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Effect of post harvest treatment on biochemical composition and organoleptic quality in Kagzi lime fruit during storage

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ABSTRACT

The present investigation was carried out to test the efficacy of various post harvest treatments using gamma irradiation, growth retardants and coatings on quality and sensory parameters of Kagzi lime under ambient conditions. Among various treatments, pure coconut oil coating was very effective as higher TSS, acidity, vitamin C, juice content, flavour, appearance and taste were retained during storage. Pure coconut oil coated fruits maintained natural light-green colour upto 24 days of storage, which was acceptable to consumers.

Key words: Oil coating, consumer acceptability, organoleptic, Kagzi lime, shelf-life, storage period

INTRODUCTION

Lime fruits are important as these find several uses in culinary, beverage, industry and medicine. The high acceptability is due to their attractive colour and distinctive flavour, and the fact that they are a rich source of Vitamin C and also contain Vitamin B, pectin, organic acids, minerals and other nutritive substances, required for human health. Fruits are perishable and get spoiled in times of a glut in the market. Inadequate infrastructure for storage, improper handling of the produce during packaging, transport, storage and marketing also cause considerable losses. Thus, retention of quality in fruits for a longer period is one of the most important aspects of post harvest handling and storage. Various viable technologies such as use of gamma irradiation, growth retardants, anti transpirants, wax emulsion and oil coating have been used to increase longevity of harvested fruits. In places where refrigeration and storage facilities are not available, protective skin coating is one of the methods for increasing storage life of fresh fruits. Keeping the above in view, an experiment was designed to test the effect of post harvest treatments on chemical composition and sensory qualities of Kagzi lime fruits.

MATERIAL AND METHODS

The present investigation was carried out at the Fruit Preservation Laboratory of the Department of Horticulture, College of Agriculture, Jabalpur. Freshly harvested Kagzi lime fruits were procured from Fruit Research Station, Imalia, Jabalpur. Fruits were harvested at the physiological mature stage, which was decided on the basis of colour turn in the skin. Fresh, fully ripe and uniform fruits were selected, thoroughly washed in tap water and subjected to different treatments, after initial quality analysis and organoleptic evaluation. Fruits treated with five doses of gamma radiation (50, 100, 200, 300 and 400 Gy), six treatments of growth retardants (MH-250 ppm, 500 ppm, 750 ppm, CCC-250 ppm, 500 ppm, 750 ppm) and three treatments of coating (Mustard oil 100%, coconut oil 100%, and, liquid paraffin 100%). Observations were recorded at 6, 12, 18 & 24 days of storage. Total soluble solids were measured by Zeis hand Refractometer and values obtained were corrected at 20^0C. Acidity and ascorbic acid content were measured as described by A.O.A.C. (1970). Juice content was calculated on volume basis and expressed as per cent. The appearance, taste, flavour and colour of each sample was evaluated by panel of five judges on a scale of 10 marks. The experiment consisted of 15 treatments replicated thrice and laid out in Complete Randomized Design.

RESULTS AND DISCUSSION

Data presented in Table 1 clearly indicate that the TSS of lime juice was not significantly influenced by different post harvest treatments. TSS of the fruit increase

Table 1. Effect of post harvest treatment on biochemical composition of Kagzi lime fruit

Treatment	TSS (%)				Juice content (%)				Acidity (%)				Vitamin C (mg/100ml juice)			
	DAT				DAT				DAT				DAT			
	6	12	18	24	6	12	18	24	6	12	18	24	6	12	18	24
Control	8.5	8.7	8.9	8.4	35.88	34.46	32.25	31.08	6.48	6.60	7.12	7.03	28.49	29.28	30.46	29.94
50Gy	8.6	9.0	9.1	8.5	37.93	35.82	33.94	32.20	6.52	6.62	7.15	7.06	28.51	29.42	30.77	29.98
100 Gy	9.7	10.0	10.1	9.5	50.32	47.34	45.64	41.25	6.67	6.83	7.31	7.21	30.88	31.60	34.10	33.64
200 Gy	9.4	9.7	9.8	9.3	44.64	41.18	40.39	38.10	6.55	6.67	7.21	7.10	29.40	30.10	32.20	29.75
300 Gy	8.5	8.6	8.7	8.3	34.57	32.07	31.12	29.57	6.45	6.58	7.11	7.04	28.60	29.57	31.23	30.19
400 Gy	8.3	8.4	8.5	8.2	32.98	31.57	29.06	27.19	6.43	6.55	7.09	7.03	28.26	29.12	30.17	29.56
CCC 250 ppm	9.2	9.6	9.7	9.1	39.24	34.43	35.18	33.94	6.56	6.64	7.20	7.08	28.94	29.50	31.46	30.58
CCC 500 ppm	9.5	9.7	9.9	9.4	46.93	42.67	41.08	39.18	6.60	6.78	7.27	7.18	30.27	30.34	33.33	32.50
CCC 750 ppm	8.9	9.3	9.4	8.8	42.12	40.20	37.63	35.94	6.57	6.70	7.23	7.13	29.76	30.23	32.80	31.40
MH 250 ppm	8.7	9.2	9.3	8.6	40.87	38.75	36.54	35.20	6.53	6.63	7.18	7.07	29.12	29.88	31.76	30.98
MH 500 ppm	9.6	9.8	9.9	9.4	48.45	44.57	42.38	40.37	6.65	6.80	7.20	7.19	30.74	31.10	33.94	32.88
MH 750 ppm	9.1	9.5	9.6	9.0	43.19	40.12	38.94	37.14	6.51	6.74	7.25	7.15	30.56	30.94	33.66	32.75
Mustard oil coating (100% pure)	8.1	8.3	8.4	8.0	31.37	29.59	27.42	25.10	6.40	6.55	7.08	7.01	27.92	28.74	29.80	29.10
Coconut oil coating (100% pure)	10.1	10.4	10.6	9.9	56.61	54.23	50.78	47.98	6.75	6.93	7.39	7.25	32.49	33.80	36.92	35.23
Liquid paraffin coating (100%pure)	9.9	10.2	10.4	9.8	52.93	50.07	48.34	45.27	6.69	6.87	7.35	7.22	31.32	32.13	34.84	33.95
SEm±	0.751	0.766	0.764	0.750	0.572	0.446	0.352	0.577	0.283	0.285	0.290	0.288	0.617	0.515	0.415	0.416
CD at *(P=0.05%)*	NS	NS	NS	NS	1.652	1.291	1.018	1.667	NS	NS	NS	NS	1.783	1.488	1.200	1.201

NS = Non significant ;DAT= Days after treatment

during storage upto 18 days, and thereafter a slight decline was noticed in all the treatments. Increase in TSS during storage may be due to water loss in the fruits. The minimum value (8.0%) of TSS was observed with mustard oil coating. This may be due to cell death and highly concentrated oil penetration in the nuclei of cells resulting in lower TSS percentage in fruits receiving mustard oil coating. Similar findings were reported by Sindhu and Singhrot (1996) in Baramasi lemon. Maximum (9.9%) TSS was recorded in coconut oil coated fruits followed by those coated in liquid paraffin (9.8). This could be due to delay in ripening and senescence. Results are in conformity with EI. Monem *et al* (2003) in custard apple and Choudhary *et al* (2004*)* in kinnow mandarin.

Data given in Table 1 reveal that pure coconut oil coating significantly influenced percentage of juice content as compared to control and all other treatments. Although storage period was enhanced to 24 days, it was found that the juice content of fruits decreased in all the treatments. Maximum (47.98%) juice content retention in fruits was observed under coconut oil coating, followed by (45.27%) liquid paraffin coating. This may be due to lower water loss. Similar findings were made by Bhullar (1983) in Kagzi lime. The least juice content was found with pure mustard oil coating. This may be due to continuous transpiration from surface of the fruits as a result of higher dehydration and drying of juice due to skin injury.

Acidity of the fruits increased initially in all the treatments up to 18 days, but thereafter, it decreased up to 24 days of storage (Table 1). This decrease in acidity with increasing storage period may be due to utilization of acids during metabolism. Minimum acidity (7.01%) was observed in mustard oil coating due to dilution effect of the hydrolysis of acids. Maximum acidity (7.25%) was recorded in pure coconut oil followed by liquid paraffin (7.22%) coated fruits after 24 days of storage at room temperature. Higher acidity of lime fruits retained under coconut oil coating, followed by liquid paraffin coating may be due to lesser availability of oxygen to fruits in later stages of storage. It appears that an organic acids which participates in the respiratory process is not oxidized, and therefore, their levels remained high. Similar result was also obtained by Jagadeesh *et al* (2001) in guava fruits.

Vitamin C content showed an increasing trend up to 18 days. Thereafter, it started decreasing in almost all the treatments (Table 1). These results are in conformity with earlier findings of Singhrot *et al* (1987) in Baramasi lemon. Maximum retention of Vitamin C content (35.23 mg/100 ml juice) was recorded in pure coconut oil coating, followed by (33.95 mg/ 100 ml juice) liquid paraffin, which was significantly higher than control. Minimum (29.10mg/100ml juice) Vitamin C content was recorded under mustard oil coated fruits. Coconut oil and liquid paraffin coating helped in reducing the rate of respiration

and ripening, which resulted in dissipation of ascortic acid into dehydro ascorbic acid during storage. The present findings are in conformity with Nagar *et al* (2004) in Kagzi lime fruits.

Relatively better physical appearance of fruits (9.6%) was observed 18 days storage period with coconut oil coating. At storage period of 24 days, appearance of the fruits was affected adversely in all treatments (Table 2). However, maximum appearance acceptability of fruits (8.8%) was obtained under coconut oil coating at 24 days of storage period. This might be due to delay in ripening as well as uniform colour development in fruits under coconut oil coating at this period of storage. Similar results were reported by Mahajan *et al* (2005) in kinnow fruits. Whereas, minimum acceptability regarding appearance of fruits (2.8%) was observed under mustard oil coating after 24 days of storage. This may be due to wrinkling and softening of fruit tissues by skin injury, which is caused by application of pure mustard oil coating. The highest organoleptic scoring for flavour was recorded under coconut oil coating followed by liqu id paraffin coating under every stage of storage. It might be due to delay in ripening of fruits, which retain the flavour for longer period of time and release pleasant flavour in those fruits were coated with coconut oil. While natural flavour decreased under mustard oil coating. Some differences in appearance and flavour were also noted by Dalal *et al* (1987) in Baramasi lemon.

Maximum consumer acceptability for fruit juice was noted under coconut oil coating at 6, 12, 18 and 24 days storage, respectively, followed by liquid paraffin coating. Whereas, satisfactory taste of lime juice was not retained under mustard oil coating. When the storage period was increased more than 12 days, it was observed that taste of fruit juice gradually deteriorated under all treatments. On the basis of the findings (Table 2) more acceptable taste was noted with coconut oil coating at all the stages of storage period. Retention of better taste is due to content of more acidity. These results are in conformity with the findings of Naik and Rekhade (1994) in ber fruits.

Coconut oil and liquid paraffin coating of fruits was found to be more effective in maintaining natural light green colour of fruits upto 24 days of storage, and this was acceptable to consumers. It might be due to retardation of senescence process and less degradation in the colour pigments (chlorophyll), which slowed the change in external colour under these treatments. Similarly result was obtained by Das and Medhi (1996) in pineapple fruits, whereas, dark brown colour of fruits was observed with pure mustard oil coating at 24 days of storage. This may be due to skin injury caused by higher concentration of mustard oil coating further causing tissue softening and destruction of colour pigments, leading to a change in external colour of the fruits. Similar findings were also reported by Dalal *et al* (1987) in Baramasi lemon.

Table 2. Effect of post harvest treatment on organoleptic quality in Kagzi lime fruit

Treatment	Appearance				Flavour				Taste				External colour			
	DAT				DAT				DAT				DAT			
	6	12	18	24	6	12	18	24	6	12	18	24	6	12	18	24
Control	5.8	6.4	6.7	5.5	5.4	5.8	4.4	3.8	5.4	5.8	4.4	3.8	YG+LG	LY+YG	LG+LB	YB+DB
50Gy	6.0	6.5	6.9	5.8	5.7	6.0	4.7	4.0	5.7	6.0	4.7	4.0	YG+DG	LG+YG	DY+YB	LB+YB
100 Gy	8.5	8.7	8.9	7.8	7.1	7.6	6.9	6.0	7.1	7.6	6.9	6.0	LG+DG	LY+YG	LY+YG	LY+LB
200 Gy	7.5	7.9	8.2	6.8	6.7	7.2	6.2	5.2	6.7	7.2	6.2	5.2	YG+DG	LG+YG	LY+YG	LY+LB
300 Gy	6.2	6.0	5.6	4.5	5.3	4.7	4.0	3.3	5.3	4.7	4.0	3.3	LG+YG	LY+YG	LB+LY	DB
400 Gy	5.6	5.2	4.8	3.9	4.9	4.5	3.5	3.0	4.9	4.5	3.5	3.0	LG+YG	LY+YG	LB+LY	DB
CCC 250 ppm	6.3	6.8	7.1	6.1	5.8	6.1	4.9	4.1	5.8	6.1	4.9	4.1	YG+LG	LY+LG	LY+LB	LY+DB
CCC 500 ppm	7.8	8.3	8.6	7.2	6.5	7.0	6.4	5.4	6.5	7.0	6.4	5.4	YG+DG	LY+YG	DY+LY	LY+LB
CCC 750 ppm	6.7	6.9	7.6	6.5	6.2	6.5	5.5	4.7	6.2	6.5	5.5	4.7	LY+LG	LG+YG	LY+LB	LY+YB
MH 250 ppm	6.5	7.0	7.3	6.3	6.0	6.2	5.1	4.4	6.0	6.2	5.1	4.4	YG+LG	LY+LG	LY+LB	LY+DB
MH 500 ppm	8.2	8.0	8.7	7.5	6.9	7.4	6.7	5.6	6.9	7.4	6.7	5.6	LG+DG	LY+YG	DY+LY	LY+LB
MH 750 ppm	6.9	7.2	7.9	6.7	6.4	6.8	5.9	5.1	6.4	6.8	5.9	5.1	LY+LG	LG+YG	LY+LB	LY+YB
Mustard oil coating (100% pure)	5.4	4.9	4.1	2.8	4.5	4.1	3.6	2.8	4.5	4.1	3.6	2.8	YG+LB	LY+LB	LB+DB	DB
Coconut oil coating (100% pure)	9.1	9.3	9.6	8.8	7.8	8.3	7.3	6.7	7.8	8.3	7.3	6.7	LG+DG	LG+DG	LG+DG	LG+LY
Liquid paraffin coating (100% pure)	8.8	9.1	9.3	8.4	7.5	7.9	7.1	6.3	7.5	7.9	7.1	6.3	LG+DG	LG+DG	LG+YG	LG+LY

DB= Dark brown DG= Dark green LG= Light greenLB= Light brownYG= Yellowish green YB= Yellowish brown DAT= Days after treatment

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