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EFFECT OF APPLICATION OF GIBBERELLIC ACID (GA_3) ON SHELF-LIFE OF BANANA

U.ARCHANA[1], S. SIVACHANDIRAN[2]

Department of Agronomy, Faculty of Agriculture, University of Jaffna, Sri Lanka
Corresponding author: Archanauthayaratnam@gmail.com

ABSTRACT

Kathali (Musa sp) is the most promising banana cultivar grown by farmers in Jaffna. Post-harvest losses are very high in banana during transport and storage. Post-harvest losses could be reduced by extending green shelf-life of banana. A study was carried out to assess the effects of gibberellic acid (GA_3) treatments on extending shelf-life of banana cultivar '*kathali*'. Four concentrations of GA_3 (250 ppm, 350 ppm, 500 ppm, 750 ppm) were applied by dipping method. The banana fruits were then packed in corrugated fibre boxes and kept at room temperature. Qualitative and quantitative data were obtained and used to analyze the shelf life of banana fruits. GA_3 treated fruits showed delayed peel colour development, total soluble solids accumulation, total sugar synthesis, decreased the rate of increasing pH and reduced cumulative weight loss during storage compared to control treatment significantly. Based on all the parameters, tested 500 ppm and 750 ppm GA_3 levels significantly extended the shelf-life of *Kathali* cultivar of banana by 4 and 5 days, respectively. Increased concentration of GA_3 may result in extending shelf-life further. But cost effectiveness and effect on quality have to be evaluated before recommendation.

***Key words*: *Kathali,* Gibberellic (GA_3) acid, dipping method, shelf-life**

1. INTRODUCTION

Kathali is one of the most promising banana cultivar in Jaffna. The demand for Jaffna *Kathali* is very much high is southern market because of its unique taste and flavor. It has a great potential But the post-harvest losses during transportation is very high. This loss could be minimized by extending the Green-life of banana. Several technologies are evolved to extend the green life of banana and application of gibberellins (GA_3) was proven be effective in extending shelf-life in different cultivars of banana. Application of GA_3 at concentration between 50-250 mg/l in Cavendish variety increased the green- life of banana by 3-4 days (Vargas *et al*., 2011). GA_3 also delays the softening of pulp of banana (Vendrell, 1970). Considering above facts a study was carried out at Department of Agronomy, Faculty of Agriculture, and University of Jaffna to evaluate the effect on different concentration of GA_3 on extending the shelf-life of *Kathali* cultivar of banana.

2. LITERATURE REVIEW

Bananas (*Musa* spp) are a tropical crop and a staple in the wet tropic areas of Africa, the Americas, and mainland and island southeast Asia, South Asia, Melanesia and the Pacific islands (K. Kris Hirst). The effect of polyethylene film lining, sealed or perforated, and gibberellic acid (100 ppm), by dipping the tip of the fruit only or the whole fruit, on quality and shelf-life of banana fruits at 18ºC ±2ºC and 90% - 95% relative humidity was investigated by Department of Horticulture, Faculty of Agriculture, in Sudan . Polyethylene film liners, sealed or perforated, significantly delayed fruit ripening, maintained quality and extended shelf-life of bananas. Salicylic acid treatment has been found to delay the ripening of banana fruits (*Musa acuminata*). Fruit softening, pulp: peel ratio, reducing sugar content, invertase and respiration

rate have been found to decrease in salicylic acid treated fruits as compared with control ones (Srivastava et al 2000).

Treatment with gibberellic acid (GA_3) by dipping the tip of the fruit only or the whole fruit, resulted in more delay of fruit ripening and extension of shelf-life of banana fruits. The sealed film liners was more effective than the perforated ones and dipping the whole fruit in GA_3 was more effective than dipping the fruit tip only, in delaying fruit ripening and extending shelf-life of bananas (Hiba Elmukhtar Osman et al, 2008). GA3 delays chlorophyll degradation and fruit softening (Vendrell 1970; Khader 1992) and decreases sugar accumulation, TSS and sugar/ acid ratio in banana.

3. MATERIALS AND METHODOLOGY

Kathali banana bunches were harvested from three different farmer's orchard field. Fruits were selected as samples with no serious defects such as cuts, bruise, deep wounds or insect damage. Total banana bunch was dehanded and similar size rounded fruits were selected from each hands. Fruits were washed with tap water to remove latex and dust. Commercial available gibberellic acid (Nab Gibb) was applied. Five different concentration of gibberellic acid were applied to the whole hands of banana fruits by were dipping method. The fruits were dipped for 3-5 minutes in the GA_3 solution and packed in corrugated fibre boxes. Table 1 shows the different concentration of Gibberellic acid used in the experiment.

Treatment	Concentration of Gibberellic acid (ppm)
Control (T_0)	0
Treatment 1(T_1)	250
Treatment 2(T_2)	350
Treatment 3 (T_3)	500
Treatment 4 (T_4)	750

Table 1: *Details Of Gibberellic Acid Concentration*

The experiment was laid out in randomized complete block design (RCBD) with three replicates. Storage life (shelf life) in days was measured at the completely ripened stage. The fruit was considered full ripened when their peel colour was completely changed to yellow colour.

The difference between initial and final weight was considered as total weight loss during the storage interval. Fruits weight was measured in 4 days storage interval by digital balance. Peel colour of the banana fruit was observed using by colour chart. This colour change was observed daily. Seven stages of colour changes are characterized in banana colour chart. Green, Green - trace of yellow, More green than yellow, More yellow than green, Green tip, All yellow and Yellow - flecked with brown colour.

The total soluble solids (TSS) were determined by using Eclipse Handheld Refractometer (Anon). Sample pH was measured using by HACH model digital pH meter. Total sugars were carried out through Lane and Eynon method as described by James (1995). Sensory evaluation (Taste, flavor and aroma) test was done by prepare sensory evaluation card.

The data was analyzed using an analysis of variance (ANOVA procedure and Duncan's multiple range tests (DMRT) was used to select the best treatment. The statistical significant was tested at $\alpha = 0.05$. Statistical analysis was carried out using SAS statistical package.

4. RESULTS AND DISCUSSION

Shelf life was measured at the completely yellow ripened stage. Figure 1 illustrates the extending the shelf life in banana by application of gibberellic acid. Changing of the peel colour in to yellow is an indication for banana ripening. In colour chart it is represented by stage 6 (all yellow).

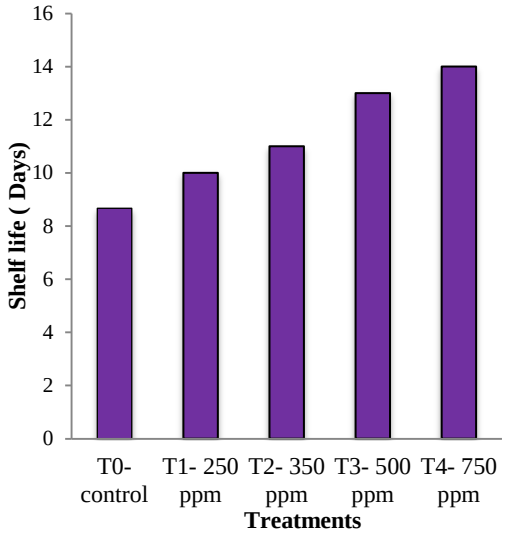

Figure 1: *Average Shelf Life (Days) During Storage*

GA_3 treated banana fruits significantly differed in extending the shelf life than untreated banana fruit. The effect of treatment 3 (500 ppm) and treatment 4 (750 ppm) on extending shelf-life is high compare to other levels of GA_3 and control.

Fruit pulp and skin experienced substantial weight loss during ripening (Fernandez, 2006). At 4th day of storage, the average weight loss showed there is no significant difference among treatments. The effect of different treatments on weight loss significantly differed among treatments during 8th day of storage. Control and T_1 (250 ppm) GA_3 applied banana bunches showed significantly higher weight loss compare to other treatments. Application of 500 ppm (T_3) and 750 ppm (T_4) of GA_3 showed 13.5457, 11.9924 percentages of weight loss respectively and the values are highly significant compare to control and other two treatments.

Colour is one of the important parameter to express the stage of ripening. Colour change in banana during ripening is usually based on the peel colour rather than the pulp colour. At the 8th day of storage untreated banana (control) was decayed. T_3 (500 ppm) and T_4 (750 ppm) showed more yellow than green colour (Index 5) in 8th day. The peel colour of T3 changed to completely yellow colour (index 6) in 12th day which is the ideal fruiting stage to be used as table fruit.

Total soluble solids increased during storage. 4th day of storage untreated banana have high total soluble solid content than Gibberellic acid treated banana. In 8th day all GA_3 treated banana significantly differs from the untreated banana bunch. Low mean value of TSS implies the delay of ripening. T_3 (500 ppm) and T_4 (750 ppm) had significantly lower TSS than control.

The pH values of treatments 2, 3, 4 (350 ppm, 500 ppm and 750 ppm) are significantly differed from T_1 (250 ppm) and untreated (control) fruits sample at 4th day, 8th day and 12th day of storage implies that treatment 3, 4, 5 (350 ppm, 500 ppm, 750 ppm) shows significant effect than the 250 ppm of GA_3 applied banana bunch and untreated banana bunch.

Total sugar content is one of the important parameter to determine the ripening of banana fruit. GA_3 applied banana fruits had significantly lower sugar content compare to control and the lowest value was recorded in T4 (750 ppm).

Sensory attributes of the experimental GA_3 treated bananas were not significantly ($P>0.05$) differed. Thus implies the application of GA_3 did not alter the quality characters of the banana fruits.

5. CONCLUSION

This study revealed that gibberellic acid (GA_3) could be used to extend the shelf- life of *Kathal*i cultivar. T_3 (500 ppm) and T_4 (750 ppm) were equally performed well in extending shelf-life of banana without affecting the quality of the fruits. Based on all the parameters, the 500 ppm and 750 ppm of GA_3 levels can be recommended to extend the shelf-life of *Kathali* cultivar of banana 4 and 5 days respectively. Increase the concentration of GA_3 may result in extending shelf-life further. But cost effectiveness and the side effects have to be tested before recommendation.

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