Effect of Sodium Hypochlorite on Chemical Composition of Graded Mango (*Mangifera indica* L.) Fruits Cv. Alphonso

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Abstract

The present investigation was undertaken to evaluate the post harvest disinfection on changes of chemical composition of Alphonso fruits. Maximum moisture (82.50%), TSS (18.48^{0}B), reducing sugars (3.08%) and total sugars (16.01%) was observed in control fruits, whereas maximum acidity (0.32%), ascorbic acid (69.80 mg/100g) and β-carotene (12742.5 mg/ 100g) was noticed in 50 ppm NaOCl treated fruits.

Keywords : Sodium hypochlorite, specific gravity, grading, mango.

Introduction

Mango is a popular fruit in the world and is praised due to its delicious taste, unique and attractive flavour with high nutritive value. Mango fruit contains 10-20% sugars and is a good source of carbohydrates, amino acids, fatty acids, organic acids and minerals. New challenges like WTO, strict quarantine measures and other sanitary and phyto-sanitary protocols are emerging for export of mango. In order to meet these challenges, we have to be competitive both in mango production and export. This is only possible if producing countries understand the modern production and harvesting techniques as well as post harvest handling and storage requirements of mango (Anwar, 2004). Postharvest diseases and disorders reduce fruit quality and cause severe losses. In many cases, blemished fruit does not meet the standards and hence fetch low price in the international markets. Major postharvest diseases are anthracnose and stem end rot.

Postharvest management of mango fruits is one of the major challenges faced by mango industry (Amin *et al.,* 2008). Postharvest hot water dips with fungicides have been proven to be effective in protecting mango against postharvest pathogen infection and in extending storage life of mango fruit during overseas shipments (Swart *et al.,* 2002). There is need to evaluate the effect of these chemicals in commercial mango cultivars of India. The adverse effects of synthetic chemicals residues on human health (Lichtenberg & Zilberman, 1987) and environment (Weaver *et al.,* 1990) have led to the intensified worldwide research efforts to develop alternatives. Hence the present investigation on effect of Sodium Hypochlorite on chemical composition of graded Mango was undertaken.

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Material and Methods

The fruits for experiment were obtained from the Pangari block of Central Experiment Station, Wakwali of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India. The mature fruits were harvested and graded as per maturity into three groups (75%, 85%, and 100%) of specific gravity by float and sink method (Mukherjee, 1959).

Group I: Specific gravity < 1.00 (75% maturity)
Group II: Specific gravity 1.00 – 1.02 (85% maturity)
Group III: Specific gravity > 1.02 (100% maturity)

For grading plain water (specific gravity 1.00) and 2.5 per cent salt solution (specific gravity 1.02) were used. The fruits which sinked in plain water but floated in 2.5% salt solution had specific gravity 1.00 - 1.02. Likewise sinkers in 2.5 % salt solution had specific gravity more than 1.02 whereas those which floated in plain water had specific gravity less than 1.The fruits were washed, dried and further dipped in sodium hypoclorite solution (NaOCl) of desired concentration for a period of five minutes and kept for ripening at ambient temperature 28^{0}C to 31^{0}C; 76% RH The experiment was laid out in Completely Randomized

Design with six replications and six treatments. The treatments were T_1- 10 ppm NaOCl treated fruits, T_2- 20 ppm NaOCl treated fruits, T_3- 30 ppm NaOCl treated fruits, T_4- 40 ppm NaOCl treated fruits T_5- 50 ppm NaOCl treated fruits and T_6- control fruits. To evaluate the effect of NaOCl on chemical composition Alphonso fruits at ambient temperature moisture %, total soluble solids (TSS), acidity, pH, reducing sugars, total sugars, ascorbic acid and β Carotene was measured at initial stage and after ripening.

Results and Discussion:

The results obtained for the post harvest disinfection to evaluate the change in chemical composition of Alphonso fruits are presented in table 1. Maximum moisture per cent was reported by T_6 (82.50%). and was at par with treatment T_1 (82.24%), T_2 (82.22%) and T_3 (82.21%) and significant over rest. Control fruits recorded maximum moisture per cent as compared to 10, 20, 30, 40 and 50 ppm NaOCl treated fruits. The decline in moisture from harvest to ripening was due to loss of moisture due to respiration and transpiration in storage. Similar results to present findings were reported by Sahani *et al.* (1994) in Amrapalli fruits. Highest TSS was found in treatment T_6 (18.48^0B) and was at par with T_1 (18.04^0B) and T_2 (17.94^0B) and significant over rest. The increase in TSS during ripening process could be attributed to the hydrolysis of starch into sugars. Jabbar *et al.* (2011) reported decrease in TSS in fruits treated with NaOCl in Samar Bahisht Chausa mango.

Table 1 : Effect of Sodium hypochlorite on chemical composition of Alphonso fruits at ambient temperature.

Treatments	Moisture (%)		Total soluble solids (^{0}B)		Acidity (%)		pH	
	Initial	Ripe	Initial	Ripe	Initial	Ripe	Initial	Ripe
T_1		82.24		18.04		0.25		3.47
T_2		82.22		17.94		0.27		3.45
T_3		82.21		16.91		0.28		3.43
T_4	83.05	82.13	10.35	16.75	3.46	0.31	2.57	3.40
T_5		82.05		16.58		0.32		3.39
T_6		82.50		18.48		0.24		3.48
SE		0.062		0.263		0.012		0.035
CD at 1%		0.282		0.986		0.043		NS
Treatments	Reducing Sugars (%)		Total Sugars (%)		Ascorbic acid (mg/100 g)		β Carotene (mg / 100 g)	
	Initial	Ripe	Initial	Ripe	Initial	Ripe	Initial	Ripe
T_1		3.22		15.85		63.70		12302.5
T_2		3.18		14.95		64.90		12632.5
T_3		3.12		14.45		66.80		12682.5
T_4	1.32	3.13	2.60	14.34	82.25	68.00	484	12729.7
T_5		3.13		13.91		69.80		12742.5
T_6		3.27		16.01		62.00		12258.4
SE		0.019		0.359		0.270		62.186
CD at 1%		0.077		1.429		1.04		268.23

The titratable acidity of fruits declined continuously from harvest to ripe stage in fruits treated with different concentrations of sodium hypochlorite. Acidity was maximum in T_5 (0.32%) and was at par with T_4 (0.31%) and T_3 (0.28%) and was significant over rest. The decrease in acidity during ripening could be attributed to degradation of organic acids during ripening process. Jabbar *et al.* (2011) reported decrease in acidity (0.45%) in fruits treated with NaOCl Cv. Samar Bahisht Chausa mango. The pH was increased at ripe stageand found to be non significant. The increase in pH values from harvest to ripening could be attributed to corresponding degradation of organic acids during ripening. Similar results to present findings corroborate well with those of Ahire (2009) in Alphonso mango.

Maximum reducing sugars was recorded in (3.08%) and was significantly superior over rest. The increase in RS during ripening process could be attributed to conversion of starch into sugars. Similar observations were recorded by Tefera *et al.* (2008) in mango fruits.Total sugars were increased during storage period. Maximum TS were registered by T_6 (16.01%) and was at par with T_1 (15.85%) and T_2 (14.95%) and significant over rest. Control fruits recorded maximum TS as compared to 10, 20, 30, 40, and 50 ppm NaOCl treated fruits. The increase in TS during ripening was due to conversion of starch into sugars. Identical observations were noticed by Tefera *et al.* (2008) and Ahire (2009) in mango. It was observed that ascorbic acid decrease during the storage period. Highest ascorbic acid was noticed in T_5 (69.80) mg/100g and was significantly superior over rest. The decline in ascorbic acid during ripening could be attributed to its degradation during ripening process. These results conform well to findings of Ahire (2009) in Alphonso mangoes treated with NaOCl. Beta carotene was highest T_5 (12681.67mg/100g and was at par with T_4 (12729.7 mg/100g) followed by T_3 (1268.5 mg/100g), T_2 (12632.5mg/100g) and significant over rest treatments. The abrupt increase in the β-carotene content could be attributed to their accelerated biosynthesis during ripening process. Results on similar trend were reported by Thomas (1975) in Alphonso mango.

References

Anwar. 2004. Growth pattern and effect of split application of fertilizers on vegetative and reproductive growth and malformation of mango inflorescence (*Mangifera indica L.*) cv. Langra. M.Sc. Thesis, Inst. Hort. Sci., Univ. of Agri., Faisalabad.

Amin M, A U Malik, M S Mazhar, Din M, S Khalid and S Ahmad. 2008. Mango fruit desapping in relation to time of harvesting. Pak. J. Bot. 40(4): 1587-1593

Ahire U P . 2009. Effect of desapping and disinfectants on the shelf life and quality of mango (*Mangifera indica*) Cv. Alphonso under cold storage condition. M.Sc. (Agri) the thesis submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri (M.S).

Jabbar A, A U Malik, Islam-UD-Din, R Anwar, M Ayub, I A Rajwana, M Amin, A S Khan and M Saeed .2011. Effect of combined application of fungicides and hot water quarantine treatment on post harvest diseases and quality of mango fruit. Pak. J. Bot 43(1):65-73.

Lichtenberg E and D Zilberman. 1987. Regulating environment and human health risk from agricultural residuals. Appl. Agric. Res. 2: 56-64.

Mukherjee P K. 1959. Biochemical and physiological studies during development of mango fruits. Hort. Adv. 3(2): 95-101.

Sahani C K, D S Khurdiya and MA Dalal .1994. Effect of ripening aids on the quality of Amrapali mango. Mah J. Hort. 8(1):72-77.

Swart S H, J J Serfontein and J Kalinnowski. 2002. Chemical control of postharvest diseases of mango-the effect of prochloraz, thiobendazole and fludioxonil on soft brown rot, stem-end rot and anthracnose. S.A. Mango Growers' Assoc. Year Book, 22: 55-62.

Thomas P. 1975. Effect of post harvest temperature on quality, carotenoids and ascorbic acid content of Alphonso mangoes on ripening. J. Food Sci. 40 (4): 704-706.

Tefera A, T Seyoum and K Woldetsadik .2008. Effects of disinfection, packaging and evaporative cooled storage on sugar content of mango. African J. Biotech. 7(1):65-72.

Weaver J E, H W Hogmire, J L Brooks and J C Sencindiver. 1990. Assessment of pesticide residues in surface and soil water from a commercial apple orchard. Appl. Agric. Res. 5: 37-43.