Effect of hot water treatment and irradiation on physiological loss of weight of graded mango (*Mangifera indica*) cv Alphonso fruits at ambient and cold storage conditions

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ABSTRACT

The present investigations were carried out to study the effect of hot water treatment and irradiation on physiological loss in weight of graded mango (*Mangifera indica*) cv Alphonso fruits at ambient and cold storage conditions. Treated fruits were stored at ambient temperature (28.6 to 31.8°C, 76% RH) whereas in cold storage were kept at (12 ± 2°C, 90% RH). Maximum PLW was recorded in treatment 100 per cent mature hot water treated irradiated fruits (16.59%) that was at par with 85 per cent mature hot water treated irradiated fruits (16.55%) and 75per cent mature hot water treated irradiated fruits (16.34%) and significant over rest of the treatments on 16th day of storage .

Keywords: Grading; hot water treatment; irradiation; physiological loss; cold storage

INTRODUCTION

Alphonso is popular mango cv worldwide due to its attractive colour, shape, size, fiberless flesh, pleasent flavour, excellent taste, good keeping quality, good sugar acid blend and suitability for processing as it retains flavour even after processing.

Mango (*Mangifera indica* L) is a tropical to sub-tropical fruit; its rapid ripening process and infection caused by microorganisms are the major causes of post-harvest losses that limit the transport of fresh fruit from the site of harvest to market (Mitra and Baldwin 1997).

Mangoes are perishable due to high moisture content and to extend their ripening during long distance shipment, fruits are generally harvested at physiologically mature stage, stored at low temperature and ripened at destination under favourable conditions (Arthachinta 2000). The objective of study was to evaluate the effect of hot water treatment and irradiation on physiological loss in weight of graded mango fruits at ambient and cold storage conditions.

MATERIAL and METHODS

The mature fruits were harvested and graded as per maturity into three groups 75, 85, and 100 per cent of specific gravity by float and sink method (Mukherjee 1959). The fruits were washed with water separately as per grades, dried and packed in CFB boxes; boxes were labeled and carried toward hot water treatment (HWT) unit of APMC, Nachane, Ratnagiri, Maharashtra. Fruits were given HWT for 5 minutes for which these were separately passed towards hot water unit fitted with thermostat control sensors to maintain the desired temperature of 55°C and were dried with blow of air. Fruits were packed in labeled CFB boxes.

Openings were provided in boxes and such ventilators in boxes were covered with an insect proof screen of 30 mesh (mandatory for USA and Japan). The packaging material was of food grade quality. The packed boxes were immediately loaded in van and carried for irradiation treatment at 400 Grays at KRUSHAK (Krishi Utpadhan Sanskaran Kendra), Lasalgoan, district Nashik, Maharashtra. As per the grades, the CFB boxes were loaded in pallets and

conveyed towards irradiation chamber. Fruits of control were carried in van but not irradiated. After irradiation procedure was completed, fruits were returned to Dapoli and kept for ripening at ambient temperature and cold storage. The individual fruits were numbered and weight loss was measured on top pan balance at every alternate day. The experiment was conducted by using FCRBD. Main treatments used were T_1N: 75 per cent mature fruits (control), T_1HI: 75 per cent mature hot water treated irradiated fruits, T_2N: 85 per cent mature fruits (control), T_2HI: 85 per cent mature hot water treated irradiated fruits, T_3NI: 100 per cent mature fruits (control), T_3I: 100 per cent mature hot water treated irradiated fruits. Sub-treatments used were storage at ambient temperature (28.6 to 31.8°C, 76% RH) and storage at cold temperature (12 ± 2°C, 90% RH). In each treatment 20 fruits were taken and each treatment was replicated six times.

RESULTS and DISCUSSION

Maximum PLW was recorded in treatment T_3HIAT (16.59%) that was at par with T_2HIAT (16.55%) and T_1HIAT (16.34%) and significant over rest of the treatments on 16th day of storage (Table 1). The cold storage fruits recorded minimum PLW. The maximum PLW in CS was recorded in T_3HICS (5.20%) on 16th day of storage. HI fruits of all grades exhibited higher PLW as compared to control both at AT and CS conditions. At AT and CS conditions, maximum PLW was noticed in 100 per cent maturity grade irradiated fruits whereas minimum PLW at AT and CS was observed with 75 per cent mature non-irradiated fruits on 16th day of storage. The fruits stored at CS conditions exhibited less than 10 per cent PLW till 28th day of storage. However at AT storage, this much PLW was achieved within 10 to 12 days of storage. The steady increase in PLW throughout the storage period could be attributed to steady loss of moisture due to respiration and transpiration of fruits.

The difference in PLW within the fruits could be due to their maturity grades. Rathore et al (2010a) observed 36.1 per cent PLW in Dasheheri fruits on 15th day of storage at ambient conditions (32.35°C, 53.6-78.8% RH) after 30 days of storage. Rathore et al (2010b) reported 10.96 per cent PLW in Chausa White variety of mango treated with hot water (28.33°C, 96% RH) after 30 days of storage. El-Salhy et al (2006) reported maximum PLW (9.67%) after 8

Table 1. Effect of grading, hot water treatment and irradiation on PLW of Alphonso mango fruits at ambient and cold storage conditions

Treatment	Days of storage													
	2	4	6	8	10	12	14	16	18	20	22	24	26	28
T_1NAT	1.68	3.27	5.09	7.28	9.36	11.40	13.31	14.88	5.25	6.06	7.26	8.02	8.78	9.54
T_1HIAT	1.71	3.55	5.27	8.10	10.29	11.96	13.87	16.34	5.57	6.40	7.54	8.14	8.98	9.80
T_1NCS	0.45	0.84	1.35	1.97	2.66	3.41	3.99	4.85						
T_1HICS	0.43	0.93	1.48	2.04	2.75	3.52	4.25	4.98						
T_2NAT	1.70	3.31	5.12	7.66	9.64	11.71	13.64	15.54	5.59	6.16	7.42	8.09	8.97	9.70
T_2HIAT	1.78	3.60	5.46	8.50	10.57	11.97	14.15	16.55	5.96	6.66	7.57	8.18	9.03	9.83
T_2NCS	0.46	0.86	1.37	2.00	2.72	3.46	4.17	4.96						
T_2HICS	0.45	0.93	1.55	2.20	2.79	3.54	4.29	5.15						
T_3NAT	1.63	3.51	5.26	7.91	9.82	11.92	13.66	16.21	5.69	6.28	7.55	8.25	9.01	9.86
T_3HIAT	1.73	3.73	5.47	8.60	10.86	12.14	14.24	16.59	6.01	6.82	7.73	8.28	9.07	9.91
T_3NCS	0.46	0.86	1.42	2.01	2.74	3.48	4.23	4.97						
T_3HICS	0.50	0.96	1.62	2.26	2.83	3.58	4.33	5.20						
Mean	1.07	2.19	3.37	5.04	6.41	7.67	9.01	10.52						
Tr (SE)	0.025	0.059	0.079	0.059	0.065	0.119	0.133	0.118						
$CD_{0.01}$	0.092	0.218	0.292	0.218	0.240	0.440	0.492	0.436						
St (SE)	0.014	0.034	0.045	0.034	0.037	0.069	0.077	0.068						
$CD_{0.01}$	NS	0.125	NS	0.125	0.136	NS	NS	0.251						
Int (SE)	0.356	0.084	0.111	0.083	0.092	0.169	0.188	0.167						
$CD_{0.01}$	NS	NS	NS	0.307	0.340	NS	NS	NS						

T_1N: 75% mature control fruits, T_2N: 85% mature control fruits, T_3N: 100% mature control fruits, T_1HI: 75% mature hot water treated irradiated fruits, T_2HI: 85% mature hot water treated irradiated fruits, T_3HI: 100% mature hot water treated irradiated fruits, AT: Ambient temperature, CS: Cold storage

weeks of storage in fruits treated with1.0 kGY and minimum (8.17%) in hot water treated fruits of cv Awais stored mango fruits (10°C, 85-90% RH) whereas Abbasi et al (2011) reported maximum (38.0%) and minimum PLW (11.65%) in hot water treated fruits of cv Chausa at 50 ± 2°C for 3 minutes in control and 2 per cent carboxyl methyl cellulose (CMC) treated fruits respectively on 17th day of storage at 8°C temperature.

CONCLUSION

The PLW of graded mango fruits was found to increase continuously throughout the storage period irrespective of the maturity grades and storage conditions. The lowest PLW was noticed in 75 per cent mature fruits whereas highest with 100 per cent mature fruits. At ambient and cold storage conditions, maximum PLW was noticed with hot water treated irradiated fruits having 100 per cent maturity while minimum with control fruits at 75 per cent maturity.

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