



EFFECT OF CALCIUM CHLORIDE SPRAYS ON RIPENING, SHELF-LIFE, PHYSICO-CHEMICAL PARAMETERS AND ORGANOLEPTIC EVALUATION OF MANGO FRUITS (*MANGIFERA INDICA* L.) CV. TOTAPURI

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Abstract

The experiment was conducted on effect of calcium chloride sprays on ripening, shelf-life, physico-chemical parameters and organoleptic evaluation of mango fruits (*Mangifera indica* L.) cv. Totapuri were carried out at the mango orchard at U.A.S., G.K.V.K. Campus, Bangalore (Karnataka), India; during 2011-12. Mango trees were sprayed with 0.50%, 1.00% and 1.50% CaCl₂ at 30 days and 15 days before harvest with three replications in a complete randomized design. The results revealed that spraying of 1.50% CaCl₂ at 30 days before harvest maximum days for ripening (19.89 days), shelf-life of fruit (25.89 days), physico-chemical parameters like fruit length (25.89 cm), breadth (7.73 cm), thickness (6.97 cm), weight of fruit (347.89 g), pulp weight (215.56 g), peel weight (42.11 g), stone weight (54.33 g), TSS of fruit (16.73°Brix), total sugars (11.89%), reducing sugar content of fruit (1.95 %), non-reducing sugar content (9.94%) and minimum titratable acidity (0.10%) compared to control. Whereas organoleptic qualities of fruits for overall acceptance (65.74 points) were given to control as compare to all other treatment.

Key words : Mango cv. Totapuri, ripening, shelf-life, physico-chemical parameters and organoleptic evaluation.

Introduction

Totapuri or Bangalore is a commercial variety of South India, it is a heavy yielder and it is regular bearing. Fruit is medium to large and it has a prominent beak in shape of about 6-8 inches. Colour is green yellow. The fruit quality is good. That cultivar contains vitamin A and C. There is a central large seed in these mangoes covered by the pulp that has a pale to bright yellow colour. Low fruit calcium levels have been associated with reduced post-harvest life and physiological disorders. For example, low levels have been correlated with physiological disorders of mangoes. So, to solve the problem of short shelf-life of mango fruits, different chemicals are used to delay the hastening. Gofure *et al.* (1997) studied on extension of post-harvest storage life of mango and they reported that the increase in calcium salts levels leads to delayed hastening, but had bad effect on fruit quality by enhancing skin shriveling and reducing flavor and taste of the fruits.

Materials and Methods

The experiment was conducted on effect of calcium chloride sprays on ripening, shelf-life, physico-chemical parameters and organoleptic evaluation of mango fruits (*Mangifera indica* L.) cv. Totapuri were carried out at the 'A' block of mango orchard at U.A.S., G.K.V.K. Campus, Bangalore (Karnataka), India. Complete randomized design was used with three replications. Cv. Totapuri trees were sprayed with CaCl₂ at 30 days and 15 days before harvest. Data on number of days taken for ripening of fruits, shelf-life of fruits, physico-chemical parameters of fruits and organoleptic qualities of fruits were recorded.

Treatments details

T₁ : Control (no spray)

T₂ : 0.50% spray of calcium chloride at 30 days before harvest.

T₃ : 1.00% spray of calcium chloride at 30 days before harvest.

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Table 1 : Effect of CaCl₂ spray on number of days taken for ripening and shelf-life of mango fruits in Cv. Totapuri.

Treatments	No. of days taken for ripening of fruits	Shelf-life of fruits (days)
T ₁ : Control	16.22	21.44
T ₂ : CaCl ₂ 0.50% spray at 30DBH	18.44	24.11
T ₃ : CaCl ₂ 1.00% spray at 30DBH	19.11	25.22
T ₄ : CaCl ₂ 1.50% spray at 30DBH	19.89	25.89
T ₅ : CaCl ₂ 0.50% spray at 15DBH	16.11	22.33
T ₆ : CaCl ₂ 1.00% spray at 15DBH	17.22	23.22
T ₇ : CaCl ₂ 1.50% spray at 15DBH	19.11	23.89
F test	**	**
S Em ±	0.29	0.30
C.D. at 5%	0.63	0.63
C.V. (%)	1.97	1.53

DBH: Days before harvest, **: Significant at 1%.

Table 2 : Effect of CaCl₂ spray on physical parameters of mango fruits in Cv. Totapuri.

Treatments	Physical parameters of fruits							
	Fruit length (cm)	Fruit breadth (cm)	Fruit thickness (cm)	Fruit volume (ml)	Fruit weight (g)	Pulp weight (g)	Peel weight (g)	Stone weight (g)
T ₁ : Control	11.46	7.07	6.09	226.67	231.11	139.89	21.00	36.67
T ₂ : CaCl ₂ 0.50% spray at 30DBH	12.08	7.39	6.50	277.67	281.11	184.55	33.22	48.00
T ₃ : CaCl ₂ 1.00% spray at 30DBH	12.36	7.58	6.69	330.00	337.66	198.89	37.89	51.00
T ₄ : CaCl ₂ 1.50% spray at 30DBH	25.89	7.73	6.97	341.33	347.89	215.56	42.11	54.33
T ₅ : CaCl ₂ 0.50% spray at 15DBH	11.50	7.25	6.26	243.44	240.00	152.22	28.00	43.11
T ₆ : CaCl ₂ 1.00% spray at 15DBH	11.54	7.38	6.32	254.33	255.66	157.89	34.33	46.89
T ₇ : CaCl ₂ 1.50% spray at 15DBH	11.61	7.44	6.45	263.33	267.67	175.44	39.00	51.11
F-test	**	**	**	**	**	**	**	**
S Em ±	0.05	0.06	0.08	6.93	5.07	3.82	1.75	1.6
C.D. at 5%	0.09	0.13	0.16	14.86	10.88	8.18	3.76	3.39
C.V. (%)	0.48	0.98	1.42	3.06	2.23	2.68	6.38	4.08

DBH: Days before harvest, **: Significant at 1%.

T₄ : 1.50% spray of calcium chloride at 30 days before harvest.

T₅ : 0.50% spray of calcium chloride at 15 days before harvest.

T₆ : 1.00% spray of calcium chloride at 15 days before harvest.

T₇ : 1.50% spray of calcium chloride at 15 days before harvest.

Results and Discussion

The data presented in table 1 showed that significantly

delay of ripening of fruit was found in Cv. Totapuri when trees were sprayed with 1.50% CaCl₂ at 30 days before harvest (19.89 days). The delay could be attributed to the fact that pre-harvest applications are more useful early in the development of fruits rather than when applied late. Similar observations were noticed by Penter and Stassen (2000). Higher fruit calcium levels in fruits leads to the reduction of respiration and ethylene production rates thus delay the ripening of fruits. These findings are in agreement with the reports of Hewajulige *et al.* (2003) and Gill *et al.* (2005). Significantly shelf-life of fruits was recorded in Cv. Totapuri when trees were sprayed with 1.50% CaCl₂ at 30 days before harvest (25.89). The extension of shelf-life was more important when fruits were sprayed at 30 days before harvest. The reason of extension of shelf-life by CaCl₂ sprays might be due to the fact that where fruits are harvested at the correct maturity; calcium plays a number of roles such as an increase in fruit firmness relative to control. This leads to benefits like a slower ripening and increased shelf-life.

The present findings are in close conformity with those of Gore (2005).

The data portrayed in table 2 clearly showed that the physical characters of fruits, Cv. Totapuri recorded significantly higher fruit length (25.89 cm), breadth (7.73 cm), thickness (6.97 cm), fruit weight (347.89 g), pulp weight (215.56 g), peel weight (42.11 g), pulp weight (215.56 g) and stone weight (54.33 g) when trees were sprayed with 1.50% CaCl₂ at 30 days before harvest. This is due to pre-harvest applications are more successful early in the development of fruits rather than when they

Table 3 : Effect of CaCl₂ spray on chemical composition of mango fruits in Cv. Totapuri.

Treatments	Chemical composition of fruits				
	TSS (°Brix)	Total sugars (%)	Reducing sugar (%)	Non-reducing sugar (%)	Titratable acidity (%)
T ₁ : Control	10.63	11.46	1.73	9.73	0.20
T ₂ : CaCl ₂ 0.50% spray at 30DBH	14.87	11.66	1.84	9.82	0.17
T ₃ : CaCl ₂ 1.00% spray at 30DBH	16.16	11.76	1.89	9.87	0.13
T ₄ : CaCl ₂ 1.50% spray at 30DBH	16.73	11.89	1.95	9.94	0.10
T ₅ : CaCl ₂ 0.50% spray at 15DBH	11.68	11.51	1.76	9.75	0.18
T ₆ : CaCl ₂ 1.00% spray at 15DBH	12.57	11.62	1.81	9.81	0.15
T ₇ : CaCl ₂ 1.50% spray at 15DBH	12.88	11.74	1.89	9.85	0.13
F test	**	**	**	**	**
SEm±	0.58	0.05	0.02	0.03	0.01
C.D. at 5%	1.23	0.10	0.05	0.07	0.02
C.V. (%)	5.16	0.51	1.52	0.38	8.77

DBH : Days before harvest, **: Significant at 1%.

Table 4 : Effect of CaCl₂ spray on organoleptic qualities of mango fruits in Cv. Totapuri.

Treatments	Organoleptic qualities of fruits					
	Peel colour (15)	Pulp colour (15)	Pulp texture (20)	Pulp flavor (20)	Pulp taste (30)	Overall acceptance (100)
T ₁ : Control	13.20	10.33	12.00	12.28	17.93	65.74
T ₂ : CaCl ₂ 0.50% spray at 30DBH	13.08	10.50	12.28	11.85	17.78	65.49
T ₃ : CaCl ₂ 1.00% spray at 30DBH	12.50	10.52	12.37	11.40	17.56	64.35
T ₄ : CaCl ₂ 1.50% spray at 30DBH	11.67	10.57	12.45	11.12	17.46	63.27
T ₅ : CaCl ₂ 0.50% spray at 15DBH	12.16	10.36	12.15	10.66	17.35	62.68
T ₆ : CaCl ₂ 1.00% spray at 15DBH	11.77	10.42	12.23	10.18	17.22	61.82
T ₇ : CaCl ₂ 1.50% spray at 15DBH	11.00	10.51	12.40	9.83	17.16	60.90
F test	**	NS	NS	NS	NS	NS
SEm±	0.50	0.94	0.25	1.34	0.53	2.61
C.D. at 5%	1.06	–	–	–	–	–
C.V. (%)	4.98	11.10	2.54	14.91	3.77	2.16

DBH: Days before harvest, **: Significant at 1%, NS : Non significant.

are applied late just before harvest. The improvement observed in the fruit quality due to calcium chloride could be attributed to its effects in influencing formation and changes of carbohydrates and carbohydrate enzymes, others reasons might be the reduction of abscission and the calcium influence in maintaining the middle lamella cells. The findings obtained in the present investigation can be compared to those obtained by Wahdan *et al.* (2011).

The data presented in table 3 showed that significantly higher TSS of fruit (16.73 °Brix), percentage of total sugars (11.89%), reducing sugar content (1.95%), non reducing sugar content (0.10%) and with respect to

titratable acidity of fruits minimum percentage (0.14%) was recorded in Cv. Totapuri, when trees were sprayed with 1.50% CaCl₂ at 30 days before harvest. The reason of the increase of TSS during storage periods might be the transformation of organic matter of fruits to soluble solids under enzymatic activities and CaCl₂ influence. The general increase of TSS of fruits has been recorded by Wahdan *et al.* (2011). Reduction of acidity content may be due to the change of acid into sugars under enzyme invertase influence during storage period. The findings obtained in the present investigation can be compared to those obtained by Omayama *et al.* (2010).

Organoleptic qualities of mango fruits Cv. Totapuri when trees were sprayed with different concentrations of CaCl₂ at 30 and 15 days before harvest showed a good quality of fruit when compared to control trees (65.74 points). Highest score of peel colour, pulp flavor and pulp taste was observed in control trees (table 4). These results are in accordance with finding of Singh *et al.* (1993) and Muhammad *et al.* (2008). Gofure *et al.* (1997) showed that the increase in concentration of calcium salts on mango fruits leads to delay of hastening but had negative effect on fruit quality by inducing skin shriveling and reducing flavor and taste of the fruits.

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