0.41	54.61	18.04	14.11	3.93	10.37
T <sub>3</sub> (Bunch cover using polythene tube),	27.06	0.36	77.43	17.97	12.24	5.73	11.37
T <sub>4</sub> (Dehanding of one apical hand + vermi-wash spray on the bunch at one month after emergence)	24.00	0.40	60.57	17.64	12.97	4.67	9.37
T <sub>5</sub> (Dehanding of two apical hands + vermi-wash spray on the bunch at one month after emergence)	25.02	0.38	66.77	18.29	14.19	4.10	9.62
T <sub>6</sub> (Dehanding of one apical hand + Cow's urine spray on the bunch at one month after emergence)	23.15	0.36	63.77	16.55	12.64	12.64	10.25
T <sub>7</sub> (Dehanding of two apical hands + Cow's urine spray on the bunch at one month after emergence)	23.20	0.38	60.40	16.30	12.95	12.95	10.75
T <sub>8</sub> (Dehanding of one apical hand + Coconut water spray on the bunch at one month after emergence)	23.15	0.39	59.73	16.80	13.02	13.02	10.37
T <sub>9</sub> ( Dehanding of two apical hands+ Coconut water spray on the bunch at one month after emergence)	23.25	0.39	59.11	16.89	12.94	12.94	10.75
T <sub>10</sub> ( Dehanding of one apical hand + GA 50 ppm spray on the bunch at one month after emergence)	28.10	0.35	79.44	19.96	14.45	14.45	14.12
T <sub>11</sub> ( Dehanding of two apical hands + GA 50 ppm spray on the bunch at one month after emergence)	28.20	0.35	80.98	18.32	14.62	14.62	14.50
T <sub>12</sub> (Dehanding of one apical hand + NAA 25 ppm spray on the bunch at one month after emergence )	25.37	0.37	67.56	18.21	13.07	13.07	13.37
T <sub>13</sub> (Dehanding of two apical hands + NAA 25 ppm spray on the bunch at one month after emergence)	22.30	0.41	54.23	17.94	12.40	12.40	12.50
SE(d)	0.31	0.02	4.21	0.04	0.03	0.04	0.17
CD (p=0.05 )	0.95	0.06	12.85	0.14	0.09	0.13	0.53

urine spray on the bunch at one month after emergence),  $T_7$  (Dehanding of two apical hands + Cow's urine spray on the bunch at one month after emergence),  $T_8$  (Dehanding of one apical hand + Coconut water spray on the bunch at one month after emergence),  $T_9$  (Dehanding of two apical hands + Coconut water spray on the bunch at one month after emergence),  $T_{10}$  (Dehanding of one apical hand + GA 50 ppm spray on the bunch at one month after emergence),  $T_{11}$  (Dehanding of two apical hands + GA 50 ppm spray on the bunch at one month after emergence),  $T_{12}$  (Dehanding of one apical hand + NAA 25 ppm spray on the bunch at one month after emergence),  $T_{13}$  (Dehanding of two apical hands + NAA 25 ppm spray on the bunch at one month after emergence). The design of the experiment was randomized block design (RBD) with two replications. Main items of observations were TSS, acidity, TSS: acid ratio, total sugars, reducing sugars, non-reducing sugars and shelf life in ambient condition. The data collected were analyzed by applying the technique of analysis of variance for randomized block design following Panse and Sukhatme (1967).

### III. RESULTS AND DISCUSSION

Results of the present studies revealed that there was significant difference among the various treatments for quality characters.

#### A. Effect of Pre-Harvest Treatments on TSS, Acidity and TSS : Acid Ratio of Fruits

The results indicated that the highest total soluble solids content was in  $T_{11}$  (Dehanding of two apical hands + GA 50 ppm spray on the bunch at one month after emergence) followed by  $T_{10}$  (Dehanding of one apical hand + GA 50 ppm spray on the bunch at one month after emergence) and  $T_3$  (bunch cover using polythene tube) while it was lowest for  $T_0$  (control).

The titrable acidity of fruits was lowest in  $T_{11}$  (Dehanding of two apical hands + GA 50 ppm spray on the bunch at one month after emergence) and  $T_{10}$  (Dehanding of one apical hand + GA 50 ppm spray on the bunch at one month after emergence) both followed by  $T_3$  (bunch cover using polythene tube) and  $T_6$  (Dehanding of one apical hand + Cow's urine spray on the bunch at one month after emergence) both, while it was highest in  $T_0$  (control).

The results revealed that TSS: Acid ratio was highest in  $T_{11}$  (Dehanding of two apical hands + GA 50 ppm spray on the bunch at one month after emergence) followed by  $T_{10}$  (Dehanding of one apical hand + GA 50 ppm spray on the

bunch at one month after emergence) and  $T_3$  (bunch cover using polythene tube) while it was lowest in  $T_0$  (control). Results obtained from the present studies are in agreement with the reports of Aravindakshan (1981) who observed that, in Nendran banana, pre-harvest application of growth regulators increased TSS but decreased acidity and brix / acid ratio.

#### B. Effect of Pre-Harvest Treatments on Total Sugars, Reducing Sugar, Non Reducing Sugar of Fruits

The total sugar content was highest in  $T_{10}$  (Dehanding of one apical hand + GA 50 ppm spray on the bunch at one month after emergence) followed by  $T_{11}$  (Dehanding of two apical hands + GA 50 ppm spray on the bunch at one month after emergence) and  $T_5$  (Dehanding of two apical hands + vermi-wash spray on the bunch at one month after emergence) while it was lowest in  $T_0$  (control). The highest reducing sugar content of fruit was recorded in  $T_{11}$ , followed by  $T_{10}$  and  $T_5$ . While it was lowest in  $T_0$ . The non-reducing sugar content of fruit was highest in  $T_3$  (bunch cover using polythene tube) followed by  $T_{13}$  (Dehanding of two apical hands + NAA 25 ppm spray on the bunch at one month after emergence) and  $T_{10}$  (Dehanding of one apical hand + GA 50 ppm spray on the bunch at one month after emergence). While it was lowest for  $T_7$  (Dehanding of two apical hands + Cow's urine spray on the bunch at one month after emergence). Experiment in similar lines with Poovan variety of banana (Vijayakumar and Shanmugavelu, 1983) showed that pre-harvest application of growth regulators increased the fruit quality by increasing total sugars and reducing sugars. Shirgavi *et al.* (2000) are also found improvement of fruit quality in banana cv. 'Rajapuri' when GA and 2, 4-D were sprayed on bunches.

#### C. Effect of Pre-Harvest Treatments on Shelf Life of Fruits

Shelf life of fruit samples at ambient conditions showed significant variation among different treatments. Maximum shelf life was noticed in  $T_{11}$  (Dehanding of two apical hands + GA 50 ppm spray on the bunch at one month after emergence) followed by  $T_{10}$  (Dehanding of one apical hand + GA 50 ppm spray on the bunch at one month after emergence) and  $T_{12}$  (Dehanding of one apical hand + NAA 25 ppm spray on the bunch at one month after emergence) while the minimum shelf life was observed in  $T_0$  (control).

Results obtained from the present studies with regard to shelf life are in agreement with the reports of Gottfried and Halevy (1982) who observed that application of GA3

and GA<sub>4</sub>+7 in banana cv. Dwarf Cavendish resulted delay of ripening and improved shelf life of the fruits. From similar studies, Chellppan (1983) reported that the application of GA<sub>3</sub> delayed ripening in banana. The present studies revealed that sugar content increased by the application of the treatment T<sub>10</sub> i.e., removing one apical hand and spraying 50 ppm GA, one month after bunch emergence.

The results also showed that TSS content and shelf life increased whereas acidity decreased when the treatment T<sub>11</sub> (removal of two apical hands and spraying of 50 ppm GA one month after bunch emergence) was imposed.



Fig.1 Dehanding of two apical hands



Fig. 2 Dehanding of one apical hand



Fig.3 Bunch cover using polythene tube

#### IV. CONCLUSION

Pre-harvest treatment of banana which consist of trimming of one or two apical hands and application of GA at the rate of 50 ppm one month after bunch emergence improved quality of fruits.

#### REFERENCES

- [1] Aravindakshan, K, "Effect of pre and post harvest treatments on storage and quality of banana cv. Nendran", M.Sc. (Hort.) thesis, Kerala Agricultural University, Thrissur, 1981.
- [2] Chellappan, K, "Effect of 2,4-D and GA on the fruit development and post harvest physiology of banana" Ph.D. thesis, Tamil Nadu Agricultural University, Coimbatore, 1983.
- [3] Gottreich, M., Halevy, Y., "Delaying ripening of pre-harvest bananas (Dwarf Cavendish) with gibberellins", *Fruits*. vol. 37(2),pp. 97-102, 1982.
- [4] Shirgavi, Y.S., Hulamani, N.C., Patil, S.N., Athani, S.I., " Shelf life and Organoleptic quality of banana cv. Rajapuri as influenced by pre harvest bunch sprays of growth regulators" *Advances in Plant Science Research*, vol. 12, pp.114-117, 2000.
- [5] Panse, V.G., Sukhatme, P.V., " Statistical Methods for Agricultural Workers". ICAR, New Delhi,pp. 175-177,1967.
- [6] NHB, [www.nhb.gov.in](http://www.nhb.gov.in), Accessed in September 2008.