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PERFORMANCE OF WHITE SEEDED GRAPE VARIETIES FOR RAISIN RECOVERY AND RAISINS QUALITY UNDER SEMIARID CONDITION

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ABSTRACT

Raisins are widely consumed and globally traded dried fruit. Evaluating white-seeded grape varieties for raisin quality is essential to determine their suitability for commercial raisin production. Among the different varieties evaluated, Angoor Kalan recorded maximum bunch weight (398.3g), 50 berry weight (830.9g), TSS (23.1p brix) and raisin recovery (24.8%). The accession Aledo recorded maximum berry diameter and length (23.0 and 24.0 mm). The performance with respect to biochemical composition pointed out that the variety Angoor Kalan recorded highest range of phenol (4.3 mg/g), tannin (4.6 mg/g), reducing sugar (182.6 mg/g) and carbohydrates(365.3 mg/g). However, the maximum protein and proline was recorded in Aledo (52.1 and 15.8 mg/g). It was concluded that, Angoor Kalan performed better for good quality of raisins followed by Palomina and Aledo.

Key words : Accession, Evaluation, Grapes, Raisins, TSS.

Introduction

Grape (*Vitis vinifera* L.) is one of the most commercial fruit crop in the world, it is native to Caspian Sea. It is an export-oriented crop, which is successfully grown temperate region and also acclimatized in tropical and subtropical region also. Grape is consumed as tablegrapes (71%) or for the readiness of various itemslike raisins (27.0%), wine (1.5%) and different items(0.5%) like juice (Sharma *et al.*, 2018). In India, Maharashtra is leading state (2,466.29MT) followed by Karnataka (854.66 MT) and Tamil Nadu (50.01 MT) (Anonymous, 2022). After excess production or harvesting at a time, the markets become oversaturated, which causes prices to decrease and causes growers to suffer significant losses. To solve the marketing issues with fresh grapes, it is therefore necessary to convert fresh fruits into value-added intermediate moisture goods like raisins. In India, next to table grapes, raisin grapes become an important grape growing.

Raisins, which are simply dried grapes, have significant economic value. The French term “racemes,” which means “a cluster of grapes or berries,” is where the English word “raisin” first appeared (Venkatram *et al*., 2017). Since ancient time Raisins i.e. dry grapes are most popular dried fruit due to their high nutritive value. Raisins are poor in fat and cholesterol and a rich source of fibre, potassium, iron, calcium and vitamin B. They solely use natural sugars as a fuel source. These are a rich source of antioxidants such as oleanolic acid, oleanolic aldehyde, botulin, betulinic acid, in addition to carbohydrates, vital amino acids and fatty acids (Meng *et al*., 2011 and Carranza Concha *et al*., 2012). Raisins produced from seeded varieties gave higher contents of most of the analyzed sugars and amino acids than the raisins produced from seedless varieties (Kaya *et al*., 2022). Technique of making raisins involves dehydrating grapes using the sun heat, natural air drying, mechanical oven drying. In Maharashtra’s Sangli, Solapur and Nasik districts as well as Karnataka’s Bijapur district, raisins

are mostly produced. This region is ideal for the production of raisins because the harvesting season is in the summer (February to May) with low relative humidity (Venkatram *et al.*, 2017). Several grape varieties that are grown here are vigorous and extremely fruitful. These grapes' physical and chemical properties make them highly suitable to produce raisins. Raisins made from seeded grapes 'Munakka' are used for their medicinal properties. Hormone accumulation in the seeded grape varieties is due to its synergies and antagonism effect among endogenous hormones (Kaya *et al.*, 2022). The size of the berries, the uniformity and intensity of the berry colour, the condition of the berry surface, the texture of the skin, the chemical makeup of the pulp, and the presence of foreign matter all affect the quality of raisins (Thakur *et al.*, 2010). Considering this, white seeded grape varieties were evaluated for raisin recovery, quality raisins production under semi-arid condition.

Materials and Methods

Present experiment was carried out during the year 2022-2023 at an experimental site of ICAR- National Research Centre for Grapes, Pune, India (18.32 °N, 73.51 °E). Five-year-old vineyard of white seeded accessions grown on Dogridge rootstock, planted at a spacing of 9 feet × 4 feet and trained to a Y trellis system was used for study. The test was carried out using a random block design. During this period all necessarily cultural practices properly followed.

Quality parameters

When attainingmore than 22^{0}Brix total soluble solids (TSS), selected grape bunches of 10 varieties were harvested manually. To test TSS, a drop of the prepared juice was applied to the hand refractometer's mirror and the total soluble solids was expressed as ^{0}Brix. After harvesting random sample were selected from each replication to determine fruit quality factors such as average bunch weight, number of berries/bunches, 50-berry weight, berry length and diameter, TSS, acidity and pH. From each accession, five kg of grape bunches were washed under water to remove dust. After being dipped for 8-10 minutes in a solution of 15 ml ethyl oleate and 2.5 g potassium carbonate in 100 litres of water, the picked grapes were then preserved under raisin shade. Daily moisture levels (on a wet basis) for all accessions were evaluated using moisture analyzers. While drying, the moisture was monitored at around 16%. Dried grapes were carefully removed from the rachis and pedicels by twisting and gently rubbing against the slotted surface of the net. From each replication, 100 raisins were chosen at random and weighed. After the raisins were dried, the estimated recovery of the raisins was calculated using the formula below.

Raisins Recovery = Weight of raisins/Weight of fresh grapes × 100

Organoleptic test

The sensory examination was conducted by 10 skilled panelists. The score card includes information about different aspects of raisins' quality, including their colour and appear, flavour, texture, and general acceptance (Mane *et al.*, 1998). The sensory score data were analysed using a fully randomized block method.

Biochemical composition

Samples were prepared for the determination of the biochemical composition of raisins. The raisins were crushed with the help of a mortar and pestle. After crushing, 0.5 g of raisins samples were taken in a centrifuge tube, add 20 ml of 80% methanol, shake the tubes, and centrifuge at 5000 rpm for 5 min and the supernatant was then collected for analysis. To calculate the concentration of phenol present, Folin-Ciocalteu method was used and expressed in mg/g. Using the Folin-Denis method, the tannin in raisins were estimated. The absorbance was measured at 700 nm and reported in mg/g using tannic acid as the reference solution. Dinitrosalicylic acid was used to analyze the raisins samples and determine the amount of reducing sugar. The Lowery method was employed to calculate the protein content. The total carbohydrate content was estimated using the Anthrone method (Sadasivam and Manickam, 1997). The amount of total anthocyanin was calculated using Lee *et al.* (2005). Three samples from each treatment were examined, and the RBD method was used to analyze the data statistically.

Results and Discussion

Quality parameters

The significant variations were recorded for all the parameters studied. Angoor Kalan variety had highest bunch weight (398.3 g) and 50 berry weight (830.9 g) than others, while minimum bunch weight and 50 berry weight was recorded in Palomina (220.9 and 122.2 g). However, maximum number of berries/bunch was recorded in Phakdi (97.0). The accession Aledo recorded maximum berry diameter and length (23.0 and 24.0 mm). The raisin quality and recovery of the raisins are directly impacted by TSS during the production process (Christensen and Peacock, 2000). In this study, highest TSS was recorded in Angoor Kalan (23.1^0 brix). Spin Sahebi recorded highest amount of acidity (0.64%) than other accessions followed by Cheema Sahebi and

Table 1 : Qualitative characters of different grapes accessions for raisins making.

Accessions	Average bunch wt (g)	50 berry wt (g)	Number of berries (g)	Berry diameter (mm)	Berry length (mm)	TSS (°Brix)	Acidity (%)	pH	100 Raisins wt (g)	Raisin recovery (%)
Rosaria Bianca	263.7	197.5	66.7	15.3	22.3	22.5	0.53	3.6	54.2	22.3
Aledo	255	227	56.3	23	24	22.4	0.53	3.3	130.3	21.6
Pandhari Sahebi	323	206.3	77.7	17.7	21.1	22.9	0.63	3.4	53.4	22.1
Golden Queen	233.3	245.9	47.3	16.3	16.9	22.3	0.5	3.9	87.8	24.3
Cheema Sahebi	381.3	208.3	92.3	15	20	23.1	0.63	3.2	49.6	22.8
Dilkush	326	261	62.3	13.3	20.9	23	0.6	3.5	112.3	22.6
Palomina	220.9	122.2	90.6	17.7	19	21.9	0.44	4.1	85	19.5
Phakdi	236.9	128.4	97	15.5	20.8	22.6	0.54	3.6	77.2	21.6
Spin Sahebi	365.4	239.7	76.3	15.6	20.1	22	0.64	3.8	70	21
Angoor Kalan	398.3	830.9	13.3	15.7	19.4	23.1	0.49	3	72.5	24.8
SEm±	55.6	2.8	1.9	1.2	0.5	0.8	0.03	0.2	1.9	0.41
CD at 5%	165.2	8.2	5.6	3.5	1.5	2.3	0.08	0.5	5.7	1.21

Pandhari Sahebi (0.63 and 0.63 %). Maximum pH level was recorded in Palomina (4.1). Fresh grapes' pH is always acidic because, as they dry out, more of their water content evaporates, increasing their acidity (Mahmutoglu *et al*., 1996). High temperatures under tropical conditions during the ripening period may aid to boost the sugar and reduce the acidity. Berries from warmer places showed higher pH levels and lower levels of anthocyanins and acidity than berries from cooler regions at a typical maturity of 22° Brix TSS (Barnuud *et al*., 2014). Due to the bold size berries, accession Aledo recorded Maximum weight of 100 raisins (130.3 g). Maximum raisins recovery was recorded in Angoor Kalan (24.8 %) followed by Golden Queen (24.3), while minimum raisins recovery was recorded in Palomina (19.5%). The recovery of raisins is positively correlated with the TSS concentration of the berries. The majority of studies have shown that it is the sole factor that directly correlates with the quality of raisins in fresh fruit (Somkuwar *et al*., 2019).

Biochemical composition

Amount of phenol and tannin contents in raisins ranged from 1.8 to 4.3. Angoor Kalan (4.3 and 4.6 mg/g) recorded highest amount of phenol and tannin than others. A large amount of chemical substances called phenol are concentrated during the drying process as a result of the grapes' water loss. However, due to enzymatic and air oxidation that takes place during the drying process, converting the grapes into raisins may also result in the loss of phenolic compound (Breksa *et al*., 2010). Maximum amount of reducing sugar was recorded in Angoor Kalan (182.6 mg/g) whereas minimum in Golden queen (89.9 mg/g). Grape composition changes during the drying process, particularly with an increase in sugar concentration might be due to grapes dehydration (Franco *et al*., 2004). Significant differences were recorded for carbohydrate content in raisins, Angoor Kalan recorded highest amount of carbohydrates (365.3 mg/g) followed by Pandhari Sahebi (352.7 mg/g) however, minimum amount of carbohydrates was recorded in accession Dilkhush (253.9 mg/g). Protein and proline concentration was more in the accession Aledo (52.1 and 15.8 mg/g) than others. Protein and reducing sugar contents increased during the process of raisin making, the content of phenol was significantly reduced, there was a higher anthocyanin concentration found in raisins in Golden Queen (36.9 mg/g), closely followed by Phakdi (36.0 mg/g), while Rosaria Bianca found lowest range of anthocyanin content.

Sensory evaluation

In present study colour, flavour, taste and overall

Table 2 : Biochemical composition of raisins prepared from different accession.

Accessions	Phenol (mg/g)	Tannin (mg/g)	Reducing sugar (mg/g)	Carbohyd-rates (mg/g)	Protein (mg/g)	Proline (mg/g)	Anthocyanin (mg/g)
Rosaria Bianca	3.4	4.5	132.3	284.0	36.9	13.7	14.4
Aledo	2.6	3.3	119.4	336.4	52.1	15.8	19.4
Pandhari Sahebi	2.6	3.5	173.5	352.7	43.2	10.1	15.7
Golden Queen	2.6	3.5	89.9	259.8	38.9	9.6	36.9
Cheema Sahebi	2.3	3.4	117.4	299.1	36.6	12.7	30.8
Dilkush	2.2	3.0	165.3	253.9	41.5	13.8	18.8
Palomina	1.8	2.7	180.1	330.1	50.5	8.5	20.8
Phakdi	1.8	2.3	122.7	285.6	38.2	7.8	36.0
Spin Sahebi	4.2	4.4	176.4	301.3	33.1	14.8	27.1
Angoor Kalan	4.3	4.6	182.6	365.3	49.9	15.0	25.5
SEm±	0.2	0.2	4.3	16.0	2.2	0.7	4.1
CD at 5%	0.6	0.5	2.1	47.4	6.4	2.2	11.9

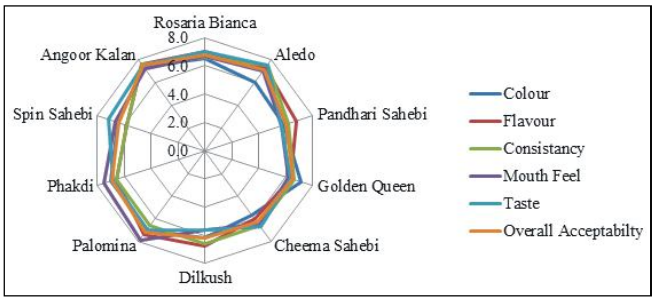

Fig. 1 : Sensory score of Raisins.

acceptability were taken into consideration for the organoleptic study. Accession Golden Queen (7.2) recorded good colour score than others. In terms of flavour and consistency Angoor Kalan (7.6) recorded highest score. The raisins made from varieties, Angoor Kalan, Aledo and Spin Sahebi were considered better for taste. Maximum Overall acceptability was recorded in Angoor Kalan followed by Palomina and Aledo.

Conclusion

In the present study, significant differences were observed with respect to quality parameters, biochemical compositions, and sensory evaluation. Out of 10 varieties evaluated, Angoor Kalan performed better with respect to quality parameters such as average bunch weight, 50-berry weight, TSS and raisins recovery. In biochemical composition, Angoor Kalan also showed better performance than others. Based on sensory evaluation Angoor Kalan, Palomina and Aledorecorded best result as compared to others. Considering this, Angoor Kalan can be considered as suitable for good qualityraisins making followed by Palomina and Aledo.

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