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RESEARCH ARTICLE

EFFECT OF HARVEST MATURITY AND POST HARVEST ETHREL TREATMENT ON RIPENING AND QUALITY OF MANGO CV. SUVARNAREKHA

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ABSTRACT

An Experiment was carried out to investigate the effect of different concentrations of Ethrel (500 ppm, 750 ppm and 1000 ppm) on ripening and quality of mango cv. Suvarnarekha fruits harvested at different stages of maturity (7-9°B TSS stage, 9-11°B TSS stage and 11-13°B TSS stage). The treated fruits were assessed for physicochemical parameters such as physiological loss in weight (%), firmness, TSS (°Brix), titrable acidity, total sugars along with organoleptic evaluation and observations were recorded at an interval of 3 days at ambient temperature. Ethrel treated fruits showed early and uniform ripening thereby enhancing the quality. Mango fruits harvested at 9-11°B TSS stage recorded better physico-chemical parameters and organoleptic score with good flavor, texture and overall acceptability. From the experiment it was concluded that the mango fruits cv. Suvarnarekha harvested at 9-11°B TSS stage and treated with ethrel at @ 500 ppm were significant and superior in quality.

INTRODUCTION

Mango (*Mangifera indica* L.) is considered as one of the choicest fruits of the world because of its attractive colour, delicious taste and excellent nutritional value. The interest in fruit crops has increased due to increase in exports and income potential. Especially mangoes are in increasing commercial importance all over the world. However, errors in determination of harvest maturity and post harvest handling practices are resulting in post harvest damage and consequent economic losses to farmers and exporters. About 30% of fruits and vegetables grown in India get wasted annually due to post harvest losses (Maheshwar and Chanakwa, 2006).

Hence, post harvest management of mangoes is important in conservation and maintenance of quality of this fruit. Keeping these points in forefront, the present investigation was executed with the objectives to find out suitable harvest maturity stage, post harvest ethrel treatment for improving the quality of mango cv. Suvarnarekha.

MATERIALS AND METHODS

The present investigation was carried out at Fruit Research Station, Sangareddy, Medak, Andhra Pradesh during the year 2013. The experiment was planned under completely randomized block design (CRD) with factorial concept replicated thrice with twelve treatments. Mango (*Mangifera indica* L.) cv. Suvarnarekha fruits with uniform size were selected at harvest maturity stage of 7-9°B TSS, 9-11°B TSS and 11-13°B TSS and were treated with three different concentrations of ethrel *i.e*., 500, 750, 1000 ppm and control (water) by dipping for 5 minutes. After treatment, the fruits were air dried and placed in plastic trays and stored at ambient temperature. Analysis was done at an interval of 3 days and all the observations were recorded until the fruit attained a stage that is unsuitable for marketing.

The physico chemical quality parameters like physiological loss in weight, fruit firmness, TSS, titrable acidity, total sugars and organoleptic score were recorded by using standard analytical methods.

RESULTS AND DISCUSSION

Mango cv.Suvarnarekha fruits showed early ripening with different concentrations of ethrel compared to control fruits. The percentage of physiological loss in weight increased with increase in concentration of ethrel.

Ripening was faster in fruits harvested at more mature stage and then subjected to ethrel treatment than those harvested at less mature stage. In the present investigation, mango fruits harvested at 11-13°B TSS stage showed significantly higher weight loss compared to the fruits harvested at early stages of maturity. This is due to higher rates of respiration and transpiration with the advancement of ripening.

Data presented in Table 2 indicated that firmness decreased with the ripening of the fruits.

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Table 1 PLW (%) of mango cv. Suvarnarekha as influenced by (A) maturity stages and (B) post harvest ethrel treatments at subsequent 3rd, 6th and 9th day at ambient temperature.

Treatments	3rd day				6th day				9th day			
	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean
T_1:Ethrel 500 ppm	8.18	9.00	9.49	8.89^{B}	11.49	14.49	15.46	13.81^{B}	22.33	23.06	24.10	23.16^{B}
T_2: Ethrel 750 ppm	8.33	9.42	9.90	9.22^{C}	12.02	15.85	17.28	15.05^{C}	23.12	23.94	24.78	23.95^{B}
T_3:Ethrel 1000 ppm	8.45	9.57	10.13	9.38^{D}	13.36	16.97	18.52	16.28^{D}	23.26	24.15	25.29	24.23^{B}
T_4: Control	6.36	6.59	7.89	6.95^{A}	8.75	9.97	10.69	9.80^{A}	16.25	17.80	21.06	18.37^{A}
MEAN	7.83^{a}	8.65^{b}	9.35^{c}		11.41^{a}	14.32^{b}	15.49^{c}		21.24^{a}	22.24^{b}	23.80^{c}	

Factors	3rd day		6th day		9th day	
	CD	SEm±	CD	SEm±	CD	SEm±
A (Maturity stages)	0.06	0.02	0.67	0.23	0.70	0.24
B (Ethrel treatment)	0.07	0.02	0.78	0.27	0.81	0.28
A* B	0.12	0.04	1.346	0.46	1.41	0.48

Table 2 Firmness (kg cm^{-2}) of mango cv. Suvarnarekha as influenced by (A) maturity stages and (B) post harvest ethrel treatments at subsequent 0, 3rd, 6th and 9th day at ambient temperature.

Treatments	0 day				3rd day				6th day				9th day			
	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean
T_1:Ethrel 500 ppm	7.50	9.83	11.50	9.61	13.25	15.50	16.50	15.08^{B}	15.33	17.75	17.50	16.86^{B}	14.92	16.83	16.33	16.03^{C}
T_2: Ethrel 750 ppm	8.00	10.00	12.17	10.06	15.00	16.50	17.50	16.33^{C}	15.42	17.17	17.33	16.64^{B}	15.17	15.67	16.00	15.61^{B}
T_3:Ethrel 1000 ppm	8.83	10.17	12.17	10.39	17.00	17.50	17.67	17.39^{D}	16.50	16.83	17.03	16.79^{B}	15.25	15.33	15.83	15.47^{B}
T_4: Control	8.17	10.17	12.50	10.28	11.50	12.50	14.08	12.69^{A}	11.42	13.25	14.42	13.03^{A}	14.33	14.50	14.83	14.55^{A}
MEAN	8.13^{a}	10.04^{b}	12.08^{c}		14.19^{a}	15.50^{b}	16.44^{c}		14.67^{a}	16.25^{b}	16.57^{b}		14.92^{a}	15.58^{b}	15.75^{b}	

Factors	0 day		3rd day		6th day		9th day	
	CD	Sem±	CD	SEm±	CD	SEm±	CD	SEm±
A(Maturity stages)	0.94	0.32	0.74	0.25	0.15	0.05	0.21	0.07
B(Ethrel treatment)	N.S.	0.37	0.85	0.29	0.18	0.06	0.25	0.08
A* B	N.S.	0.64	N.S.	0.51	0.31	0.11	N.S.	0.15

Table 3 TSS(°Brix) of mango cv. Suvarnarekha as influenced by (A) maturity stages and (B) post harvest ethrel treatments at subsequent 0, 3rd, 6th and 9th day at ambient temperature.

Treatments	0 day				3rd day				6th day				9th day			
	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean
T_1:Ethrel 500 ppm	7.50	9.83	11.50	9.61	13.25	15.50	16.50	15.08^{B}	15.33	17.75	17.50	16.86^{B}	14.92	16.83	16.33	16.03^{C}
T_2: Ethrel 750 ppm	8.00	10.00	12.17	10.06	15.00	16.50	17.50	16.33^{C}	15.42	17.17	17.33	16.64^{B}	15.17	15.67	16.00	15.61^{B}
T_3:Ethrel 1000 ppm	8.83	10.17	12.17	10.39	17.00	17.50	17.67	17.39^{D}	16.50	16.83	17.03	16.79^{B}	15.25	15.33	15.83	15.47^{B}
T_4: Control	8.17	10.17	12.50	10.28	11.50	12.50	14.08	12.69^{A}	11.42	13.25	14.42	13.03^{A}	14.33	14.50	14.83	14.55^{A}
MEAN	8.13^{a}	10.04^{b}	12.08^{c}		14.19^{a}	15.50^{b}	16.44^{c}		14.67^{a}	16.25^{b}	16.57^{b}		14.92^{a}	15.58^{b}	15.75^{b}	

Factors	0 day		3rd day		6th day		9th day	
	CD	Sem±	CD	SEm±	CD	SEm±	CD	SEm±
A(Maturity stages)	0.53	0.18	0.43	0.15	0.39	0.13	0.45	0.15
B(Ethrel treatment)	N.S.	0.21	0..49	0.17	0.45	0.15	0.52	0.18
A* B	N.S.	0.37	0.86	0.29	0.78	0.27	N.S.	0.31

Table 4 Titrable Acidity (%) of mango cv. Suvarnarekha as influenced by (A) maturity stages and (B) post harvest ethrel treatments at subsequent 0, 3rd, 6th and 9th day at ambient temperature.

Treatments	0 day				3rd day				6th day				9th day			
	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean
T_1:Ethrel 500 ppm	0.64	0.51	0.45	0.53	0.40	0.36	0.30	0.35^{A}	0.32	0.28	0.21	0.27^{A}	0.23	0.21	0.19	0.21^{A}
T_2: Ethrel 750ppm	0.62	0.58	0.49	0.56	0.38	0.32	0.27	0.32^{A}	0.30	0.26	0.19	0.25^{A}	0.23	0.19	0.19	0.20^{A}
T_3:Ethrel1000ppm	0.68	0.56	0.45	0.56	0.36	0.25	0.23	0.28^{A}	0.27	0.21	0.19	0.23^{A}	0.22	0.20	0.17	0.19^{A}
T_4: Control	0.64	0.53	0.49	0.55	0.49	0.47	0.43	0.46^{B}	0.38	0.34	0.33	0.35^{B}	0.25	0.27	0.28	0.27^{B}
MEAN	0.65^{c}	0.54^{b}	0.47^{a}		0.41^{b}	0.35^{a}	0.31^{a}		0.32^{b}	0.27^{a}	0.23^{a}		0.23	0.22	0.21	

Factors	0 day		3rd day		6th day		9th day	
	CD	Sem±	CD	SEm±	CD	SEm±	CD	SEm±
A (Maturity stages)	0.006	0.023	0.059	0.019	0.062	0.021	N.S.	0.013
B (Ethrel treatment)	N.S.	0.026	0.064	0.022	0.072	0.025	0.044	0.015
A* B	N.S.	0.046	N.S.	0.038	N.S.	0.043	N.S.	0.026

Table 5 Total sugars (%) of mango cv. Suvarnarekha as influenced by (A) maturity stages and (B) post harvest ethrel treatments at subsequent 0, 3rd, 6th and 9th day at ambient temperature.

Treatments	0 day				3rd day				6th day				9th day			
	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean
T_1:Ethrel 500 ppm	5.11	5.40	5.71	5.41	5.75	8.11	9.22	7.69^{B}	10.13	11.98	11.83	11.31^{B}	9.76	11.89	11.35	11.00^{B}
T_2: Ethrel 750ppm	5.06	5.50	5.73	5.43	7.96	9.26	10.25	9.15^{C}	10.17	11.36	11.74	11.09^{B}	9.87	10.85	11.33	10.68^{B}
T_3:Ethrel 1000ppm	5.09	5.50	5.74	5.45	9.54	11.13	11.63	10.70^{D}	10.36	11.38	11.47	11.06^{B}	10.17	11.08	11.22	10.82^{B}
T_4: Control	5.05	5.41	5.75	5.40	5.72	6.07	6.49	6.09^{A}	8.45	8.68	8.92	8.69^{A}	8.94	9.35	9.59	9.30^{A}
MEAN	5.08^{a}	5.46^{b}	5.73^{c}		7.24^{a}	8.64^{b}	9.39^{c}		9.78^{a}	10.85^{b}	10.99^{b}		9.69^{a}	10.79^{b}	10.87^{b}	

Factors	0 day		3rd day		6th day		9th day	
	CD	Sem±	CD	SEm±	CD	SEm±	CD	SEm±
A (Maturity stages)	0.09	0.03	0.30	0.10	0.45	0.15	0.30	0.10
B (Ethrel treatment)	N.S.	0.03	0.34	0.12	0.52	0.18	0.34	0.12
A* B	N.S.	0.06	0.59	0.20	N.S.	0.31	0.59	0.20

Table 6 Organoleptic score of mango cv. Suvarnarekha as influenced by (A) maturity stages and (B) post harvest ethrel treatments at subsequent 0, 3rd, 6th and 9th day at ambient temperature.

Treatments	0 day				3rd day				6th day				9th day			
	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean	7-9°B TSS (M_1)	9-11°B TSS (M_2)	11-13°B TSS (M_3)	Mean
T_1:Ethrel 500 ppm	2.67	3.67	3.67	3.33	3.33	6.33	7.33	5.68 B	6.00	8.67	7.00	7.22 B	2.33	5.67	4.00	4.00 B
T_2: Ethrel 750 ppm	2.67	3.67	3.67	3.33	5.67	6.67	7.33	6.56 C	5.67	7.67	6.67	6.67 B	2.33	4.333	3.33	3.33 A
T_3:Ethrel 1000 ppm	2.67	3.33	4.00	3.33	5.67	7.33	7.67	6.89 C	4.00	7.00	6.33	6.33 B	3.00	3.67	3.00	3.00 A
T_4: Control	2.67	3.67	4.00	3.44	2.33	4.33	4.67	3.78 A	2.33	4.67	5.00	5.00 A	2.00	4.00	3.67	3.67 B
MEAN	2.67 a	3.58 b	3.83 b		4.25 a	6.17 b	6.75 c		4.50 a	7.00 c	6.25 b		2.42 a	4.42 c	3.50 b	

Factors	0 day		3rd day		6th day		9th day	
	CD	Sem±	CD	SEm±	CD	SEm±	CD	SEm±
A(Maturity stages)	0.44	0.15	0.49	0.17	0.56	0.19	0.51	0.17
B(Ethrel treatment)	N.S.	0.17	0.56	0.19	0.65	0.22	0.58	0.20
A* B	N.S.	0.30	0.97	0.33	N.S.	0.38	1.01	0.35

The results shown that fruits treated with ethrel @ 1000 ppm undergone complete softening on 3rd day but the spoilage percentage also increased indicating less shelf life. Fruits harvested at 9-11°B TSS stage developed good quality characteristics with 500 ppm. Similar results were also obtained by Suresh Nair and Zora Singh (2004) in mango. This is due to the changes in the pectin substances cementing the cell walls and hydrolysis of starch due to enhanced activity of enzymes during ripening.

It is evident from the data that as the days of storage progressed TSS and total sugar content increased up to ripe stage and declined thereafter during storage at ambient temperature. Mango fruits treated with ethrel at a concentration of 1000 ppm recorded sudden increase in TSS and total sugars but ethrel at 500 ppm maintained optimum TSS and total sugars up to the end of shelf life. The increase in TSS and total sugars may be attributed to the conversion of starch and other polysaccharides into sugars (Mukherjee and Dutta, 1967). The subsequent decrease is owed to the metabolic breakdown as a result of respiratory process leading to senescence of the fruit. Mango fruits harvested at 7-9°B TSS recorded a lower TSS and total sugars throughout the ripening period as compared to the fruits harvested at later stages but ethrel induced ripening in mango fruits irrespective of stages of maturity due to activation of hydrolytic enzymes that convert starch and other polysaccharides into sugars. Among the combination treatments, fruits harvested at 9-11°B TSS stage treated with 500 ppm reported highest TSS of 17.75°B and 16.83°B on 6th and 9th day respectively.

Mango fruits treated with ethrel exhibited less titrable acidity than the control fruits. The acid content decreased with increase in concentration of ethrel.

In organoleptic evaluation, higher scores were observed in the fruits harvested at 11-13°B stage and 9-11°B stage on 3rd and 6th day respectively. Ethrel treated fruits recorded higher organoleptic scores in terms of flavor, appearance, colour, texture and taste as compared to control. Despite of their pleasant flavor, pulp colour and general acceptance, mango cv. Suvarnarekha fruit fail to develop full yellow colour in peel on ripening due to incomplete degradation of chlorophyll which is characteristic of this variety. However, ethrel treated mango fruits recorded the highest colour score of peel and pulp as compared to control. Ethrel increased the permeability of the external tissue and enzymatic activity responsible for carotene synthesis which was in agreement with findings of Wasim Siddiqui and Dhua, (2009) in mango. The pulp colour of mangoes harvested at 7-9°B TSS stage showed significantly lower score than the fruits harvested at later stages of maturity throughout the ripening period. The delay in yellow colour development in fruits harvested at early stage of maturity could be due to the enzymes related to ripening having not been fully synthesized or even inactivated. Among the treatment combinations, fruits harvested at 9-11°B TSS and treated with ethrel at a concentration of 500 ppm reported higher organoleptic scores.

Based on TSS, sugars and overall acceptability it can be concluded that mango fruits harvested at 9-11°B TSS, treated with 500 ppm of ethrel were superior in maintaining the quality and shelf life of mango cv. Suvarnarekha at ambient temperature.

References

1. Maheshwar, C. and Chanakwa, T.S. 2006. Post harvest losses due to gaps in cold chain in India –A Solution. Acta Horticulturae. 712: 777-784.
2. Mukherjee, S.K. and Dutta, M.N. 1967. Physico-chemical changes in Indian guavas (Psidium guajava L.) during fruit development. Current Science. 24: 674-675.
3. Suresh Nair and Zora Singh. 2003. Pre-storage ethrel dip reduces chilling injury, enhances respiration rate, ethylene production and improves fruit quality of 'Kensington' mango. Journal of Food, Agriculture & Environment. 1(2): 93-97.
4. Wasim Siddiqui and Dhua, R.S. 2009. International conference on Horticulture proceedings. 1641-1644.

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