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HORTICULTURE

Studies on effect of various levels of ethephon on ripening of sapodilla fruits (*Manilkara achras* (Mill) Fosberg

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Abstract

Studies on the effect of various levels of ethephon on ripening of sapodilla (*Manilkara achras* (Mill) Fosberg) fruits under north Indian conditions was carried out on cultivars Kalipatti and Cricket Ball. The fruits were dipped in solution of ethephon @500ppm, 750ppm and 1000ppm for two minutes to induce ripening of fruits followed by drying and packing of fruits in corrugated fiber board boxes at ambient temperature. It was observed that fruits dipped in ethephon 1000ppm resulted in better ripening of fruits after three days with pleasant flavor, high TSS, lower acidity and acceptable sensory quality as compared to other treatments. The control fruits showed uneven ripening and were hard in texture with poor quality attributes

Highlights

- Sapota fruits were dipped in solution of ethephon @500ppm,750ppm and 1000ppm for two minutes to induce ripening.
- The results reveal that fruits dipped in ethephon 1000ppm resulted in better ripening of fruits after three days with pleasant flavor, high TSS, lower acidity and acceptable sensory quality as compared to other treatments.

Keywords: Cultivars, ethephon, ripening, corrugated fiber board boxes and ambient

Sapota (*Manilkara achras* (Mill) Fosberg) commonly known as Chiku is an important tropical fruit crop grown at commercial scale in India. It is native of tropical America and belongs to family *Sapotaceae.* The fruit is highly delicious, nutritive and valued for its melting and sweet taste. It is hardy, highly productive and generally free from major pests, diseases and physiological disorders. In India current sapota fruits production is 1.54 million tones and total area is 1.63lakh ha. The national productivity is 9.1 MT/ha. The Maximum area under cultivation is in Maharashtra followed by Karnataka. The maximum production of sapota is in Karnataka followed by Maharashtra and Gujarat. The productivity of Karnataka is double as compared to Maharashtra so production is more in Karnataka. Sapota contributes 2.3% of the total area under fruits and 1.8% of total fruit production. The productivity of sapota ranges from 4.7 ton to 31.7 tonnes/ha. So there is ample scope of this crop. In Punjab, it is grown on small scale as minor fruit crop. Sapota fruit is receiving attention of Punjab farmers and emerging as new commercial crop. However, sapota is climacteric fruits hence fruits are harvested at full maturity and ripen in the transit for distance market. Being climacteric in nature, it needs ripening treatments after full maturity (Tsomu and Patel 2014). Ethephon has been

found to be effective in causing ripening of fruits (Warner and Leopold 1969). Different workers have tried different concentrations of ethephon ranging from 1000-5000 ppm for ripening of sapota fruits. Present study was conducted to know optimum concentration of ethephon for uniform ripening of sapota and to study quality attributes of under north Indian conditions.

Materials and Methods

The experiment was conducted at Regional Fruit Research station Bahadurgarh and Department of Fruit Science PAU Ludhiana. The fruits of commercial cultivars ie Kallipati and Cricket Ball were under study. For this experiment uniform size fruits were harvested at right stage of maturity. The fruits were first cleaned with gunny bags to remove the scaly material and then dipped in solution of Ethephon@500ppm, 750ppm and 1000ppm for two minutes and fruits under control treatment were dipped in distilled water for two minutes. After treatment the fruits were shade dried and packed in corrugated fiber boxes and kept at room temperature by replicating thrice. The experimental data was analysed in Completely Randomized Design (CRD). The treatment means were analysed for variance using SAS 9.3. The significant treatment were subjected to mean comparison using L.S.D ($P<0.05$). The fruits ripened after three days were assessed for physiological loss in weight, days to ripening, total soluble solids, acidity and sensory quality.

The total soluble solids (TSS) content of the juice was determined with the help of a digital hand refractometer(make Erma)and readings were expressed in percent after making the temperature correction at 20°C. The titratable acidity was estimated as per AOAC (1990) procedures. The sensory quality of the fruit was determined by a panel of 10 judges as per Hedonic scale (1-9 points) as described by (Amerine *et al.* 1965). The ripening percentage of fruits was estimated by counting the total number of ripened fruits on the basis of their appearance and firmness.

Initial fruits weight was recorded just before giving treatment. The total loss of physiological weight was then calculated by subtracting the final weight of the fruits from initial weight and the results were expressed in percentage using following formula:

$$\text{PLW (\%)} = \frac{\text{(Initial weight-Final weight)}}{\text{Initial weight}} \times 100$$

Results and Discussion

In the present investigation, the percent physiological loss in weight and ripening percentage increased significantly with the increasing concentration of ethephon (Table 1). Ethephon treated fruits were more uniform in ripening than fruits under control. The mean percent physiological loss in weight ranged from 1.57 to 2.53 per cent. The minimum in control and maximum in the1000ppm of ethephon. Present findings are in line with the findings of (Ingle *et al.* 1982, Madavi *et al.* 2005) and (Suryanarayan and Goud 1984). Higher the concentration of ethephon, faster was the ripening. Among the different concentrations of ethephon in 1000ppm there was more percentage of marketable fruits after three days of treatment. Similar findings have also been reported by (Madavi *et al.* 2005). Both the varieties had non-significant differences for physiological loss in weight and ripening percentage. However, Kallipatti fruits ripened earlier than the fruits of Cricket Ball. The treated fruits having higher TSS content as compared to fruit under control. Among the various treatments, fruit treated with ethephon ie 1000ppm showed the highest TSS. The increase in TSS and sugars of fruit could be attributed to conversion of starch and other insoluble carbohydrates into soluble sugars. Mahajan *et al.* (2008) also reported an increase in TSS in guava fruits treated with ethylene gas. Similarly Kulkarni *et al.* 2004 reported an increase in TSS and sugars in mango fruits treated with ethephon.

Significant reduction in acidity was observed in ethephon treated fruits (0.21 to 0.17%) as compared to control (0.30%). Among different treatments, fruits treated with ethephon 1000ppm showed lower acidity as compared to other treatments. These finding get support from the findings of (Madhavi *et al.* 2005). The decrease in acidity during ripening may be due to utilization of organic acid in respiratory process (Ulrich 1974). Kulkarni *et al.* (2004) also noticed low acidity in mango cv Neelam with ethephon dip treatment.

The overall mean acceptability score of fruit was maximum (7.50) in ethephon 1000ppm as compared

to control (6.50) after three days of treatment. However, non-significant differences were observed among different treatments in both the varieties.

Table 1: Effect of Post-harvest treatments of ethephon on physico-chemical parameters of sapodilla

Parameters	Treatments	Varieties		Mean
		Kalipatti	Cricket Ball	
PLW(%)	Ethephon 500ppm	2.35	2.14	2.24 b
	Ethephon 750ppm	2.63	2.26	2.45 ab
	Ethephon 1000ppm	2.58	2.47	2.53 a
	Control	1.45	1.68	1.57 c
	Mean	2.25	2.14	
	LSD (P<0.05)	T=0.27	V=NS	T×V=NS
Ripening (%)	Ethephon 500ppm	42.33	36.67	39.50 c
	Ethephon 750ppm	61.33	60.00	60.67 b
	Ethephon 1000ppm	88.67	84.00	86.33 a
	Control	28.67	26.67	27.67 d
	Mean	55.25	51.83	
	LSD (P<0.05)	T=4.62	V=NS	TxV=NS
Acidity (%)	Ethephon 500ppm	0.19	0.22	0.21 b
	Ethephon 750ppm	0.16	0.18	0.17 c*
	Ethephon 1000ppm	0.16	0.20	0.18 c*
	Control	0.37	0.24	0.30 a
	Mean	0.22	0.21	
	LSD (P<0.05)	T=0.03	V=NS	TxV=0.04
TSS (%)	Ethephon 500ppm	18.30	17.63	17.97 c*
	Ethephon 750ppm	18.50	18.77	18.63 b
	Ethephon 1000ppm	19.97	19.83	19.90 a
	Control	18.00	16.90	17.45 c*
	Mean	18.69	18.28	
	LSD (P<0.05)	T=0.58	V=NS	TxV=NS
Sensory quality	Ethephon 500ppm	7.00	7.07	7.03 ab*
	Ethephon 750ppm	7.17	7.13	7.15 ab*
	Ethephon 1000ppm	7.67	7.33	7.50 a
	Control	6.67	6.33	6.50 b
	Mean	7.13	6.97	
	LSD (P<0.05)	T=NS	V=NS	TxV=NS

*means with same letter are not significantly different at P<0.05

Conclusion

From the present investigation it may be concluded that dipping of sapodilla fruits in Ethephon 1000 ppm for two minutes followed by packing in corrugated fiber boxes at ambient temperature ensures faster and uniform ripening, development of pleasant flavor and consumer acceptability of fruits after three days.

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