

Effect of Polypropylene Packaging and Ethrel Treatment on Shelf Life and Quality of Mango Cv. 'Suvarnarekha'

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Abstract: An experiment was conducted to study the effect of polypropylene packaging and ethrel treatment on shelf life and quality of mango cv. Suvarnarekha. Fruits were harvested at mature green (9-11^oB TSS) stage and treated with 500 ppm of ethrel and packed in polypropylene bags of 100 and 150 gauge with 1, 2 and 3% ventilation and stored at ambient condition. Periodical observations were recorded on physical parameters such as physiological loss in weight (%), firmness, colour score of peel and pulp, shelf life, spoilage, chemical parameters such as TSS (^oBrix), titrable acidity, ascorbic acid, reducing sugars, total sugars along with organoleptic evaluation. Results indicated that polypropylene packaging markedly reduced weight loss as compared to control irrespective of thickness and ventilation. Ethrel induced early, uniform ripening and enhanced the TSS, total sugars, fruit colour and thereby enhancing its organoleptic quality. Polypropylene of 150 gauge with 1% ventilation was the most suitable packaging material for mango cv. Suvarnarekha with reduced physiological loss in weight and spoilage thereby maintaining the quality and extending the shelf life up to 9 days at ambient conditions.

Key words: Mango cv. 'Suvarnarekha', Polypropylene, Ethrel, Shelf life.

INTRODUCTION

Mango (*Mangifera indica* L.) is one of the most important tropical fruit with delicious taste, excellent flavor/aroma, attractive colour and is a rich source of vitamin A and C. Reputed as fruit par excellence, mango has assumed a leading position among commercial fruits and is a valued source of income. India is the largest producer of mango in the world accounting for 2.516 million ha of area with a production of 18.431 million tons and a productivity of 7.3 t ha⁻¹ (NHB, 2014). However, improper post harvest handling practices are resulting in post harvest damage and consequent economic losses to farmers and exporters (Santos *et al.*, 2008). About 30% of the fruits and vegetables grown in India (40 million tons amounting to US\$ 13 billion) get wasted annually due to post harvest losses (Maheshwar *et al.*, 2006). Hence, post harvest management of mango fruits is an important aspect to be considered in order to maintain the quality and shelf life of fruits. Various viable technologies

like use of various growth regulators, wax coatings, different types of packing materials, modified and controlled atmosphere storage *etc.* are available among which polypropylene packaging was found to be one of the most economical method for improving the shelf life and marketability of fruits. Ethrel has been found to induce early and uniform ripening thereby enhancing the marketable quality in many fruits (Das *et al.*, 2011; Madhavi *et al.*, 2005). Appropriate ventilation could prevent the undesirable effect of the polypropylene film on fruit ripening particularly at ambient temperature. Hence, the present study is aimed to study the effect of polypropylene packaging and ethrel treatment on shelf life and quality of mango cv. Suvarnarekha.

MATERIALS AND METHODS

The present investigation was carried out at Fruit Research Station, Sangareddy, Medak, Telangana. The experiment was planned under completely randomized block design (CRD) with seven

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treatments replicated five times. Mango (*Mangifera indica* L.) cv. 'Suvarnarekha' fruits with uniform size were selected at green mature (9-11°B TSS) stage and were treated with 500 ppm of ethrel by dipping for 5 minutes. 100 and 150 gauge polypropylene bags of size 35 × 25 cm with 1 per cent, 2 per cent and 3 per cent ventilation were used for packing of mango fruits. Circular holes of 0.2 cm diameter each were made randomly on the surface area of the polypropylene bag.

In each bag, one kg of fruits were kept and sealed by using an electronic sealer and stored at ambient temperature. Unpacked fruits were taken as control. 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, colour score peel and pulp, spoilage, shelf life, TSS, titrable acidity, ascorbic acid, reducing sugars, total sugars and organoleptic score were recorded by using standard analytical methods.

RESULTS AND DISCUSSION

Ethrel induced early and uniform ripening in mango cv. Suvarnarekha fruits by increasing the TSS, reducing sugars, total sugars, colour score of peel and pulp and organoleptic score in terms of flavor, colour, texture, taste and appearance thereby enhancing the marketable quality. Polypropylene packaging reduced the physiological loss in weight remarkably as compared to control fruits (Table 1). The reduced weight loss in polypropylene packaging is due to the prevention of water loss and reduced rate of transpiration. Physiological loss in weight increased with increase in ventilation. Shriveling and wrinkling which are the major constraints of high respiration and transpiration was effectively controlled as a result spoilage was also decreased due to reduced rate of water loss from the pericarp by increasing RH around the package. In polypropylene treatments, fruits packed in 150 gauge with 1% ventilation recorded lowest spoilage of 33.00% (Table 7).

Fruit firmness decreased with storage but was retained for a longer period in polypropylene

packaging as compared to control thereby enhancing its shelf life (Table 2). Among the treatments, mango fruits packed in polypropylene bags of 150 gauge with 1% ventilation recorded higher firmness throughout the end of shelf life *i.e.* upto 9 days.

Titrable acidity and ascorbic acid decreased with increase in storage period irrespective of treatments but there is a slow rate of degradation in acidity in fruits packed in polypropylene bags due to reduced respiration and enzymatic activity, thereby slowing the rate of ripening (Hiwale and Singh, 2003).

TSS and sugars of mango increased progressively with increase in no. of days of storage but there was no significant difference on TSS and sugars among polypropylene treatments but delayed ripening is reported in the fruits packed in polypropylene bags as compared to the control fruits (Table 3 & 4).

In organoleptic evaluation, mango fruits packed in polypropylene bags recorded highest organoleptic scores in terms of flavor, appearance, texture, taste etc. throughout the storage period thereby enhancing its shelf life and marketable quality (Table 5).

Based on physiological loss in weight, firmness, spoilage, organoleptic score and shelf life it can be concluded that mango cv. Suvarnarekha

Table 1
PLW (%) of mango cv. Suvarnarekha as influenced by polypropylene packaging in ethrel treated mango @ 500 ppm harvested at 9-11°B TSS stage at ambient conditions

Polypropylene Treatments	Days		
	3 rd day	6 th day	9 th day
100 gauge - 1% vent (T ₁)	4.16 ^B	6.07 ^A	9.07 ^A
100 gauge - 2% vent (T ₂)	4.78 ^D	6.62 ^A	9.57 ^A
100 gauge - 3% vent (T ₃)	5.10 ^E	9.19 ^C	10.65 ^B
150 gauge - 1% vent (T ₄)	3.83 ^A	5.88 ^A	8.74 ^A
150 gauge - 2% vent (T ₅)	4.48 ^C	6.33 ^A	9.45 ^B
150 gauge - 3% vent (T ₆)	4.97 ^E	8.45 ^B	10.24 ^B
Control(T ₇)	9.09 ^F	14.36 ^D	23.13 ^C
CD at (0.05)	0.15	0.34	0.41
S.Em ±	0.05	0.12	0.14

Table 2
Firmness (kg cm⁻²) of mango cv. Suvarnarekha as influenced by polypropylene packaging in ethrel treated mango @ 500 ppm harvested at 9-11°B TSS stage at ambient conditions

Polypropylene Treatments	Days			
	0 day	3 rd day	6 th day	9 th day
100 gauge - 1% vent (T ₁)	10.16	8.70 ^A	6.78 ^B	5.06 ^B
100 gauge - 2% vent (T ₂)	10.38	8.46 ^A	6.04 ^B	4.90 ^B
100 gauge - 3% vent (T ₃)	10.28	7.49 ^A	5.02 ^A	4.28 ^B
150 gauge - 1% vent (T ₄)	10.08	8.90 ^A	7.28 ^B	6.00 ^C
150 gauge - 2% vent (T ₅)	10.34	8.51 ^A	6.34 ^B	5.18 ^B
150 gauge - 3% vent (T ₆)	10.50	7.54 ^A	5.32 ^A	4.76 ^B
Control(T ₇)	10.28	6.36 ^A	4.74 ^A	2.26 ^A
CD at (0.05)	N.S.	1.04	0.56	0.63
S.Em ±	0.26	0.36	0.19	0.22

Table 3
TSS(°Brix) of mango cv. Suvarnarekha as influenced by polypropylene packaging in ethrel treated mango @ 500 ppm harvested at 9-11°B TSS stage at ambient conditions

Polypropylene Treatments	Days			
	0 day	3 rd day	6 th day	9 th day
100 gauge - 1% vent (T ₁)	10.10	14.40	16.20	17.40
100 gauge - 2% vent (T ₂)	10.28	15.00	16.5	17.00
100 gauge - 3% vent (T ₃)	10.00	15.40	17.02	17.60
150 gauge - 1% vent (T ₄)	10.04	14.20	16.40	17.20
150 gauge - 2% vent (T ₅)	10.10	14.60	16.60	17.20
150 gauge - 3% vent (T ₆)	10.34	15.20	16.90	17.40
Control(T ₇)	10.18	15.60	17.60	16.60
CD at (0.05)	N.S.	N.S.	N.S.	N.S.
S.Em ±	0.24	0.34	0.34	0.27

Table 4
Total sugars (%) of mango cv. Suvarnarekha as influenced by polypropylene packaging in ethrel treated mango @ 500 ppm harvested at 9-11°B TSS stage at ambient conditions

Polypropylene Treatments	Days			
	0 day	3 rd day	6 th day	9 th day
100 gauge - 1% vent (T ₁)	5.42	7.05 ^A	9.96 ^A	11.39
100 gauge - 2% vent (T ₂)	5.44	7.44 ^B	10.38 ^A	11.56
100 gauge - 3% vent (T ₃)	5.47	8.01 ^C	11.16 ^A	11.52
150 gauge - 1% vent (T ₄)	5.36	6.90 ^A	9.82 ^A	11.41
150 gauge - 2% vent (T ₅)	5.50	7.47 ^B	10.18 ^A	11.53
150 gauge - 3% vent (T ₆)	5.43	7.90 ^C	10.95 ^A	11.79
Control(T ₇)	5.42	8.11 ^C	11.95 ^B	11.38
CD at (0.05)	N.S.	0.26	0.85	N.S.
S.Em ±	0.05	0.09	0.30	0.281

Table 5
Organoleptic score of mango cv. Suvarnarekha as influenced by polypropylene packaging in ethrel treated mango @ 500 ppm harvested at 9-11°B TSS stage at ambient conditions

Polypropylene Treatments	Days			
	0 day	3 rd day	6 th day	9 th day
100 gauge - 1% vent (T ₁)	3.40	4.20 ^A	8.40 ^B	8.80 ^C
100 gauge - 2% vent (T ₂)	3.60	4.60 ^B	7.35 ^A	7.80 ^B
100 gauge - 3% vent (T ₃)	3.40	5.60 ^B	7.00 ^A	8.00 ^B
150 gauge - 1% vent (T ₄)	3.40	4.20 ^A	8.60 ^B	9.00 ^C
150 gauge - 2% vent (T ₅)	4.00	5.20 ^B	7.60 ^A	8.00 ^B
150 gauge - 3% vent (T ₆)	3.60	6.00 ^B	7.20 ^A	8.20 ^B
Control(T ₇)	3.60	6.20 ^B	8.60 ^B	5.00 ^A
CD at (0.05)	N.S.	0.68	0.63	0.97
S.Em ±	0.23	0.23	0.22	0.33

Table 6
Shelf life of mango cv. Suvarnarekha as influenced by polypropylene packaging in ethrel treated mango @ 500 ppm harvested at 9-11°B TSS stage at ambient conditions

Polypropylene Treatments	No. of Days
100 gauge - 1% vent (T ₁)	8.80 ^B
100 gauge - 2% vent (T ₂)	8.40 ^B
100 gauge - 3% vent (T ₃)	8.00 ^B
150 gauge - 1% vent (T ₄)	9.00 ^B
150 gauge - 2% vent (T ₅)	8.60 ^B
150 gauge - 3% vent (T ₆)	8.20 ^B
Control(T ₇)	6.60 ^A
CD at (0.05)	0.56
S.Em ±	0.19

Table 7
Spoilage (%) of mango cv. Suvarnarekha as influenced by polypropylene packaging in ethrel treated mango @ 500 ppm harvested at 9-11°B TSS stage at ambient conditions

Polypropylene Treatments	Days	
	6 th day	9 th day
100 gauge - 1% vent (T ₁)	10.40 ^A	36.00 ^A
100 gauge - 2% vent (T ₂)	9.50 ^A	41.00 ^A
100 gauge - 3% vent (T ₃)	8.70 ^A	52.00 ^A
150 gauge - 1% vent (T ₄)	9.90 ^A	33.00 ^A
150 gauge - 2% vent (T ₅)	9.00 ^A	38.00 ^A
150 gauge - 3% vent (T ₆)	7.80 ^A	50.00 ^A
Control(T ₇)	19.50 ^B	78.00 ^B
CD at (0.05)	3.33	16.22
S.Em ±	1.14	5.57

fruits treated with ethrel and packed in polypropylene bags of 150 gauge with 1% ventilation is found to be superior in maintaining the marketable quality and shelf life upto 9 days at ambient conditions (Table 6).

References

- Das, S.C., Balamohan, T.N., Auxilia, J. and Nalina, L. (2011), Early and uniform ripening of mango cv. Alphonso with ethrel treatment. *Asian Journal of Horticulture*. 6(1): 185-190.
- Hiwale, S.S. and Singh, S.P. (2003), Prolonging shelf life of guava (*Psidium guajava* L.). *Indian Journal of Horticulture*. 60(1): 1-9.
- Madhavi, M., Srihari, D. and Dilip Babu, J. (2005), Effect of post harvest ethrel treatment on ripening and of sapota cv. Pala fruits. *Indian Journal of Horticulture*. 62(2): 187-189.
- 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.
- National Horticulture Board (2014), Indian Horticulture Database 2014. National Horticulture Board, Ministry of Agriculture, Government of India, 85, Institutional Area, Sector-18, Gurgaon, India.
- Santos, D.B.dos., Pereira, M.E.C., Vieira, E.L. and Lima, M.A.C.de. (2008), Physico-chemical characterisation of maturity stages in 'Tommy Atkins' mango grown in Icau, Bahia state, Brazil. *Magistra*. 20(4): 342-348.