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Effect of growth regulators on post-harvest life of banana cv. GRAND NAINE

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Abstract : The post-harvest treatment of GA_3 100 mg l^{-1} with fruits from 1st to 4th basal hands of the bunch (H_1) was found excellent, which did not extend the shelf life and increased the marketability, but also reduced the post harvest losses and obtained maximum ripe fruit percentage, firmness, peel:pulp ratio and organoleptic score in storage period at ambient temperature by without affecting the quality of banana fruits cv. GRAND NAINE.

Key words : Growth regulators, Fruit, Banana

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Banana (*Muza paradisiaca* L.) is one of the most important fruit crops of the world. Its origin is the tropical region of South-East Asia. Banana crop has nutritional, medicinal, industrial as well as aesthetic value in Hindu religion. India is the largest banana consumer and producer in the world. A few main challenges faced by fruit industry are the enormous post-harvest losses, lack of scientific information on handling, packaging system and post-harvest treatments. Out of large number of varieties grown in India, Basari was the most popular variety among growers and consumers. But with the introduction of high yielding variety Grand Naine, the area of Basari is shriveled to greater extent. Grand Naine is the most popular in Gujarat and Maharashtra for domestic market and export. Besides the increasing production of banana, post harvest losses are the major problem. Since, banana is a climacteric and perishable fruit, application of post harvest treatments becomes necessary to extend shelf life with reduction in post-harvest losses. The present investigation was carried out to find out the possibility to improve the shelf life of Grand Naine bananas by post harvest application of certain growth regulators.

RESEARCH METHODS

Fully mature bunches of the Grand Naine variety were used for the trial. The experiment was conducted in Completely Randomized Design with Factorial concept (FCRD). There were three repetitions and nine treatments with one control. Hands of banana were treated with growth regulating substances. All the fingers from the first basal four hands (H_1) and the succeeding four hands (H_2) were mixed together separately to find out whether any quality difference existed between hands of same banana bunch. The fingers of each treatment were dipped in the solutions for about 10 minutes and then taken out and kept separately for ripening at ambient temperature. Control fruits were dipped in distilled water. The quality was assessed with respect to different physiological parameters.

RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation

are summarized in the following sub heads :

Physiological loss in weight (%) (PLW):

The percentage of physiological loss in weight of fruit was increased with increase in storage period irrespective of any treatments (Table 1). However, the increase in weight loss was reduced in all the treated fruits as compared to control. The fruits from 1st to 4th basal hand of bunch (H_1) treated with GA_3 showed reduction in weight loss due to decreased rate of respiration and transpiration. Thus, it might be due to restrictions of ethylene accumulation in the fruits during ripening. The present observation is in conformity with the results reported by Rao and Chundawat (1988), Patil and Hulmani (1998b), Unitthan and Desai (2002) and Patel (2004) in banana.

Ripe fruit percentage:

The data revealed (Table 2) that the minimum percentage of ripe fruit was significantly reduced by GA_3 100 mg l^{-1} (42.53) over all other treatments including control on 12th day of storage. There was gradual increase in ripe fruit percentage was observed during storage. On other hand non-treated control fruits ripened with 100 per cent. The fruits treated with 2,4-D at 20 and 40 mg l^{-1} showed the similar results. Thus 2,4-D treatments did not exert any significant effect on delay of ripening. The slow rate of ripening might be due to the slow rate of respiration counteracting the production of ethylene responsible for ripening activity. Hence, the ripening events like hydrolysis of starch and the activity of respiratory enzymes like paroxidase were reduced (Rao and Chundawat, 1986, Patil and Hulmani, 1998b, Unitthan and Desai, 2002 and Patel, 2004) in banana which supported the present findings.

Shelf-life of banana fruits (days):

Fruits of 1st to 4th hand exhibited significantly more shelf life than that of fruits from 5th to 8th hands of bunch. Banana fruits treated with GA_3 100 mg l^{-1} took significantly maximum days (15.50) for ripening. This treatment

Table 1 : Effect of post-harvest treatments on physiological loss in weight (%), fruit firmness (kg/cm^2) and marketable fruit percentage of banana cv. Grand Nain

Treatments	PLW (%)				Firmness (kg/cm^2)				Marketable fruit percentage			
	Days after harvesting											
	3rd	6th	9th	12th	3rd	6th	9th	12th	3rd	6th	9th	12th
Hand treatment (H)												
Fruits from 1st to 4th hand of the bunch (H_1)	5.26	9.32	12.20	10.98	73.35	63.07	51.67	30.44	14.33	9.49	5.81	2.69
Fruits from 5th to 8th hand of the bunch (H_2)	5.43	9.49	12.41	11.12	71.36	60.97	50.01	29.56	14.15	9.34	5.70	2.63
S.E.±	0.02	0.03	0.04	0.04	0.036	0.033	0.023	0.010	0.23	0.21	0.19	0.12
C.D. (P=0.05)	0.06	0.10	0.12	0.10	0.66	0.61	0.55	0.36	0.10	0.097	0.068	0.028
Chemical treatments (C)												
2,4,5-T 40 mg l^{-1}	5.65	9.82	12.62	17.74	14.17	9.30	5.73	3.49	73.74	63.20	50.87	36.91
2,4,5-T 60 mg l^{-1}	5.46	9.64	12.19	17.49	13.94	9.05	5.16	3.27	70.69	59.99	47.15	34.80
2,4 -D 20 mg l^{-1}	6.28	10.47	13.71	0.00	13.35	8.66	4.88	0.00	61.51	53.96	42.81	0.00
2,4 -D 40 mg l^{-1}	5.98	10.10	13.34	0.00	12.93	8.31	4.21	0.00	65.76	56.82	44.76	0.00
GA_3 50 mg l^{-1}	4.02	7.69	10.67	15.54	15.38	10.23	6.85	4.57	80.25	69.63	60.82	57.00
GA_3 100 mg l^{-1}	3.90	7.51	10.45	15.32	15.76	10.61	7.02	4.85	87.55	71.39	62.84	59.00
NAA 50 mg l^{-1}	4.97	9.14	11.66	16.53	14.34	9.67	6.28	3.81	74.99	65.65	53.60	40.15
NAA 100 mg l^{-1}	5.17	9.36	11.95	16.85	14.75	9.99	6.65	4.00	77.75	67.09	55.65	42.15
Control	6.69	10.96	14.18	0.00	13.57	8.94	5.01	0.00	58.95	50.49	39.13	0.00
S.E.±	0.04	0.07	0.09	0.08	0.075	0.072	0.050	0.021	0.49	0.45	0.41	0.27
C.D. (P=0.05)	0.12	0.20	0.26	0.22	0.21	0.20	0.14	0.06	1.42	1.29	1.17	0.77
Interaction (H x C)												
S.E.±	0.06	0.10	0.13	0.11	0.106	0.102	0.070	0.029	0.70	0.63	0.59	0.38
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V. %	1.94	1.84	1.79	1.71	1.28	1.88	2.12	1.89	1.68	1.77	1.97	2.18

NS=Non-significant

extended the ripening period by 6.00 days over control. Gibberellic acid might have controlled the ethylene production as well as enzymatic activity resulting into reduction in ripening process. Corroborative results were obtained by Madhava Rao and Rama Rao (1979), Patil and Hulmani (1998b), Rao and Chaundawat (1991), Unitthan and Desai (2002), Patel (2004) in banana.

Marketable fruit percentage:

The fruit of 1st to 4th hands (H_1) was significantly more marketable (14.33) than the fruits from 5th to 8th hands (H_2) treatment. It is revealed that the highest percentage of marketable fruits on 3rd , 6th , 9th and 12th day of storage recording 87.55, 71.39, 62.84 and 54.00, respectively in GA_3 100 mg l^{-1} treatment.

Further there was gradual reduction in marketable fruits with the increase in the storage period. On the contrary the fruits of both the treatments of 2,4-D and control were not marketable at 12th day of storage. The Gibberellic acid might have controlled the ethylene production as well as enzymatic activity. Reduction in respiration and transpiration activities might have reduced the ripening process and shriveling of skin. This treatment significantly affected and the fruits retained at better marketable quality. This was in line with the finding of Das *et al.* (1996), Unitthan and Desai (2002) and Patel (2004) in banana.

Fruit firmness (kg/cm²):

Banana fruits of Grand Naine variety showed the maximum firmness (Table 1) in treatments of hands and different growth regulators. The highest firmness was found at the fruits treated with GA_3 100 mg l^{-1} (15.76) on 3rd day of storage and declined upto 12th day of storage. The fruit firmness gradually decreased during storage period, evidently due to advancement of ripening, senescence and break down in the later case. An exogenous application of GA_3 reduced the ethylene level in fruits. Higher level of ethylene may cause softening of cell wall and decrease the firmness of fruit. GA_3 retarded degradation of polymers like starch, cellulose and hemi-cellulose, thus maintaining the firmness of fruit. The results are in agreement with those of Patil and Hulmani (1998a), Unitthan and Desai (2002), Patel (2004) in banana.

Peel: Pulp ratio (%):

The results of the present studies (Table 2) indicated that peel:pulp ratio was significantly higher in the H_1 fruits

Table 2 : Effect of post-harvest treatments on peel : pulp ratio (%), ripe fruit percentage and shelf-life (days) of banana cv. Grand Nain

Treatments	Peel : Pulp ratio (%)				Ripe fruit percentage			Shelf-life (days)
	Days after harvesting							
	3rd	6th	9th	12th	6th	9th	12th	
Hand treatment (H)								
Fruits from 1st to 4th hand of the bunch (H_1)	1.90	1.97	2.42	2.13	10.57	30.43	69.38	12.80
Fruits from 5th to 8th hand of the bunch (H_2)	1.87	1.94	2.36	2.07	10.73	30.74	70.05	12.39
S.E.±	0.007	0.006	0.009	0.007	0.04	0.09	0.17	0.05
C.D. (P=0.05)	0.021	0.020	0.026	0.022	0.11	0.26	0.50	0.16
Chemical treatments (C)								
2,4,5-T 40 mg l^{-1}	1.79	1.83	2.06	2.73	9.08	28.14	62.85	13.25
2,4,5-T 60 mg l^{-1}	1.73	1.79	2.02	2.60	9.37	29.76	79.60	12.33
2,4 -D 20 mg l^{-1}	1.69	1.76	1.93	0.00	9.97	34.92	100.00	9.83
2,4 -D 40 mg l^{-1}	1.95	2.00	2.20	0.00	9.71	31.92	100.00	10.21
GA_3 50 mg l^{-1}	1.88	1.96	2.16	2.92	7.85	21.49	43.40	14.62
GA_3 100 mg l^{-1}	1.99	2.08	2.92	3.29	7.10	21.22	42.53	15.50
NAA 50 mg l^{-1}	2.10	2.19	3.10	3.46	8.94	26.96	50.95	13.75
NAA 100 mg l^{-1}	2.22	2.32	3.29	3.93	8.65	26.70	48.15	14.37
Control	1.63	1.69	1.87	0.00	25.18	54.19	100.00	9.50
S.E.±	0.016	0.015	0.019	0.017	0.07	0.19	0.37	0.12
C.D. (P=0.05)	0.044	0.042	0.055	0.048	0.22	0.55	1.06	0.34
Interaction (H x C)								
S.E.±	0.022	0.021	0.027	0.023	0.11	0.27	0.52	0.17
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
C.V. %	2.03	1.82	1.97	1.93	1.79	1.53	1.30	2.30

NS=Non-significant

Table 3: Effect of post harvest treatments on orgenoleptic test of banana fruits cv. Grand Nain

Treatments	Flavour	Taste	Colour of skin	Colour of pulp	Texture	Over all acceptability
Hand treatment (H)						
Fruits from 1st to 4th hand of the bunch (H_1)	8.00	8.45	8.29	8.39	7.61	8.15
Fruits from 5th to 8th hand of the bunch (H_2)	7.42	7.87	7.00	7.16	7.02	7.28
S.E.±	0.028	0.032	0.029	0.028	0.025	0.027
C.D. (P=0.05)	0.080	0.091	0.083	0.080	0.071	0.077
Chemical treatments (C)						
2,4,5-T 40 mg l^{-1}	7.72	8.20	7.67	7.77	7.32	7.73
2,4,5-T 60 mg l^{-1}	7.67	8.12	7.61	7.69	7.27	7.67
2,4 -D 20 mg l^{-1}	7.58	7.90	7.20	7.23	7.18	7.42
2,4 -D 40 mg l^{-1}	7.62	8.05	7.34	7.44	7.22	7.53
GA_3 50 mg l^{-1}	7.88	8.39	8.15	8.24	7.48	8.03
GA_3 100 mg l^{-1}	7.90	8.42	8.20	8.35	7.50	8.07
NAA 50 mg l^{-1}	7.75	8.27	7.75	7.85	7.35	7.79
NAA 100 mg l^{-1}	7.85	8.31	7.94	8.04	7.45	7.92
Control	7.45	7.83	6.96	7.11	7.05	7.28
S.E.±	0.059	0.067	0.062	0.059	0.052	0.057
C.D. (P=0.05)	0.170	0.192	0.177	0.170	0.150	0.164
Interaction (H x C)						
S.E.±	0.084	0.095	0.087	0.084	0.074	0.081
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS
C.V. %	1.88	2.01	1.97	1.88	1.75	1.81

NS=Non-significant

treated with NAA as compared to H_2 with control. The probable reason might be due to more supply of photosynthates and faster conversion of carbohydrates. Similar results were obtained by Parmar and Chundawat (1984) and Patel (2006) in banana.

Organoleptic test:

The data showed (Table 3) the organoleptic characters like fruit flavour, taste, colour of skin, colour of pulp, texture and overall acceptability showed the highest score in fruits from 1st to 4th hands of bunch (H_1) treated with GA_3 100 mg l^{-1} among other hands and growth regulators, when fruits were ripened. The reason for maintaining the firmness for longer time and recording the higher score for organoleptic characters might be due to chemical treatment. The results for organoleptic characters are in agreement with those reported by Roy *et al.* (1980), Puttaraju and Reddy (1997), and Vala (2002) in mango.

REFERENCES

Das, S., Dora, D.K., Das, B.K., Acharya, G.C. and Ray, D.P. (1996). Effect of chemicals and polythene on the storage behavior of banana cultivars. Paper presented in National Seminar on Plant Bioregulators in Horticulture. 29 February-March 2, 1996. Society for Advancement of Horticulture, B. C. K. V., Kalyani, West Bengal. pp. 149-153.

Madhava Rao, D. and Rama Rao, M. (1979). Post-harvest changes in banana cv. ROBUSTA. *Indian J. Hort.,* **36** : 387-393.

Parmar, B.R. and Chundawat, B.S. (1984). Effect of growth regulators and sleeving on maturity and quality of banana cv. BASARI. *South Indian Hort.,* **32** (4) : 201-204.

Patel, C.M. (2006). Effect of post shooting treatments on yield, quality and maturity of banana (*Musa paradisiaca* L.) cv. GRAND NAINE. M.Sc. (Hort.) Thesis, Navsari Agricultural University, NAVSARI, GUJARAT (India).

Patel, N.I. (2004). Effect of some chemicals and growth regulators on post-harvest life of banana (*Musa paradisiaca* L.) cv. GRAND NAINE. M.Sc. (Hort.) Thesis, Navsari Agricultural University, NAVSARI, GUJARAT (India).

Patil, S.N. and Hulmani, N.C. (1998a). Effect of post-harvest treatments on the storage of banana fruits. *Karnataka J. Agric. Res.,* **11** (1) : 134-138.

Patil, S.N. and Hulmani, N.C. (1998b). Effect of post-harvest treatments on physical characters and shelf-life of banana fruits. *Karnataka J. Agric. Sci.,* **11** (2) : 535-537.

Puttaraju, T.B. and Reddy, T.V. (1997). Effect of pre-cooling on the quality of mango (cv. MALLIKA). *J. Food Sci.Technol.,* **34** (1) : 24-27.

Rao, D.V.R. and Chundawat, B.S. (1986). Effect of certain chemical retardants on ripening changes of banana cv. LACATAN at ambient temperatures. *Prog. Hort.,* **18** (3-4) : 189-195.

Rao, D.V.R. and Chundawat, B.S. (1988). Post-harvest behaviour of banana bunches of cv. BASRAI in response to certain chemical and packaging treatment. *GA.U. Res. J.,* **14** (1) : 42-48.

Rao, D.V.R. and Chundawat, B.S. (1991). Chemicals regulation of ripening in banana bunches cv. 'LACATAN' at non-refrigerated temperature. *Haryana J. Hort. Sci.,* **20** (1- 2) : 6-11.

Roy, B.N., Biswas, S., Saha, S.K. and Pramanick, S. (1980). Effect of hot water with captan on the storage and quality of mango fruits cv. LANGRA and SAFDERPASAND. *South Indian J. Hort.,* **28** (1) : 5-7.

Unnithan, V.V. and Desai, M.M. (2002). Post-harvest application of chemicals to improve the shelf-life of banana (*Musa paradisica* L.) cv. 'DWARF CAVENDISH'. *Guj. J. Applied Hort.,* **1** (1) : 23-33.

Vala, K.V. (2002). Post-harvest investigation in mango cv. Kesar. M.Sc. (Ag.) Thesis, Gujarat Agricultural University, S.K. NAGAR, GUJARAT (India).

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