International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2017; 5(5): 80-83

Received: 03-07-2017
Accepted: 04-08-2017

HJ Christian
Department of Horticulture, B.A. College of Agriculture, AAU, Anand, Gujarat, India

HH Sitapara
Department of Horticulture, B.A. College of Agriculture, AAU, Anand, Gujarat, India

PN Kore
Department of Horticulture, B.A. College of Agriculture, AAU, Anand, Gujarat, India

RP Vasara
Department of Horticulture, B.A. College of Agriculture, AAU, Anand, Gujarat, India

JR Bamaniya
Department of Horticulture, B.A. College of Agriculture, AAU, Anand, Gujarat, India

Correspondence
HJ Christian
Department of Horticulture, B.A. College of Agriculture, AAU, Anand, Gujarat, India

Effect of different coating treatments on quality parameters of mango (*Mangifera indica* L.) CV. Amrapali

HJ Christian, HH Sitapara, PN Kore, RP Vasara and JR Bamaniya

Abstract
An investigation was carried out at Post Graduate Laboratory, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand during summer season in the year 2016 to study the "effect of different coating treatments on storage behavior and shelf-life of mango (*Mangifera indica* L.) cv. Amrapali. The experiment was framed in Completely Randomized Design with nine treatments and a control. The result revealed that fruits coated with waxol 6% recorded significantly minimum total soluble solids, reducing sugar, non-reducing sugar and total sugar content with maximum acidity content while fruits coated with aloevera gel 60% had maximum ascorbic acid content and maximum organoleptic score in terms of colour, flavour, aroma and taste of fruit whereas minimum score in terms of colour, flavour, aroma and taste was recorded in fruits coated with waxol 6%.

Keywords: mango, waxol, aloevera gel, sago

Introduction
Mango is having good nutritional value. Every 100 g pulp of mango fruit contains 81.7 g water, 16 g carbohydrate, 0.7 g protein, 0.4 g fat and 0.1 g fibers. Mango is the national fruit of India because of its excellent flavor, delicious taste, delicate fragrance and attractive colour. It is considered to be a good source of β-carotene and vitamin-A (4800 IU/100 g), vitamin-B complex, vitamin-C (36.4 mg/100 g), nutritive minerals, digestible sugars and trace elements. Its taste, flavor and aroma are very fascinating to everyone. The fruit is consumed raw or ripe. Good mango varieties contain 20% of total soluble sugars. The acid content of ripe desert fruit varies from 0.2 to 0.5 % and protein content is about 1 %. A single fruit can provide up to 40% daily dietary fibre needs (Singh *et al.*, 2005) [14]. A drink made from boiled unripe mango with salt called *panna* is a wonderful remedy for heat stroke. Juice is a restorative tonic. Bark is used in the treatment of jaundice. Dried leaf powder is used in dental care.
Oil extraction from the stones is used as hair tonic, as it is used to stop premature graying. Fresh bark with warm water is recommended for curing gonorrhea. Fruit is also a good source of antioxidants and phenolics. The phenolics range from 48.40 mg/ 100 g in cv. Haden to 208.70 mg/ 100 g of edible portion in cv. Uba (Riberio *et al*. 2007) [13].
However, mango is highly perishable, it ripens fast during summer and becomes inconsumable very soon. The abundant supply of mango in market from most of the orchards takes place in a short span which causes glut in the market thereby, causing reduction in prices. Post-harvest handling can play a major role in reducing post-harvest losses by following definite methodology. Post-harvest losses can be prevented by adopting various methods which reduce the rate of respiration and ultimately ripening by application of pre and post-harvest treatments with certain chemicals, ripening retardants (plant growth regulators and inhibitors).
A number of postharvest treatments such as wax emulsion, plant growth regulators, fungicides, polyethylene film and various chemicals are being used to extend the shelf-life of fruits (Chauhan and Joshi, 1990; Khan, 1995) [7, 11].
Application of various films and coatings modify the fruit atmosphere at micro level, reduce weight loss during transport and storage and extends shelf-life. It can also reduce growth of microorganisms. Coating provides semi permeable barrier against oxygen, carbon dioxide, moisture and volatiles. Use of coating is well known in citrus, apple, tomato, and gourd vegetables to extend shelf-life and improve appearance without adversely affecting flavor, taste and aroma. It is very cheap and effective technique and applicable at farm level. Wide

Wide range of materials like proteins, carbohydrates, lipids, resins, as well as different products of animal/insect and plant origin can be used as coating material. The fruits coated with such materials shows different respiration behavior as compared to uncoated fruits, which suggest that coating treatments can reduce weight loss, maintain firmness and slow down physico-chemical changes inside the fruits related to ripening process. It can also protect the fruits from bruising and maintains the appearance of the fruit.

There is a great potentiality to increase the shelf-life of mango through use of different coating materials. Therefore, this experiment was conducted to study the effect of wax, aloe vera gel and sago on shelf-life and quality of mango cv. Amrapali.

Materials and Methods

An investigation was carried out at Post Graduate Laboratory, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand during summer season in the year 2016. Completely Randomized Block Design was followed in the experiment with nine treatments and a control. Following post-harvest treatments were imposed on matured fruits as dipping treatment for different duration.

T_1: Dipping in waxol@ 2 % for 1 minute
T_2: Dipping in waxol@ 4 % for 1 minute
T_3: Dipping in waxol@ 6 % for 1 minute
T_4: Dipping in aloe gel@ 20 % for 45 minutes
T_5: Dipping in aloe gel@ 40 % for 45 minutes
T_6: Dipping in aloe gel@ 60 % for 45 minutes
T_7: Dipping in sago starch@ 10 % for 5 minutes
T_8: Dipping in sago starch@ 20 % for 5 minutes
T_9: Dipping in sago starch@ 30 % for 5 minutes
T_{10}: Control

The fruits were washed with normal tap water with a view to remove dust, dirt and pesticide residues in the laboratory. Waxol, aloevera gel and sago treatments were given as post-harvest dips. 60 uniform sized fruits were dipped in the respective waxol, aloevera gel and sago solutions for given time of 1 minute, 45 minutes and 5 minutes, respectively and surface was air dried in open air. Treated fruits were then kept in CFB boxes 10 in each of the 2 boxes of each repetition in each treatment. The titrametric method of Lane and Eynon described by Ranganna (1979) [12] was adopted for estimation of reducing sugar, ascorbic acid and acidity.

Result and Discussions

The results obtained from the present investigation on different quality parameters of mango are summarized here.

Total soluble solids

The changes observed in TSS content of fruits during the entire storage period are mainly due to conversion of starch and accumulation of sugars. Different coating treatments exerted their significant effect on TSS content of mango fruits. Significantly minimum TSS content i.e. 10.08 o Brix was recorded with T3 i.e. coating with waxol 6%, which remained at par with T2 and T1 i.e. 10.38 and 10.58 ^{o} Brix, respectively on 16th day of storage whereas, maximum TSS content *i.e.* 17.25 ^{o} Brix was recorded with control (T_{10}) (Table 1).

Modification of gaseous exchange in fruits coated with waxol 6% might have decreased respiration rate which resulted in lowered PLW and delayed ripening due to delayed conversion of starch to sugars at ripening and reflected as lower TSS as compared to control. The uncoated fruits had uninterrupted gaseous exchange and normal ripening processes which might be reflected as higher TSS in fruits as compared to coated fruits. Similar findings were observed in some fruits treated with edible coatings, as those reported previously for mango (Baldwin *et al.,* 1999) [4].

Reducing Sugar

Significantly minimum accumulation of reducing sugar *i.e.* 2.13% was recorded with waxol 6% (T_3), while maximum (3.59%) was recorded with control (T_{10}) on 16th day of storage (Table 1).

The slow rate of increase in sugar with waxol 6% coated fruits might be due to use of waxol which affect the activity of mitochondria and some enzymes as described by Wills and Rigney (1979) [15]. The results are in line with the findings of Gul *et al.* (1990) [9] who observed the effect of fruitox (3% total solids) having wax emulsion coating on Blood Red oranges during room storage and found that reducing sugars increased slowly in wax coated fruits than control during storage.

Non-reducing sugar

With the passage of time respiration, transpiration and other metabolic processes are enhanced. Due to this starches are converted into sugars and reducing sugar quantity increases.

Significantly the lowest non-reducing sugar *i.e.* 7.59% was recorded in fruits treated with waxol 6% (T_3) as compared to rest of the treatments and the highest non-reducing sugar *i.e.* 13.39% was recorded with control (T_{10}) and sago 10% (T_7) each on 16th day of storage (Table 1).

Total sugar

Total sugars in mango fruits increase during the entire storage period mainly due to two mechanisms *i.e.* conversion of starch to simple sugars (sucrose, fructose and galactose) due to the activity of amylase; and, biosynthesis of sucrose. Among sugars, sucrose is the predominant sugar in ripe mango fruits. Different coating treatments exerted their significant effect on the accumulation of total sugar of mango fruits.

Significantly the lowest accumulation of total sugar *i.e.* 9.72% was recorded with waxol 6% (T_3), while the highest accumulation of total sugar *i.e.* 16.98% was recorded with control (T_{10}) (Table 1). It is possible that due to wax coating resulting in conversion of starch into sugars as well as biosynthesis of sucrose slowed down as a result of modified gaseous exchange and reduced respiration rates and reflected as lower total sugars content at ripening. In uncoated fruits, the uninterrupted hydrolysis of starch in to sugars and biosynthesis of sucrose led to higher total sugars in the fruits at ripening. The result is in line with the findings of Ahmed *et al.* (1986) [2] and Gul *et al.* (1990) [9] on Blood Red oranges.

Ascorbic acid

Different coating treatments exerted their significant influence on the ascorbic acid content of mango fruits. The highest accumulation of ascorbic acid *i.e.* 30.48 mg/100 g pulp was recorded with fruits coated with aloevera gel 60% (T_6) and

remained at par with T_4 and T_5 *i.e.* 29.38 and 29.47 mg/ 100 g pulp (Table 1). However, the lowest accumulation of ascorbic acid *i.e.* 24.46 mg/ 100 g pulp was recorded with waxol 6% (T_3) on 16th day of storage.

This might be due to low oxygen permeability of coating which delayed the deteriorative oxidation reaction of ascorbic acid content (Ayranci and Tunc, 2003) [3]. Such results were also noted by Brishti *et al.* (2013) [6] in papaya.

Table 1: Effect of different coating treatments on quality parameters of mango

Treatments	TSS	Reducing sugar	Non-reducing sugar	Total sugar	Ascorbic acid	Acidity
T_1: Waxol @ 2%	10.58	2.46	7.95	10.41	26.90	0.17
T_2: Waxol @ 4%	10.38	2.44	7.61	10.05	25.55	0.19
T_3: Waxol @ 6%	10.08	2.13	7.59	9.72	24.46	0.20
T_4: Aloevera gel @ 20%	16.33	3.46	12.74	16.20	29.38	0.10
T_5: Aloevera gel @ 40%	15.42	3.43	11.89	15.32	29.47	0.10
T_6: Aloevera gel @ 60%	14.58	2.53	11.78	14.31	30.48	0.13
T_7: Sago @ 10%	17.10	3.55	13.39	16.94	27.67	0.08
T_8: Sago @ 20%	16.80	3.48	12.83	16.31	28.72	0.09
T_9: Sago @ 30%	15.50	3.47	11.57	15.04	28.84	0.09
T_{10}: Control	17.25	3.59	13.39	16.98	27.60	0.08
SEm ±	0.29	0.03	0.36	0.35	0.45	0.004
CD @ 5%	0.86	0.08	1.06	1.04	1.31	0.01
CV %	3.47	1.53	4.48	3.61	2.77	5.35

Table 2: Effect of different coating treatments on organoleptic scoring of mango

Treatments	Organoleptic test (out of 10)			
	Color	Flavor	Aroma	Taste
T_1: Waxol @ 2%	6.67	4.33	4.68	6.00
T_2: Waxol @ 4%	4.00	3.33	3.33	3.00
T_3: Waxol @ 6%	2.67	2.33	2.68	1.67
T_4: Aloevera gel @ 20%	8.00	7.33	6.68	7.67
T_5: Aloevera gel @ 40%	8.00	7.33	8.00	8.00
T_6: Aloevera gel @ 60%	8.33	8.00	8.00	8.30
T_7: Sago @ 10%	7.33	6.33	6.68	7.00
T_8: Sago @ 20%	7.67	6.68	6.68	7.33
T_9: Sago @ 30%	7.67	7.00	7.68	7.33
T_{10}: Control	7.00	5.67	5.67	6.33
SEm ±	0.45	0.57	0.60	0.45
CD @ 5%	1.32	1.68	1.76	1.32
CV %	11.50	16.86	16.93	12.36

Acidity

The acidity was decreasing due to increase of soluble sugars during the course of ripening (Abbas and Fandi, 2002) [1]. Significantly the highest accumulation of acidity *i.e.* 0.20% was recorded with waxol 6% (T_3) which remained at par with T_2 *i.e.* 0.19%. However, the lowest accumulation of acidity *i.e.* 0.08% was recorded with control (T_{10}) on 16th day of storage (Table 1). It is considered that coating reduces the rate of respiration and may therefore delay the utilization of organic acids (Yaman and Bayoindirli, 2002) [16] which resulted in higher acidity in pulp of fruits coated with waxol 6%. The uncoated fruits had higher PLW due to higher respiration rate which reflected as earlier ripening of fruits with lower acidity in pulp during the entire storage period. The results are in line with the findings of Bayindirli *et al.*, (1995) [5] in Satsuma mandarin.

Organoleptic Score

During the entire storage period, all the different levels of waxol, aloevera gel and sago coating treatments were found to have significant effect on organoleptic parameters. However, the highest score in terms of colour of fruit (8.33) was found with aloevera gel 60% (T_6). Similarly, the highest score in terms of flavor of fruit (8.00) was found with aloevera gel 60% (T_6). The highest score in terms of aroma of fruit (8.00) was recorded in both with aloevera gel 60% (T_6) and aloevera gel 40% (T_5). Similarly, the highest score in term of taste (8.30) was recorded with aloevera gel 60% (T_6). The results are in line with the observations of Chauhan *et al*., (2014) [8] on mango. Minimum score in terms of color (2.67), flavor (2.33), aroma (2.68) and taste (1.67) was recorded with waxol 6% (T_3) (Table 2). This might be due to exceeding the amount of waxol greatly increase the viscosity of the emulsion a free-flowing emulsion to a thick, slow flowing emulsion, and there by create an environment that develops an undesirable barrier between the external and internal atmosphere and restricts the exchange of respiratory gases (CO_2 an O_2) causes anaerobic respiration, resulting in fermentation and development of an off-flavour, bad smell and unpleasant taste. This result is in consistent with the report of Kaswija *et al.* (2006) [10] in mango fruits.

Conclusion

On the basis of findings, it can be concluded that the mango fruits coated with waxol 6% retained the chemical constituents *i.e.* TSS, acidity, reducing, non-reducing and total sugars while, application of aloevera gel 60% was found better in retaining ascorbic acid content and good organoleptic score.

References

1. Abbas MF, Fandi BS. Respiration rate, ethylene production and biochemical changes during fruit development and maturation of jujube (*Ziziphus Mauritiana* Lamk.)! Journal of the science of food and Agriculture**.** 2002; 82(13):1472-1476.
2. Ahmed M, Chaudhary MA, Khan I. Some post-harvest shelf life extension studies on citrus fruits! NIFA Annual Report. 1986, 55-71.
3. Ayranci E, Tunc S. A method for the measurement of the oxygen permeability and the development of edible films to reduce the rate of oxidative reactions in fresh foods! Food Chemistry. 2003; 80(3):423-431.
4. Baldwin EA, Burns JK, Kazokas W, Brecht JK, Hagenmaier RD, Bender RJ, *et al.* Effect of 2 edible coatings with different permeability characteristics on mango (*Mangifera indica* L.) ripening during storage! Postharvest Biology and Technology. 1999; 17(3):215-226.
5. Bayindirli L, Sumnu G, Kamadan K. Effects of semperfesh and jonfresh fruit coatings on post storage

quality of Satsuma mandarins! Journal of Food Processing and Preservation. 1995; 19(5):399-407.
6. Brishti FH, Misir J, Sarker A. Effect of biopreservatives on storage life of papaya fruit (*Carica papaya* L.)! International Journal of Food Studies. 2013; 2(1):126-136.
7. Chauhan HL, Joshi HU. Evaluation of phyto-extracts for control of mango fruit anthracnose! *Proc. Symp. Botanical pesticides in IPH*, Rajamundry, India. 1990, 445.
8. Chauhan S, Gupta KC, Agrawal M. A new approach of hurdle technology to preserve mango fruit with the application of aloe vera gel and calcium chloride! Int. J Curr. Microbiol. App. Sci., 2014; 3(5), 926-934.
9. Gul S, Ishtiaq M, Shah SH. Studies on the effect of storage on the quality of sweet orange! Sarhad J Aric. 1990; 6(5):433-436.
10. Kaswija M, Peter M, Leonard F. Sensory attributes, microbial quality and aroma profiles of off vine ripened mango (*Mangifera indica* L.) fruit! J Biotech. 2006; 5:201-205.
11. Khan R. Effect of HDPE film, fungicide and edible oil on the shelf- life of mandarin cv. 'Nagpur'! (Post graduate thesis, *R.A.U.* Bikaner), 1995.
12. Ranganna S. Manual of Analysis of Fruit and Vegetable Products! Tata McGraw Hill Publishing Company Ltd., New Delhi, 1979.
13. Riberio SMR, Queiroz JH, de Queiroz MEL, de R, Campos FM, Sant Ana HMP *et al.* Antioxidant in mango (*Mangifera indica* L.) pulp! Plant Foods for Human Nutrition, 2007; 62(1)13-17.
14. Singh Z, Malik AU, Davenport T. Fruit drop in mango! Hort. Review. 2005; 31:111-140.
15. Wills RBH, Rigney CJ. Effect of calcium on activity of mitochondria and pectic enzymes isolated from tomato fruits! J Food Biochem. 1979; 3:103.
16. Yaman O, Bayoindirli L. Effects of an edible coating and cold storage on shelf-life. and quality of cherries! Lebnsm.-Wiss. Und. Technol. 2002; 35:46-150.