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Influence of pre-treatments on sensory properties of raisins

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Abstract

Raisins are an important processed product of grapes in India. Sensory evaluation is first and most important parameter which determines the food quality characteristics. Human element plays a major role in evaluating the organoleptic characters of a product. In present study, grape bunches pre-treatment with 1% ethyl oleate and 1% potassium carbonate in normal temperature, 1.5% ethyl oleate + 2.5% potassium carbonate dipping solution at 45°C and 55°C, then dried in commercial raisin making shed. Pre-treatments had effect on sensory properties of raisin. Grape bunches pre-treatment at 45°C dipping solution recorded maximum sensory score for colour/appearance (8.50) and overall acceptability (8.86) of raisins.

Keywords: sensory properties, raisins

1. Introduction

Grape (*Vitis vinifera* L.) is a leading fruit with world annual production of 75.80 million metric tons (Anon, 2017). 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) ^[13].

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) ^[2, 3]. 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) ^[4]. Grapes are processed into raisins for longer shelf-life as well as into dehydrated grapes, for use in wine or juice production.

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. Pre-treating helps to keep light-coloured fruits from darkening during drying and storage and it speeds up the drying of fruits with tough skins (Lokhande and Sahoo, 2016)^[5].

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). According to some investigators, dipping in hot chemical solutions and in boiling water have resulted in poor quality raisins that were sticky in nature with micro-cracks on their outer surface (Esmaiili *et al.* 2007; Pangavhane *et al.* 1999)^[9,10].

According to Singh *et al.* (2014) ^[11] and Bingol *et al.* (2012) ^[12] increasing the temperature (up to 40°C) of the alkaline dip solution is capable of loosening and widening the waxy plates that results in higher level of outer skin permeability of grapes and in higher mass transfer without affecting physico-chemical and organoleptic properties of raisin.

The main aim of sensory evaluation is to determine the food quality characteristics and the degree of compliance with the legal requirements and consumer habits.

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The first and most important 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) ^[14]. Therefore, the study was conducted to study the effect of pre-treatments on sensory evaluation of raisins.

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 K_2CO_3 dipping solution at 45°C for 5 minutes
- T_3:1.5 per cent ethyl oleate + 2.5 per cent K_2CO_3 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 $36\pm2^{\circ}$ 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 $85\pm2^{\circ}$ 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- sensory properties of raisins 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)^[15].

2.2 Statistical analysis

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

3. Results and Discussion

The data pertaining to colour, flavour, taste, texture and overall acceptability of raisin as influenced by different pretreatments is presented in Table 2.

Statistical analysis revealed significant differences with respect to colour and appearance of raisin under the influence of different pre-treatments. Maximum mean score was recorded in T_2 (8.50) and significantly minimum mean score observed in T_3 (7.43). The data on taste scores did not show significant differences among the pre-treatments. Maximum mean score was obtained by T_2 (8.85) followed by T_1 (8.50). Minimum mean score was recorded in T_3 (8.43).

The sensory scores for flavour awarded by the panel for raisin did not vary significantly. The maximum mean score for flavour was recorded for T_2 (8.85) followed by T_1 (8.46) and minimum mean score observed in T_3 (8.43). The scores for the texture of raisin did not exhibit significant differences among the treatments. Maximum mean score was recorded in T_2 (8.65) and T_1 (8.65). The minimum mean score for texture was recorded in T_3 (8.29). The scores for overall acceptability of raisin differed significantly among the treatments. Significantly highest mean score found T_2 (8.86) was statistically similar with T_1 (8.46). Significantly minimum mean score was found in T_3 (8.08).

Table 1: Effect of pre-treatments on sensory evaluation of raisin

Treatments	Colour and appearance	Taste	Flavour	Texture	Overall acceptability
T 1	8.15 ^a	8.50	8.46	8.65	8.46 ^{ab}
T2	8.50^{a}	8.85	8.85	8.65	8.86 ^a
T3	7.43 ^b	8.43	8.43	8.29	8.08 ^b
Mean	8.03	8.59	8.58	8.53	8.47
S.Em±	0.22	0.22	0.17	0.21	0.15
CD@5%	0.65	NS	NS	NS	0.44

Note: Similar alphabets within the column represent non-significant differences at (p<0.05)

Besides nutritional quality, evaluation of sensory qualities of a food product is important in deciding the consumers' acceptability. Human element plays a major role in evaluating the organoleptic characters of a product. For any new product or for old product with modified procedure or treatment, the consumer acceptability needs to be evaluated at laboratory level. Hence, in the present investigation, semi-trained panel of judges comprising of the teachers and post-graduate students of College of Horticulture, Bagalkot were involved in the evaluation process.

Sensory scores for colour and appearance showed significant differences among the treatments (Table 1). Maximum score for colour and appearance was recorded in T_2 (8.50) and minimum was recorded in T_3 (7.43). Raisins obtained by T_2 (dipping solution at 45°C) were golden yellow in colour than T_1 (farmers' practice) and T_3 (dipping solution at 55°C). No significant differences were observed with respect to sensory scores for flavour, taste and texture. However, Raisins of treatment T_2 recorded maximum score for taste (8.85), flavour (8.85) and texture (8.65). Pre-treatment with dipping solutions irrespective of temperature had no effect on physico-chemical properties of raisins *viz.*, TSS°B, sugars and titratable acidity (Appendix 1).

Sensory score for overall acceptability showed significant Differences among the treatments. Maximum score was recorded in T_2 (8.86). Attractive golden colour along with higher score for taste, flavour and texture of raisins of T_2 pre-treatment might have recorded maximum for overall acceptability. In the study of Pangavhane *et al.* (1999) ^[10], grapes pre-treated with commercial dip oil (0.5%) + K₂CO₃ (2.5%) recorded maximum sensory score for colour and appearance (8.3), flavour (8.1), taste (8.2), texture (8.4) and overall acceptability (8.1) in comparison to those which were dipped in 0.50 per cent NaOH at 93°C.

Appendix 1: Physico-chemical properties of raisins

Treatments	TSS (°B)	Titratable acidity (%)	Total sugars (%)
T1	43.39	0.77	63.34
T2	43.70	0.76	63.37
T3	43.55	0.70	63.32

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