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Effect of storage period on organoleptic evaluation of raisins under refrigerated condition

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Abstract

A semi-trained sensory panel evaluated the raisins during storage studies. The main colour /appearance, taste, flavour, texture and overall acceptability organoleptic attributes were determined by semi-trained panel. Grape bunches were pre-treated with 1% Potassium carbonate + 1% Ethyl oleate in normal water, 2.5% Potassium carbonate + 1.5% Ethyl oleate at 45°C and 55°C for five minutes and then dried under commercial raisin making shed. Raisins prepared were packed in poly bag (400 gauge Low Density Polyethylene (LDPE) film bag) and kept for storage studies under refrigerated condition (4°C). Organoleptic (sensory) score for colour/appearance, taste, flavour, texture and overall acceptability was decreased with increase in storage period. Raisins packed in poly bag (400 gauge Low Density Polyethylene (LDPE) film bag) and stored under refrigerated condition (4°C) showed minimum decrease in organoleptic score during storage period.

Keywords: grapes, raisin, organoleptic property, storage period

1. Introduction

Grape (*Vitis vinifera* L.) is a leading fruit with world annual production of 75.80 million metric tons (Anon, 2017)^[1]. Grape is an important commercial fruit crop of India, which contributes to the maximum share among the fresh fruits and vegetables exported from India to Europe and other parts of the world. According to the estimate of NHB, the total area and production of grapes in the year 2016-17 was 136.0 thousand hectares and 2683.3 thousand MT respectively. Major grapes growing states are Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, and the North-Western region covering Punjab, Haryana, western Uttar Pradesh, Rajasthan and Madhya Pradesh. In India, raisins are mainly produced in Sangli, Solapur and Nasik districts of Maharashtra and Vijayapur district of Karnataka state (Venkatram, 2017)^[2]. Fresh grapes, a seasonal fruit having relatively high sugar and moisture content, are very sensitive to microbial spoilage during storage even under refrigerated condition (Xiao *et al.*, 2010; Xiao and Mujumdar, 2014)^[3, 4]. Therefore, after harvest grapes must be consumed or processed into various products in a few weeks in order to reduce economic losses. Drying or dehydration is one of the oldest and most important methods for preserving food, including grapes (Defraeye, 2017)^[5].

Pre-treatment is a necessary step in raisin production which includes physical (blanching) and chemical means in order to ensure the increased rate of water removal during the drying process. Various chemical pre-treatments (hot and cold) have been used to increase the drying rate of grapes (Grncarevic, 1969; Winkeler *et al.*, 1974)^[6, 7]. Wax compounds present on surface of grape berry have high molecular weight and they are insoluble in water and a melting point between 40 and 100°C (Glenn *et al.*, 2005)^[8].

The main purpose of sensory evaluation is to determine the food quality characteristics and the degree of compliance with the legal requirements and consumer habits. The first and most essential parameter of food is the sensory characteristics. It is complex property, and it is an opinion about the product itself, which cannot be replaced by any other method. The colour, taste, and texture (*i.e.* organoleptic qualities) of the raisins produced are important attributes for consumer acceptance and are judged by sensory evaluation (Ranganna, 1977)^[9]. The quality of product may deteriorate during storage due to effect of various treatments and processing methods and also due to physico-chemical changes in the product as influenced by storage environment. Therefore, the study was conducted to study the effect of storage period on organoleptic properties of raisins under refrigerated condition.

2. Material and Methods

Fresh grapes bunches (variety Thompson seedless) used in the present investigation were procured from a well maintained grapes orchard in Vijayapura (District), Karnataka.

Preparation of fruits

Grape bunches harvested at full maturity (22°B) were brought to the commercial raisin making shed in the farmers' field. Grapes were sorted to remove dead, diseased and under developed berries. Later, the grapes were washed with normal water before subjecting to pre-treatments.

Pre-treatments (3 Treatments with 7 replications)

T₁:Control (Farmers' practice) 1.0 per cent ethyl oleate + 1.0 per cent K₂CO₃ in normal water for 5 minutes

T₂:1.5 per cent ethyl oleate + 2.5 per cent K₂CO₃ dipping solution at 45°C for 5 minutes

T₃:1.5 per cent ethyl oleate + 2.5 per cent K₂CO₃ dipping solution at 55°C for 5 minutes

Drying

Pre-treated grape bunches were dried under raisin making shed till reaching a safe moisture level of 17-20 per cent. The average ambient temperature in the drying shed during the study period was 36±2°C.

Separation of dried grapes

Separation of dried grapes (raisins) from its stalks and rachis in bunches was done manually. The raisins were then brought to laboratory of Dept. of Post-Harvest Technology, College of Horticulture, Bagalkot for further studies.

Washing and shade drying

Raisins were washed with hot water at a temperature of 85±2°C in laboratory in order to remove chemical residue present on the surface of raisins. Washed raisins were shade dried in the laboratory to remove excess surface moisture.

2.1 Observation recorded- organoleptic properties of raisins at monthly intervals (up to 3 months)

Sensory evaluation

Sensory evaluation of raisin was carried out by a semi-trained panel consisting of Teachers and Post-Graduate students of College of Horticulture, Bagalkot with the help of nine point hedonic rating scale (1 = dislike extremely, 2-like only slightly, 3 = dislike moderately, 4 = dislike slightly, 5 = neither like nor dislike, 6-like slightly, 7 like moderately, 8 like very much and 9 like extremely). Sensory parameters considered in evaluation included colour and appearance, texture, taste, flavour and overall acceptability (Swaminathan, 1974)^[10].

Table 1: Physico-chemical properties of raisins

Treatments	TSS (°B)	Titratable acidity (%)	Total sugars (%)
T ₁	43.39	0.77	63.34
T ₂	43.70	0.76	63.37
T ₃	43.55	0.70	63.32

2.2 Statistical analysis

Statistical analysis was performed using Web Agri Stat Package (WASP) Version 2.0 (Jangam and Thali, 2010)^[11]. All data the collected were analysed by one-way analysis of variance (ANOVA). Significant differences among means at $P \leq 0.05$ were determined by post hoc tests using Duncan's multiple range test.

3. Results and Discussion

Colour and appearance

Significant differences were recorded with respect to colour and appearance of raisins during 3 months of storage period. Sensory score for this parameter was found to decrease with the storage period of 3 months. It varied between 8.79 and 7.35 (Fig. 1). Initially, significantly maximum mean score was recorded in T₂ (8.50). Minimum mean score was recorded in T₃ (7.43). At 1MAS, significantly maximum mean score was recorded in T₂ (8.79) and significantly minimum mean score was recorded in T₃ (7.71). At 2MAS, significantly maximum mean score was found in T₂ (8.50). Significantly minimum mean score was recorded in T₃ (7.50). At 3MAS, significantly maximum mean score was recorded in T₂ (8.18). Significantly minimum mean score was recorded in T₃ (7.35).

Taste

The range varied from 8.85 to 7.29 (Fig. 1). Maximum initial mean score was recorded in T₂ (8.85) and minimum was recorded in T₃ (8.43). At 1MAS, maximum mean score was recorded in T₂ (8.71) and minimum was recorded in T₁ (8.32). At 2MAS, maximum mean score was observed in T₂ (8.50) and minimum score was recorded in T₃ (7.57). At 3MAS, significantly maximum mean score was recorded in T₂ (8.07) and minimum was recorded in T₃ (7.29).

Flavours

Sensory score for flavour decreased gradually with the storage period of 3 months. The range varied between 8.85 and 7.35(Fig. 1). Initially, maximum mean score was recorded in T₂ (8.85) and minimum was recorded in T₃ (8.43). At 1MAS, maximum mean score was recorded in T₂ (8.50) and minimum was recorded in T₃ (8.15). At 2MAS, maximum score mean was observed in T₂ (8.43) and minimum score was recorded in T₃ (7.71). At 3MAS, maximum mean score was recorded in T₂ (8.07) and minimum was recorded in T₃ (7.35).

Texture

Sensory score for taste was found to decrease with the progress in storage period and its range varied between 8.65 and 7.40 (Fig. 1). Initially, maximum mean score was recorded in T₂ and T₁ (8.65) and minimum was recorded in T₃ (8.29). At 1MAS, maximum mean score was recorded in T₂ (8.57) and minimum was recorded in T₁ (8.21). At 2MAS, maximum mean score was observed in T₂ (8.43) and minimum score was recorded in T₃ (8.00). At 3MAS, significantly maximum mean score was recorded in T₂ (8.00) and minimum was recorded in T₃ (7.50).

Overall acceptability

Significant differences were recorded with respect to overall acceptability of raisins during 3 months of storage under refrigerated condition (4°C). Sensory score for overall acceptability was found to gradually decrease with the increase in storage period. It had a range from 8.86 to 7.38 (Fig. 1). Initially, significantly maximum mean score was recorded in T₂ (8.86) statistically followed by T₁ (8.46) which was on par with T₃ (8.08). At 1MAS, significantly mean maximum score was recorded in T₂ (8.75). Significantly minimum score was recorded in T₁ (7.99). At 2MAS, significantly maximum score was observed in T₂ (8.47). Significantly minimum score was recorded in T₃ (7.70). At 3MAS significantly maximum mean score was recorded in T₂ (8.08). Significantly minimum was recorded in T₃ (7.38).

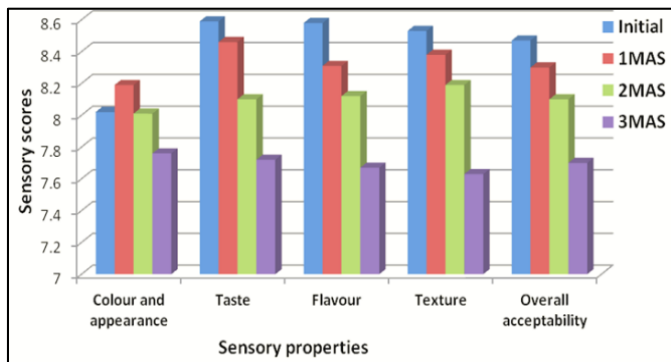


Fig 1: Effect of storage on sensory evaluation of raisins packed in LDPE (400 gauge) bags under refrigerated condition (4°C)

Irrespective of the treatments, sensory score for colour and appearance, taste, texture, flavour and overall acceptability of raisin decreased at the end of three months of storage period (Fig. 1). Variations in sensory properties of raisins owing to the influence of storage have been reported by Venkatram *et al.* (2017) [2] and Akev *et al.* (2017) [12]. However, significant differences in this investigation were recorded with respect to colour and appearance, and overall acceptability of raisins during 3 months of storage period. Colour is one of the important qualitative aspects in foods and plays a vital role in the acceptance of a product. Most of the researchers observed colour as key change among sensory attributes of raisin quality during storage. Maillard reactions are considered as major reaction mechanisms associated with the production of undesirable dark coloured products in food items during storage (Toribio and Lozano, 1984) [13]. During storage period of three months, significantly maximum sensory score for colour and appearance, and overall acceptability was observed in T₂. This is supported by instrumental colour L^* , a^* and b^* values, and OD value for NEB of T₂ raisins. During storage period of three months, sensory score for taste, flavour and texture did not vary significantly among the treatments. This is supported by non-significant variations seen in TSS and titratable acidity of raisins.

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