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Changes in sensory quality taste in Dashehari mango fruits by use of different biodegradable wrapping and packaging materials during storage

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Abstract

Use of biodegradable and eco-friendly packaging materials not only play important role in maintaining the keeping qualities but, these are also easy to use and economically feasible for mango growers. The application of this type of modified or Controlled Atmosphere packaging helps in extending shelf life with retaining the other qualities without deteriorations in taste and other qualities for longer period. Considering the same, CFB box, Wooden box and Bamboo basket were taken as containers and ;Tissue paper, Blotting paper and News paper were taken as wrapping materials. The experiment was conducted at Patharchatta farm of GBPUA&T, Pantnagar. The experiment was laid out in Factorial Completely Randomized Design having total 12 treatments and three replications. In case of different packaging materials, fruits were also scored maximum point (7.82) on 6th day on 9 point hedonic scale. Among packaging containers, highest sensory score for taste (7.25) was recorded of CFB box fruits and the lowest score for taste (6.14) was obtained of the fruits kept in bamboo basket. The maximum sensory score for taste (7.57) was recorded of fruits wrapped with tissue paper and minimum sensory score for taste (4.72) was obtained under control i.e. fruits without wrapping. This might be happened because there may be slow rate of senescence of wrapped fruits. Interactions among container, wrapper and storage intervals also showed similar results for better performance in the treatment where fruits were kept in CFB box after wrapping with Tissue paper on 8th day of storage period.

Keywords: CFB Box, Wrapping, Packaging, Sensory score, Blotting paper, Tissue paper

Introduction

India ranks first in growing the King of fruits. Most of them are the result of open pollination arising as chance seedlings. Small, monoecious and polygamous flowers produce delicious fruits which are rich in amino acids, carbohydrates, fatty acids, organic acids, proteins, vitamins, carotenoids, phenolic compounds and other dietary antioxidants. Ripe mango fruit pulp contains as much vitamin A as butter. Besides its exemplary nutritive value, captitive flavour, attractive fragrance and beautiful colour it has luscious unique taste. India shares about 43% of total mango production of the world. The demand and requirement of mango fruits in domestic and international market is increasing but, productivity of total fruits in India has become almost stable i.e. around 11.2 tones/ha. On the other side, post harvest loss of fruits is still lying between 25 to 30%. Therefore, we will have to concentrate on post harvest activities which should be quality wise desirable, economically profitable and socially acceptable. The taste is one of the important quality which plays important role in maintaining the quality during storage.

Materials and Methods

Biodegradable wrapping and packaging materials have positive effect on not only its external appearance but also help to reduce weight loss and respiration rate resulting enhance in shelf life with maintenance of desired qualities of fruits. The present investigation was carried out at Horticultural Research Centre, Pattharchatta and in the Department of horticulture, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, district Udham Singh Nagar (Uttarakhand), India during June - July of the year 2009 and 2010. The fruits free from diseases and uniform in shape, size and colour were harvested in the morning time. Fruits were wrapped and packed in different combinations having total 12 treatments replicated thrice and designed in factorial CRD as detailed below.

Container - 3

C₁ – CFB Box

C₂ – Wooden box

C₃ – Bamboo basket

Wrapper - 4

W₁ – Tissue paper

W₂ – Blotting paper

W₃ – News paper

W₀ – Without wrapping

Results and Discussions

On the basis of results of 2009, 2010 and pooled data of both years, it is observed that sensory score of taste was highest on 6th day followed by 8th and 10th day. The lowest sensory score of taste of fruits was observed on 12th day of storage. CFB box container performed better among three types of them. Almost similar trend was observed of pooled data of both years. The highest sensory score of taste (7.25) was recorded of CFB box fruits followed by 6.82 of fruits kept in wooden box. The lowest sensory score of taste (6.14) was observed of the fruits kept in bamboo basket. Similar observations were recorded by Hayat *et al.* (2005) for Banky apple. Tissue paper performed better among others. The results of two years separately and pooled data reflected similar trend to that of both the years. The maximum sensory score of taste (7.57) was recorded of fruits wrapped with tissue paper which was *at par* with fruits of blotting paper (7.40) followed by news paper (7.23). The lowest sensory score of taste (4.72) was observed under control i.e. fruits without wrapping (Table 1). This might be happened because there may be slow rate of senescence of wrapped fruits. Similar results were observed by Mukherjee (1972) [4] and Srivastva (1967) [5] on mango fruits. Mann and Singh (1975) [1] observed that both Dashehari and Langra cultivars of mango were organoleptically superior when ripened under paper cuttings. The results of both the years and the pooled data indicated that interactions between storage periods and packaging containers were significant. On 6th day, all the three containers affected the fruit taste in similar manner but on 8th, 10th and 12th day CFB box fruits retained their sensory score better (Table 2). Pooled data of both years reflected the similar trend of results as it was during 2010. Effect of interactions between storage periods and wrappers was statistically significant. The maximum sensory score of taste (8.05) was observed on 6th

day of fruits wrapped with tissue paper which was *at par* with fruits wrapped with blotting paper (7.95) and news paper (7.85) on the same day. It was also *at par* with fruits wrapped with tissue paper (8.04) on 8th day. The lowest score was observed of unwrapped fruits (control) on 12th day of storage (Table 3).

The critical examination of the Pooled data of both years reflected similar trend of results as it was during the year 2009 and 2010. The significant effect of interactions between packaging containers and wrappers was also observed. The highest sensory score of taste (8.12) was observed of the fruits which were kept in CFB box after wrapping with tissue paper (C₁W₁) which was *at par* with C₁W₂ (8.04) and C₁W₃ (7.96) on the same day. It was also *at par* with C₂W₁ (7.80). The minimum sensory score of taste (4.64) was observed of unwrapped fruits kept in bamboo basket (Table 4). This might be due to balance of CO₂ and O₂ ratio in CFB box micro environment with suitable ventilation also Menon, R. R. and Goswami, T.K. (2007) [3].

Pooled data of 2009 and 2010 revealed that effect of interactions among all the three (storage periods, packaging containers and wrappers) were significant. The highest sensory score of taste (8.25) was observed of fruits on 8th day which were kept in CFB box after wrapping with tissue paper (C₁W₁) and the sensory score was *at par* with the scores of 10th (8.09) and 12th day (7.96). The C₁W₁ was also *at par* with the sensory scores of C₁W₂ (8.22) and C₁W₃ (8.04) on 8th day. The lowest score was with C₃W₀ (Table 5). Interactions among container, wrapper and storage intervals also showed similar results for better performance under C₁W₁ on 8th day of storage period. Masalkar, S.D.; Gaikwad, R.S. and Dhemere, J.K. (2006) [2] opined similar results Alphonso mango fruits in cool chamber and ambient conditions. Modified atmosphere packaging encourages uniform ripening without any mechanical injury in fruits and biochemical changes took place uniformly.

Table 1: Effect of storage periods, packaging containers and wrappers on sensory quality (taste) of mango fruits cv. Dashehari (year 2009, 2010 and pooled data)

Treatment	Taste		
	2009	2010	Pooled data
Effect of storage periods			
6 th day	7.78	7.85	7.82
8 th day	7.25	7.32	7.29
10 th day	6.50	6.58	6.54
12 th day	5.22	5.31	5.27
S.Em.±	0.037	0.077	0.072
CD at 5%	0.105	0.216	0.202
Effect of packaging containers			
CFB box (C ₁)	7.21	7.29	7.25
Wooden box (C ₂)	6.78	6.86	6.82
Bamboo basket (C ₃)	6.10	6.17	6.14
S.Em.±	0.032	0.066	0.062
CD at 5%	0.091	0.187	0.175
Effect of wrappers			
Tissue paper (W ₁)	7.53	7.61	7.57
Blotting paper (W ₂)	7.37	7.44	7.40
News paper (W ₃)	7.21	7.26	7.23
Without wrapper (W ₀)	4.68	4.76	4.72
S.Em.±	0.037	0.077	0.072
CD at 5%	0.105	0.216	0.202

Table 2: Effect of interactions between storage periods and packaging containers on sensory quality (taste) of mango fruits cv. Dashehari (year 2009, 2010 and pooled data)

Days	Packaging containers								
	2009			2010			Pooled data		
	CFB box (C ₁)	Wooden box (C ₂)	Bamboo Basket (C ₃)	CFB box (C ₁)	Wooden box (C ₂)	Bamboo Basket (C ₃)	CFB box (C ₁)	Wooden box (C ₂)	Bamboo Basket (C ₃)
6 th day	7.94	7.79	7.60	8.01	7.86	7.67	7.98	7.82	7.64
8 th day	7.44	7.20	7.11	7.52	7.28	7.20	7.48	7.24	7.16
10 th day	7.06	6.87	5.56	7.13	6.95	5.63	7.10	6.91	5.60
12 th day	6.41	5.12	4.12	6.48	5.19	4.20	6.44	5.15	4.16
S.Em.±	0.065			0.133			0.125		
CD at 5%	0.182			0.374			0.351		

Table 3: Effect of interactions between storage periods and wrappers on sensory quality (taste) of mango fruits cv. Dashehari (year 2009, 2010 and pooled data)

Days	Wrappers											
	2009				2010				Pooled data			
	Tissue paper (W ₁)	Blotting paper (W ₂)	News paper (W ₃)	Without wrapper (W ₀)	Tissue paper (W ₁)	Blotting paper (W ₂)	News paper (W ₃)	Without wrapper (W ₀)	Tissue paper (W ₁)	Blotting paper (W ₂)	News paper (W ₃)	Without wrapper (W ₀)
6 th day	8.01	7.92	7.81	7.36	8.08	7.99	7.89	7.44	8.05	7.95	7.85	7.40
8 th day	8.00	7.92	7.80	5.27	8.07	8.00	7.89	5.34	8.04	7.96	7.84	5.31
10 th day	7.45	7.27	7.22	4.05	7.52	7.34	7.30	4.12	7.49	7.31	7.26	4.09
12 th day	6.68	6.36	5.77	2.06	6.75	6.44	5.84	2.13	6.71	6.40	5.80	2.09
S.Em.±	0.075				0.154				0.144			
CD at 5%	0.210				0.432				0.405			

Table 4: Effect of interactions between packaging containers and wrappers on sensory quality (taste) of mango fruits cv. Dashehari (year 2009, 2010 and pooled data)

Packaging containers	Wrappers											
	2009				2010				Pooled data			
	Tissue paper (W ₁)	Blotting paper (W ₂)	News paper (W ₃)	Without wrapper (W ₀)	Tissue paper (W ₁)	Blotting paper (W ₂)	News paper (W ₃)	Without wrapper (W ₀)	Tissue paper (W ₁)	Blotting paper (W ₂)	News paper (W ₃)	Without wrapper (W ₀)
CFB box (C ₁)	8.09	8.01	7.92	4.84	8.16	8.08	7.98	4.91	8.12	8.04	7.96	4.87
Wooden box (C ₂)	7.76	7.53	7.08	4.62	7.84	7.60	7.16	4.69	7.80	7.56	7.11	4.65
Bamboo basket (C ₃)	6.75	6.57	6.47	4.60	6.82	6.64	6.56	4.67	6.79	6.61	6.52	4.64
S.Em.±	0.065				0.133				0.125			
CD at 5%	0.182				0.374				0.351			

Table 5: Effect of interactions between storage periods, packaging containers and wrappers on sensory quality (taste) of mango fruits cv. Dashehari (year 2009, 2010 and pooled data)

Treatment	2009				2010				Pooled data			
	6 th day	8 th day	10 th day	12 th day	6 th day	8 th day	10 th day	12 th day	6 th day	8 th day	10 th day	12 th day
C ₁ W ₁	8.18	8.21	8.05	7.92	8.24	8.28	8.13	7.99	8.21	8.25	8.09	7.96
C ₁ W ₂	8.09	8.18	8.00	7.80	8.14	8.26	8.06	7.87	8.12	8.22	8.03	7.84
C ₁ W ₃	8.01	8.00	7.98	7.71	8.08	8.08	8.06	7.78	8.05	8.04	8.02	7.75
C ₁ W ₀	7.52	5.40	4.23	2.21	7.59	5.46	4.29	2.28	7.56	5.43	4.26	2.25
C ₂ W ₁	8.06	8.01	8.00	7.00	8.12	8.08	8.08	7.06	8.09	8.05	8.04	7.03
C ₂ W ₂	7.99	7.82	7.81	6.50	8.07	7.88	7.87	6.58	8.03	7.85	7.84	6.54
C ₂ W ₃	7.81	7.80	7.70	5.00	7.88	7.86	7.77	5.07	7.85	7.83	7.74	5.04
C ₂ W ₀	7.30	5.20	4.00	1.99	7.35	5.26	4.07	2.05	7.33	5.23	4.04	2.02
C ₃ W ₁	7.80	7.79	6.31	5.12	7.88	7.85	6.38	5.20	7.84	7.82	6.35	5.16
C ₃ W ₂	7.71	7.78	6.01	4.80	7.77	7.86	6.08	4.86	7.74	7.82	6.05	4.83
C ₃ W ₃	7.63	7.67	6.00	4.60	7.69	7.78	6.08	4.67	7.66	7.73	6.04	4.64
C ₃ W ₀	7.28	5.22	3.93	1.99	7.35	5.30	4.00	2.07	7.32	5.26	3.97	2.03
S.Em.±	0.130				0.267				0.250			
CD at 5%	0.365				0.749				0.702			

C₁W₁: Fruits kept in CFB box after wrapping with Tissue paper, C₁W₂: Fruits kept in CFB box after wrapping with Blotting paper, C₁W₃: Fruits kept in CFB box after wrapping with News paper, C₁W₀: Fruits kept in CFB box without wrapper, C₂W₁: Fruits kept in Wooden box after wrapping with Tissue paper, C₂W₂: Fruits kept in Wooden box after wrapping with Blotting paper, C₂W₃: Fruits kept in Wooden box after wrapping with News paper, C₂W₀: Fruits kept in Wooden box without wrapper, C₃W₁: Fruits kept in Bamboo basket after wrapping with Tissue paper, C₃W₂: Fruits kept in Bamboo basket after wrapping with Blotting paper, C₃W₃: Fruits kept in Bamboo basket after wrapping with News paper, C₃W₀: Fruits kept in Bamboo basket Without wrapper (Control).

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