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EFFECT OF CHEMICALS AND GROWTH REGULATORS ON SHELF LIFE AND QUALITY OF BANANA CV. GRAND NAINE

J. Kowsalya and M. Rajkumar
Department of Horticulture, Annamalai University
Annamalainagar, Chidambaram-608 002, Tamilnadu, India
Email .Hortiraj2002@yahoo.com

Abstract

An investigation entitled Effect of chemicals and growth regulators on shelf life and quality of banana cv. Grand Naine" was carried out in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamil Nadu, India. The experiment was laid out in Completely Randomised Design with ten treatments and replicated thrice. Various physico-chemical parameters like physiological loss in weight, fruit spoilage percentage, firmness, pulp to peel ratio, TSS, total sugars, reducing sugar, non-reducing sugar, titrable acidity and ascorbic acid were analysed at 3 days interval. The results of the study revealed that the fruits treated with Gibberellic acid @ 150 ppm significantly increased the shelf life up to 18.64 days and reduced the physiological loss in weight, fruit spoilage percentage and maintains the good marketable colour. Among the chemical parameters, the maximum total soluble solids, total sugars, reducing sugars, non-reducing sugars, titrable acidity and ascorbic acid content were recorded in the fruits treated with gibberellic acid @ 150 ppm (T_4) when compared to control and other treatments.

Keywords **:** Growth regulators, Gibberellic acid, *Musa paradisiaca* L.

Introduction

Banana (*Musa paradisiaca* L.) belongs to the family Musaceae and it is a traditional tropical fruit regarded as "Apple of Paradise". It is an important fruit crop grown worldwide in more than 120 countries. It is a popular worldwide staple food for more than 400 million people (Zhang *et al*., 2005). Banana is the rich source of carbohydrate, potassium, phosphorus, calcium, magnesium and vitamins like Vitamin-B. Fruits are free from fat with high calorific value. Considering the nutritive value, it is believed as "poor man's apple". It can be utilized for the production of edible vaccine against Hepatitis- B virus (HBV). The plant based vaccine for HBV in edible banana seems to be an economical alternative for human healthcare (Uma *et al*., 2008). Grand Naine popularly known as G9 is one of the important variety among different varieties of banana. It is a high yielding Cavendish variety and belongs to AAA group. The plant grows to a height of 6.5 to 7.5 feet. The fruits are delicious to eat and keeping quality of the fruit is high compared to other varieties. The fruits are long cylindrical and are attractive yellowish green in colour at maturity.

The postharvest quality and longevity of fruits is highly influenced by pre harvest factors and the stage of harvest. Banana is a climacteric fruit, it exhibits a respiratory peak during ripening, after being harvested at 20°C. It is highly perishable with high post-harvest losses. 25-30% of the fresh produce deteriorates due to spoilage after harvest, the losses are being higher in the tropical regions (Magdaline *et al.,* 1998).

Prolongation of shelf life of banana may be done by some techniques like using hot water, packaging materials, fungicides, ethylene absorbents and growth regulators. These techniques may arrest the growth and spread of microorganism by reducing the shrivelling which ultimately leads to an increased shelf life and described as a natural and maintain the marketability of the fruit for a longer period (Sudha *et al.,* 2007). Post-harvest dipping treatment increases the shelf life of fruits by retaining their firmness and control of the decaying organism (Ahmed *et al.,* 2009).

Keeping these facts in view, an attempt has been made to study the Effect of chemicals and Growth regulators on shelf life and quality of banana cv. Grand Naine.

Materials and Methods

The experiment was conducted at Post harvest laboratory, Department of Horticulture, Annamalai University, Chidambaram during the year 2018-2019. The fruits were collected from SMV Exports, located at Theni district. The experiment was laid out in CRD design with three replications. Banana hands each consisting of seven fingers of uniform size, disease free were selected. Fully matured but unripe bananas were washed and immersed in the chemicals and growth regulators for 2 minutes and then the fruits were surface dried at room temperature (28 ±2°c). The observations such as PLW (%), fruit spoilage (%), Shelf life (days), TSS (°Brix), total sugar (%), reducing and non-reducing sugar content (%), ascorbic acid (mg/100gm) were recorded at 3rd, 6th, 9th, 12th and 15th day of storage.

Treatment No.	Particulars
T_1	Dipping fruits in Benzyl adenine @25ppm
T_2	Dipping fruits in Benzyl adenine @50 ppm
T_3	Dipping fruits in GA_3 @ 100 ppm
T_4	Dipping fruits in GA_3 @ 150 ppm
T_5	Dipping fruits in $CaCl_2$ @0.5%
T_6	Dipping fruits in $CaCl_2$ @1%
T_7	Dipping fruits in Thiabendazole @200 ppm
T_8	Dipping fruits in Thiabendazole @250 ppm
T_9	Dipping fruits in Hot water @ 52°C
T_{10}	Control

Results and Discussion

The minimum percentage of physiological loss was recorded in the treatment (T_4) were the fruits dipped in GA_3 at 150 ppm registered the values of 2.29, 3.41, 4.90, 5.79 and

6.25 percent at 3rd, 6th, 9th, 12th and 15th day after treatments respectively. The reduction in physiological loss in weight was due to the effect of gibberellic acid which might have retained more water against the force of transpiration and also due to reduced rate of respiration and transpiration (Sarkar *et al.,* 2016). Reduction in loss might be due to restricting ethylene accumulation and production in fruits during ripening (Lipsa Prit Bhusan *et al.,* 2018).

Among all treatments, the treatment of GA_3 150 ppm (T_4) recorded the least spoilage percentage of 0.00, 0.00, 12.50, 25.00 and 31.25 percent respectively at on 3rd, 6th, 9th, 12th and 15th day after the treatment, followed by T_3 (GA_3 at 100 ppm). The rate of spoilage increased with the increase in ripening and days to storage. Spoilage of fruits was directly related to the rate of respiration of fruits, which leads to the deterioration of fruits (Srivasta *et al.,* 1961).

The highest firmness was found in treatment (T_4) GA_3 at 150 ppm with the values of 5.69, 5.23, 4.16, 3.98 and 3.41 lb force respectively. The fruit firmness gradually decreased with increased period of storage may be due to break down of pectin substances and cell wall softening. This may be due to that gibberellic acid retarded degradation of polymer like starch, cellulose and hemicellulose (Sarkar *et al.,* 2016).

The shelf life was maximum (18.64 days) in the fruits dipped in gibberellic acid at 150 ppm (T_4). GA_3 causes the decrease in the tissue permeability and thereby reduced the rate of water loss leading to delayed fruit ripening (Nirupama *et al.,* 2010). The maximum TSS content was recorded at (T_4) GA_3 150 ppm which registered 22.78° Brix on 15th day. The increase of TSS in storage period was possibly due to hydrolysis of starch into sugar. This was also noticed by Abdullah *et al.* (1985). The maximum total sugar content of 20.97 percent was recorded in the fruits treated with GA_3 at 150 ppm (T_4) at 15th day after treatment. The increase in total sugar might be due to the conversion of starch and pectin into simple sugar (Patil and Magar, 1976).

At 15th day of storage the highest reducing sugars value was recorded in treatment T_4 (11.01%). The maximum non-reducing sugar content of 9.96 percent was recorded in (T_4) GA_3 at 150 ppm. The increase in reducing sugar may be attributed due to enzymatic conversion of the starch to the reducing sugars (Islam, 1998). Rapid increase in non-reducing sugar was probably due to break down of starch into non-reducing sugar and then the non-reduced sugar was converted into reducing sugar results slow increase in non-reducing sugar.

The maximum value of titrable acidity was found in treatment T_4 (0.54%). The higher level of titrable acidity in the fruits dipped at gibberellic acid may be due to less utilization of organic acids in respiration by antisenscent action of GA_3, which delays ripening mechanism through reduced rate of starch degradation. The results are in accordance with Bhalerao and Parmar (2011).

The maximum ascorbic acid content was registered in T_4 with the value of 6.75 mg/100g. The highest ascorbic acid content of fruits treated with $GA_3$is mainly due to reduced degradation of L-ascorbic acid resulting maximum ascorbic acid at the end of storage period. These results are similarly found by Harikumar and Dilipbabu (2014) in banana.

Table 1 : Effect of chemicals and growth regulators on physiological loss in weight (%) of banana cv. Grand Naine

Tr. No	Treatment details	Physiological loss in weight (%)				
		3rd day	6th day	9th day	12th day	15th day
T_1	Benzyl adenine @ 25 ppm	4.76	6.49	10.12	11.94	---
T_2	Benzyl adenine @ 50 ppm	3.92	4.58	6.29	7.33	10.35
T_3	GA_3@ 100 ppm	2.56	3.84	5.60	6.40	7.62
T_4	GA_3 @ 150 ppm	2.29	3.41	4.90	5.79	6.25
T_5	$CaCl_2$ @ 0.5%	3.84	5.96	9.50	10.53	11.96
T_6	$CaCl_2$ @ 1%	2.86	4.24	6.25	7.10	9.90
T_7	Thiabendazole @ 200 ppm	3.34	5.10	7.59	9.10	11.32
T_8	Thiabendazole @ 250 ppm	3.58	5.54	8.90	9.92	12.58
T_9	Hotwater @ 52°C	5.26	8.91	11.02	13.22	---
T_{10}	Control	5.67	10.16	17.85	---	---
	S.Ed	0.11	0.19	0.28	0.29	0.27
	CD (p=0.05)	0.23	0.38	0.56	0.58	0.55

Table 2 : Effect of chemicals and growth regulators on fruit spoilage (%) and shelf life (days) of banana cv. Grand Naine

Tr. No	Treatment details	Fruit spoilage (%)					Shelf life (days)
		3rd day	6th day	9th day	12th day	15th day	
T_1	Benzyl adenine @ 25 ppm	---	31.25	57.50	75.00	87.50	12.82
T_2	Benzyl adenine @ 50 ppm	---	12.50	33.45	50.00	56.25	16.90
T_3	GA_3 @ 100 ppm	---	0.00	25.00	31.25	37.50	17.97
T_4	GA_3 @ 150 ppm	---	0.00	12.50	25.00	31.25	18.64
T_5	$CaCl_2$ @ 0.5%	---	25.00	50.00	68.70	81.00	14.73
T_6	$CaCl_2$ @ 1%	---	0.00	31.25	48.75	54.50	17.39
T_7	Thiabendazole @ 200 ppm	---	13.90	43.75	54.45	62.48	16.22
T_8	Thiabendazole @ 250 ppm	---	18.75	53.75	62.50	75.00	15.51
T_9	Hotwater @ 52°C	---	34.37	62.50	81.25	---	11.08
T_{10}	Control	12.50	37.50	68.75	---	---	9.00
	S.Ed	0.08	0.61	1.41	1.67	1.49	0.24
	CD (p=0.05)	0.17	1.22	2.83	3.34	2.99	0.48

Table 3 : Effect of chemicals and growth regulators on TSS (°Brix), Acidity (%), Ascorbic acid (mg per 100 g) of banana cv. Grand Naine.

Tr. No	Treatment details	TSS (°Brix)	Acidity (%)	Ascorbic acid (mg per 100 g)
T_1	Benzyl adenine @ 25 ppm	---	---	---
T_2	Benzyl adenine @ 50 ppm	18.34	0.41	5.86
T_3	GA_3@ 100 ppm	21.18	0.49	6.43
T_4	GA_3@ 150 ppm	22.78	0.54	6.75
T_5	$CaCl_2$ @ 0.5%	15.28	0.29	4.98
T_6	$CaCl_2$ @ 1%	18.49	0.43	6.08
T_7	Thiabendazole @ 200 ppm	16.45	0.37	5.57
T_8	Thiabendazole@ 250 ppm	17.38	0.33	5.26
T_9	Hotwater @ 52°C	---	---	---
T_{10}	Control	---	---	---
	S.Ed	0.41	0.015	0.13
	CD (p=0.05)	0.83	0.031	0.26

References

Abdullha, H.M.A.; Rohaya, M.A. and Zaipun, M.Z. (1985). Physiochemical changes during maturation and after ripening of bananas (*Musa sapientum* cv. Embun). MARDI Research Bulletin, 13(3): 341-347.

Ahmed, M.J.; Singh, Z. and Khan, A.S. (2009). Postharvest Aloe Vera gel coating modulates fruit ripening and quality of Arctic Snow nectarine kept in ambient and cold storage. Intl. J. Food Sci. Technol., 44: 1024-1033.

Bhaleroa, P.P. and Parmar, B.R. (2011). Effect of growth regulators on post harvest life of banana cv. Grand naine. The Asian. J. Hort., 6(2): 283-287.

HariKumar, V. and Dilipbabu, J. (2014). Effect of modified atmosphere packing on ascorbic acid and organoleptic evaluation of banana Cv. Grand Naine at different storage conditions. Green Farming, 5(1): 133-135.

Islam, M.S. (1998). Storage life and quality of banana as affected by packaging and coating materials. M.Sc. Thesis, Institute of Postgraduate Studies in Agriculture, Salna, Gazipur, Bangladesh.

Lipsa, P.B.; Das, A.K.; Dash, D.K.; Dash, S.N.; Swain, S. and Pradhan, B. (2018). Influence of post-harvest application of GA_3 and Ca on shelf-life of banana (*Musa spp.)* cv. Grand Naine. J. Pharmacognosy and Phytochem., 7(2): 3132-3135.

Magdaline, F.V.; Sreenarayanan, V. and Easwaran, S. (1998). Modified atmosphere packaging in banana. Agro India, Sep:26.

Nirupama, P.; Neeta, B.G. and Ramana Rao, T.V. (2010). Effect of post harvest treatments on physiological Characteristics and shelf life tomato fruits during storage. American-Eurasian J. Agri. Environ. Sci., 9(5): 470-479.

Patil, D.L. and Magar, N.G. (1976). Physicochemical changes in banana fruit during ripening. J. Maharashtra Agri. Univ., 1: 95-99.

Sarkar, T.; Joshi, V.; Sarkar, T. and Sau, S. (2016). Effect of post-harvest treatments on shelf life and quality of Banana cv. Grand Naine. Intl. J. Agri. Sci., 8(61): 0975-9107.

Srivasta, D.C.; Dalal, N.S.; Subramanayam, H. and Souza, S. (1961). Circular No. 40, Central Food Technological Research Institute, Mysore.

Sudha, R.; Amudha, R.; Muthulakshmi, S.; Baby Rani, W.; Indira, K. and Mareeswari, P. (2007). Influence of Pre and Post-Harvest Chemical Treatments on physical characteristics of sapota (*Achras sapota* L.) Var. PKM 1. Res. J. Agri. Biol. Sci., 3(5): 450-452.

Uma, S. (2008). Indigenous Varieties for Export market. Intl. conference on Banana. October 24-26. NRCB. Tamilnadu. India.

Zhang, P.; Whistler, R.L.; BeMiller, J.N. and Hamaker, B.R. (2005). Bananas starch: production, physico-chemical properties and digestibility- a review. Carbohydrate Polymers, 59: 443-458.