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Effect of Post Harvest Treatments on Biochemical Changes of Mango (cv. Kesar) Fruit During Storage.

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Abstract

An experiment was carried out with a view to find out the effect of post harvest treatments on biochemical changes for maintaining quality mango of fruits, under the influence of various 12 treatments. Matured freshly harvested mango fruits of uniform size were treated with different treatments and kept for drying under shade for 30 minutes at ambient temperature (35 ± 2 °C) in Corrugated Fibre Board (CFB) boxes. The quality of fruits was improved by various growth regulator treatments. The fruits treated with Ethrel increases TSS, reducing sugar, total sugar at initial stage of storage. While GA3 increased TSS, reducing sugar, total sugar and acidity at later stage of storage. Neem leaf extract 10% recorded maximum ascorbic acid content. The treatment Ethrel 500 ppm is most beneficial for ripening, quality and early marketability, however GA3 250 ppm is better for increasing shelf life, quality and marketability of fruits as post harvest treatments before storage.

Key words: Mango, TSS, Reducing sugar, Total sugar, Acidity, Ascorbic acid, Gebberellic Acid, Ethrel, Neem Leaf Extract.

1. Introduction

Mango has high nutritional value among the fruits and is considered to be a good source of vitamins A, B and C; minerals, digestible sugars and trace elements. Its taste, flavor and aroma are fascinating to every one, due to these naturally built in qualities, it has high demand in global market. Due to changes in the habits of people and awareness in growers, export of mango is now gaining global popularity. India has nearly 1000 varieties grown in an area of 1.23 million hectares and produces 14 million tonnes of mango contributing more than 57 per cent share of the world production, (Anonymous, 2007). In the year 2006-07 India exported 0.079 million tones of mangoes worth Rs. 141.94 crores (APEDA, 2007). Post harvest handling can play a major role in reducing post harvest losses. The environmental consciousness on the part of scientists and general public awareness towards the increasing use of chemicals on food stuff and their deleterious effect on human and environment are driving force to find the use of suitable, eco-friendly and minimum risk agents for ripening and storage of fruits. The studies were, therefore, undertaken to find out the the effects of different treatments on biochemical changes of mango fruit cv. 'Kesar'.

2. Materials and Methods

The investigation was carried out Green mature fruits of uniform size, shape and free from mechanical damage, bruises, sun burns and fungal/insect attacks having specific gravity between 1.0 and 1.04 were selected from cv. Kesar Mango orchard. These were

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harvested before a day of treatment. The experiment was conducted in a Completely Randomized Design (CRD) with three repetitions. The treatments were given as post harvest dips viz., control (T_1) without any treatment and others were Gibberellic acid 250 (T_2), 500 (T_3) & 750 (T_4) ppm, Ethrel 500 (T_5), 750 (T_6) & 1000 (T_7) ppm, Neem Leaf Extract 5 (T_8) & 10 (T_9) %, Hot Water 50 ± 2 ºC (T_{10}), Carbendazim 500 ppm (T_{11}), Hot Water 50 ± 2 ºC in combination with Carbendazim 500 ppm (T_{12}) dipped in their respective solutions for 10 minutes then air dried for 30 minutes. Treated fruits were packed in Corrugated Fibre Board (CFB) boxes along with paper as cushioning material and stored in the laboratory at room temperature. The fruits were selected from each lot at a time and used for biochemical tests. The various observations were recorded with the standard procedures given by (Ranganna, 2000). Analysis was done before treatments were applied and later at 3 days interval and all the observations were recorded till the fruits were over ripe. The data were statistically analyzed as per the method described by Panse and Sukhatme (1985).

3. Results and Discussion

There was increase in TSS in Ethrel 1000 ppm treated fruits due to accumulation of sugar as consequence of starch hydrolysis, while the later it decreased due to consumption of sugar for respiration during storage, (Selvaraj *et al.* 1989). During the later phase TSS was observed higher in GA_3 750 ppm. GA_3 reduced the rate of hydrolysis of starch and delay ripening in the starting phases the results of Reddy and Haripriya (2002).

Maximum percentage of reducing and total sugar was recorded in Ethrel 1000 ppm at initial stages and GA_3 750 ppm at later stages. It is corroborated to the fact that the treatments stimulated the rate of starch hydrolysis and increased rate of respiration and oxidation might be responsible for retention of sugars during, storage. (Mann, 1985). It can also be observed that reducing sugars and total sugar content were reduced in the later period of storage. This may be due to their rapid utilization in respiration (Soule and Haltton, 1955).

The loss of acids was also rapid and titrable acidity showed a continuous decrease, such as rapid decline in organic acids suggests their faster utilization in the process of respiration. Mango is a climatric fruit an on increased respiration will be exposed in the post-harvest stage (Meddicott and Thompson, 1985). Minimum acidity was observed in fruits treated with Ethrel 1000 ppm, which is because Ethrel enhances the starch degradation and respiration process during ripening, therefore retained lower percentage of acidity in fruits. (Kulkarni *et al.*, 2004).

The ascorbic acid content of fruits decreased gradually during storage in all the treatments, these all might have happened due to rapid conversion of L-ascorbic acid in to dehydro-ascorbic acid in the presence of enzyme ascorbinase with different level of oxidation in different treatments (Mapson, 1970). Minimum ascorbic acid was recorded in Ethrel 1000 ppm (Srinivasan *et al.*, 1973). Higher level of sugar in Ethrel treated fruits might be the possible reason for decrease in ascorbic acid because it is synthesized from sugar. Maximum ascorbic acid content was observed in Neem leaf extract 10%. The Neem leaf

extract treatment retards the ripening process and slow down the respiration of fruits and therefore higher level of ascorbic acid were observed, (Jain and Mukherjee, 2001).

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Table 1: Effect of post harvest treatments on Acidity (%) and ascorbic acid (mg/100g) of mango (cv. Kesar) fruit during storage.

Treatments	Acidity (%)								ascorbic acid (mg/100g)							
	Storage period (days)															
	0	3	6	9	12	15	18	21	0	3	6	9	12	15	18	**21**
T_1	3.50	2.94	2.85	2.54	1.25	0.96	0.48	0.00	74.00	71.54	70.56	69.71	59.32	43.94	42.65	**0.00**
T_2	3.48	3.11	2.97	2.65	2.36	1.51	0.87	0.31	76.35	71.60	70.60	69.84	64.77	49.97	42.75	**39.63**
T_3	3.49	3.14	2.98	2.66	2.37	1.52	0.88	0.32	76.39	71.61	70.62	69.91	64.80	52.00	42.79	**39.64**
T_4	3.49	3.16	3.00	2.68	2.39	1.54	0.91	0.33	76.53	71.63	70.63	69.93	64.83	52.06	42.81	**39.68**
T_5	3.49	2.71	2.67	1.40	1.00	0.64	0.26	0.18	76.38	69.09	67.94	58.61	53.64	41.60	40.28	**38.90**
T_6	3.48	2.69	2.65	1.38	0.97	0.61	0.23	0.17	76.55	67.86	66.54	55.40	50.80	39.90	39.34	**38.50**
T_7	3.49	2.68	2.64	1.37	0.96	0.60	0.22	0.16	76.39	67.80	66.50	55.38	50.63	39.86	39.27	**38.45**
T_8	3.47	2.97	2.87	2.56	1.27	0.98	0.50	0.25	76.40	71.58	70.58	69.80	62.95	48.30	42.71	**39.62**
T_9	3.49	3.00	2.88	2.58	1.28	1.00	0.55	0.28	76.31	71.67	70.67	69.94	64.86	52.10	42.84	**39.94**
T_{10}	3.50	2.70	2.66	1.39	0.98	0.62	0.25	0.00	76.36	67.89	66.60	55.44	50.84	39.93	39.47	**0.00**
T_{11}	3.49	2.95	2.86	2.55	1.26	0.97	0.49	0.24	76.50	71.57	70.57	69.76	61.14	46.61	42.69	**39.60**
T_{12}	3.48	2.82	2.76	2.47	1.10	0.91	0.32	0.21	76.39	70.30	69.25	60.44	55.48	43.27	41.63	**39.25**
S.Em. ±	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.97	0.41	0.45	0.55	0.62	0.57	0.34	**0.12**
C.D. at 5 %	NS	0.10	0.08	0.06	0.06	0.07	0.05	0.02	NS	1.20	1.30	1.60	1.80	1.66	1.00	**0.34**
C.V. %	**0.80**	**1.98**	**1.79**	**1.56**	**2.48**	**4.30**	**6.20**	**6.26**	**2.20**	**1.01**	**1.20**	**1.47**	**1.82**	**2.15**	**1.43**	**0.61**

Table 2: Effect of post harvest treatments on reducing sugar (%) and total sugar (%) of mango (Cv. Kesar) fruit during storage.

Treatments	Reducing sugar (%)								Total sugar (%)							
	Storage period (days)															
	0	3	6	9	12	15	18	21	0	3	6	9	12	15	18	**21**
T_1	3.07	3.16	3.65	4.38	4.84	4.31	4.28	0.00	6.00	7.74	9.31	14.04	16.53	13.90	13.88	**0.00**
T_2	3.12	3.06	3.59	4.27	4.78	5.70	5.65	5.59	6.31	7.66	9.24	13.92	16.45	17.08	17.03	**18.13**
T_3	3.08	3.05	3.58	4.26	4.77	5.22	5.20	5.14	6.34	7.65	9.22	13.90	16.44	15.98	15.96	**16.48**
T_4	3.24	3.02	3.57	4.24	4.76	5.20	5.18	5.12	6.41	7.64	9.20	13.89	16.43	15.94	15.92	**16.43**
T_5	2.71	3.30	3.72	4.50	4.91	4.90	4.89	4.83	6.33	7.81	9.41	14.15	16.63	15.26	15.24	**15.19**
T_6	3.06	3.52	3.82	4.70	5.01	4.75	4.72	4.74	6.30	7.94	9.59	15.16	16.80	14.92	14.90	**14.85**
T_7	2.88	3.72	3.92	4.90	5.10	4.60	4.57	4.61	6.37	8.05	10.72	15.33	16.94	14.58	14.56	**14.51**
T_8	2.87	3.09	3.61	4.30	4.80	5.37	5.32	5.31	6.28	7.68	9.26	13.95	16.47	16.32	16.30	**16.98**
T_9	2.81	3.08	3.60	4.29	4.79	5.66	5.54	5.48	6.29	7.67	9.25	13.94	16.46	17.00	16.97	**18.05**
T_{10}	3.07	3.32	3.73	4.52	4.92	4.46	4.43	0.00	6.32	7.83	9.43	14.17	16.65	14.24	14.22	**0.00**
T_{11}	2.74	3.10	3.62	4.32	4.81	5.52	5.40	5.34	6.29	7.69	9.27	13.97	16.48	16.66	16.64	**17.58**
T_{12}	2.97	3.29	3.71	4.49	4.90	5.05	5.02	4.96	6.28	7.80	9.40	14.14	16.62	15.60	15.58	**15.95**
S.Em. ±	0.12	0.06	0.03	0.05	0.03	0.04	0.03	0.02	0.17	0.03	0.04	0.05	0.04	0.11	0.10	**0.04**
C.D. at 5 %	NS	0.18	0.08	0.15	0.08	0.13	0.10	0.05	NS	0.10	0.12	0.16	0.13	0.32	0.30	**0.10**
C.V. %	**7.18**	**3.32**	**1.32**	**2.04**	**1.03**	**1.53**	**1.16**	**0.69**	**4.55**	**0.75**	**0.75**	**0.66**	**0.46**	**1.22**	**1.14**	**0.45**

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Table 3: Effect of post harvest treatments on total soluble solids (%) of mango (cv. Kesar) fruit during storage

Treatments	Storage period (days)							
	0	3	6	9	12	15	18	21
T_1	8.49	9.34	10.71	12.78	15.91	17.65	17.55	16.61
T_2	8.21	9.12	10.45	11.52	14.95	16.97	18.72	17.78
T_3	8.20	9.11	10.43	11.50	14.90	16.96	18.96	18.01
T_4	8.19	9.04	10.33	11.08	14.56	16.94	18.98	18.04
T_5	8.08	9.46	10.87	13.61	16.55	18.61	18.57	17.63
T_6	8.11	9.49	10.89	13.64	16.58	18.67	18.65	17.72
T_7	8.12	9.51	10.90	13.66	16.60	18.70	18.67	17.73
T_8	8.21	9.20	10.56	11.95	15.28	17.33	17.28	16.34
T_9	8.17	9.14	10.47	11.54	14.98	17.01	18.71	17.77
T_{10}	8.19	9.48	10.88	13.62	16.57	18.65	18.61	17.67
T_{11}	8.39	9.27	10.65	12.37	15.60	17.98	17.73	16.79
T_{12}	8.07	9.40	10.79	13.20	16.23	18.30	18.08	17.14
S.Em. ±	0.28	0.02	0.02	0.13	0.10	0.07	0.01	0.01
C.D. at 5 %	NS	0.05	0.07	0.37	0.28	0.20	0.03	0.03
C.V. %	5.81	0.31	0.37	1.73	1.05	0.67	0.10	0.11

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