



Short communication

Performance of grape varieties grown under tropical regions for raisin yield and quality

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ABSTRACT

With the availability of antioxidants in grape raisins and its scope as one of the major processed products of grapes, there is huge demand for alternate varieties other than the presently grown commercial variety Thompson Seedless. Eight grape varieties were evaluated for physical and chemical properties of berries and raisins. The raisin recovery ranged from 27.10% (Manjri Kishmish) to 25% in other varieties. Higher yield was recorded in Manjri Kishmish (17.47 kg/Vine). Highest phenol concentration was found in Kishmish Rosavis (0.33 mg/g) followed by Black Monukka (0.31mg/g). Similar trend was observed in tannins where maximum tannins were recorded in Kishmish Rosavis (0.35mg/g) followed by Black Monukka (0.34mg/g). Reducing sugar and carbohydrate was in higher concentration in Clone 2A (71.84% and 77.04% respectively) followed by Manjri Kishmish (68.03% and 70.54% respectively). Highest protein content was recorded in Ribier (8.28%) followed by Kishmish Rosavis (7.94 %). The variety Manjri Kishmish found better for higher raisin recovery and can be a potential variety in grape growing region for raisin purpose.

Key words: *Vitis vinifera*, TSS, raisin recovery, carbohydrate, tannins, phenols.

Grape (*Vitis vinifera* L.) is one of the major important commercial fruit crops grown in the country. The major grape cultivation is concentrated in Maharashtra followed by Karnataka, Tamil Nadu, Mizoram and some part of North. From the total production, around 26% of the fresh grapes are converted into dried grapes called raisins, 1.5 per cent for winemaking and 0.5 per cent is used for juice while remaining produce is used as table purpose. At present, dried grapes are becoming popular in diet considering the health issues. Phenolic compounds have been associated with the health benefits derived from consuming high level of fruits and vegetables (Hertog *et al.*, 2). The grape properties directly affect raisin quality. These properties are influenced by several factors, and some of them cannot be manipulated by grape growers (variety, the age of vine, soil and climate conditions), while other practices such as soil management, irrigation management, nitrogen and potassium nutrition, canopy management, insect-pests and disease management etc., which can be improved by the grower. In order to obtain good quality raisins, both physical (berry size, berry colour) and chemical composition of grape berries (moisture content, sugar content and acidity) at harvest influences quality of dried grapes.

Currently in Maharashtra state about 90% raisins are made from Thompson Seedless and its

clones including Manjri Kishmish (a mutant from Kishmish Rozavis). In light of the above information, an attempt was made to study the performance of other grape varieties for raisin recovery, biochemical constituents and raisin quality.

The experiment was conducted at grape growers field (village: Karkamb; District: Solapur, Maharashtra) during two fruiting seasons (2015-2017). Four-year-old grape varieties viz., Ribier, Clone 2A, Merbein Seedless, Sundekhiani, Kishmish Rosavis, Manjri Kishmish, Thompson Seedless and Black Monukka grafted on Dogridge rootstocks were selected for study. The vines were spaced at 9 feet between rows and 5 feet between vines, thus accommodating 968 vines per acre. All the standard recommended cultural practices were followed during the period of study. The vines were pruned for fruits (forward pruning) between 10th to 15th October during both the year.

The assay of total soluble solids (TSS) and titratable acidity (TA) was done by extracting juice from crushed berries and centrifuged at 5000 rpm for 5 minutes. Readings were taken on Oeno Foss (FTIR based analyzer) for total soluble solids and titratable acidity and expressed in °Brix and g/L respectively. One kg fresh grapes were dipped in emulsion of 2.5% potassium carbonate and 1.5% ethyl oleate for 10 minutes and subsequently dried under raisin shade for 14-15 days. When the moisture content of dried grapes (raisins) reached to 16%, final weight was

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recorded, and raisin recovery was calculated using the formula:

$$\text{Raisin recovery} = \frac{\text{weight of raisins}}{\text{weight of fresh grapes}} \times 100.$$

To estimate the biochemicals, dinitrosalicylic acid (DNSA) method was used to estimate reducing sugar while, total carbohydrate was estimated using Anthrone method with D-glucose as the standard (Sadasivam and Manickam, 5). Protein estimation was done by Lawry *et al.* (3) method and was expressed in mg g⁻¹. The phenols were determined by Folin-Ciocalteu method as suggested by Singleton (7) using gallic acid as standard and was expressed in mg g⁻¹. Tannins in seed were estimated using the Folin-Ciocalteu method explained by Sadasivam and Manikam (5). The reference standard chemicals such as Bovine Serum Albumin Fraction-V, D-glucose, reagents etc. and all other chemicals and buffers of AR grade used were received from S.D Fine Chemicals Ltd., Mumbai (India).

The experiment was conducted in randomized block design with eight varieties as treatments replicated three times. Under each replication five healthy, uniform growing vines were labeled to record recording the observations. The data recorded on various parameters was tabulated using means of each treatment. The data were analyzed using SAS version 9.3.

The data obtained on physical characteristics of varieties evaluated and their raisin recovery is presented in Table 1. Among the varieties, significant difference was observed for average bunch weight. The variety Black Monukka recorded higher bunch weight (351.85g) followed by Manjri Kishmish (335.40g) and Clone 2A (335.0g) while Merbein Seedless recorded minimum bunch weight (293.17g). During both the year of study, yield/vine varied significantly among the varieties. Manjri Kishmish

recorded higher yield of 17.47 kg/vine followed by Thompson Seedless (17.27kg/Vine). The variety Ribier recorded low yield (11.70 kg/vine) and was rated as low yielder. Christensen (3) also reported average bunch weight of Black Monukka was higher (226-1135g) than Thompson Seedless (227-680g). The higher yield obtained in Manjri Kishmish (17.47 kg) also supports these results.

Total soluble solids and acidity in the grape berries were at par in all the varieties studied and the values ranged from 23- 24 °Brix while the acidity from 5.67-6.00% respectively. The raisin recovery is important parameter of grape varieties specially used for raisin purpose. Significant differences were observed among varieties in respect of raisin recovery. Highest raisin recovery was observed in Manjri Kishmish (27.10%) followed by Sundekhani (26.30%) while the other varieties studies were almost at par with 25 % raisin recovery. Fruit characteristics play an important role in raisin quality. Christensen (3) reported that TSS has a dominating influence on grades as it contributes to berry and raisin weight as well as the raisins' physical characteristics (meatiness and wrinkling). In our study, TSS was at par among all the evaluated varieties. The pH of fresh grapes is always acidic since during drying process the water content of grapes evaporates leading to more acidity (Mahmutoglu *et al.*, 4). During the ripening stage, high temperature under tropical condition might be helping to increase the sugar content and reducing the acids in berries.

Among the different biochemicals in raisin made from different varieties (Table 2), highest phenol concentration was found in Kishmish Rosavis (0.33 mg/g) followed by Black Monukka (0.31mg/g) while lowest in Thompson Seedless (0.17 mg/g). Similar trend was also observed for tannins where maximum tannins were recorded in

Table 1: Performance of grape varieties for bunch character, fruit composition and raisin Recovery.

Variety	Av. Bunch wt. (g)	Yield/vine (kg)	TSS (°Brix)	Acidity (g/L)	Raisin recovery (%)
Ribier	322.58	11.70	23.67	5.66	25.38
Clone 2A	335.00	16.16	23.30	5.57	25.68
Merbein Seedless	293.17	13.34	24.13	5.62	25.24
Sundekhani	333.97	12.05	23.90	5.86	26.30
Kishmish Rosavis	299.20	13.96	23.88	5.71	25.35
Manjri Kishmish	335.40	17.47	23.76	5.57	27.10
Thompson Seedless	311.00	17.27	23.73	5.53	25.48
Black Monukka	351.85	15.21	23.88	5.54	25.23
S Em ±	2.44	0.06	0.07	0.04	0.15
CD 5%	7.40	0.18	0.23	0.12	0.46

Table 2: Performance of grape varieties for biochemical composition in raisin.

Variety	Phenol (mg/g)	Tannins (mg/g)	Reducing Sugar (%)	Carbohydrates (%)	Protein (%)
Ribier	0.28	0.29	62.78	67.05	8.28
Clone 2A	0.21	0.22	71.84	77.05	6.29
Merbein Seedless	0.21	0.22	43.29	49.59	5.61
Sundekhani	0.23	0.24	54.11	57.05	6.04
Kishmish Rosavis	0.33	0.35	48.60	49.11	7.94
Manjri Kishmish	0.20	0.22	68.03	70.54	6.10
Thompson Seedless	0.17	0.18	60.83	62.44	5.46
Black Monukka	0.31	0.34	46.86	47.68	7.23
S Em ±	0.002	0.002	0.042	0.267	0.009
CD 5%	0.005	0.006	0.128	0.811	0.027

Kishmish Rosavis (0.35mg/g) followed by Black Monukka (0.34mg/g) while minimum tannin was observed in Thompson Seedless (0.18 mg/g). Significant differences were observed in varieties for reducing sugar and carbohydrates. Maximum reducing sugar (71.84 %) and carbohydrate (77.05 %) was observed in Clone 2A followed by Manjri Kishmish (68.03% and 70.54% respectively) while lowest reducing sugar was observed in Merbein Seedless (43.29 %), lowest carbohydrate in Black Monukka (47.68%). Highest protein was recorded in Ribier (8.28%) followed by Kishmish Rosavis (7.94 %) while lowest concentration was recorded in Thompson Seedless (5.46%). In the earlier studies reported by Satisha *et al.* (6) also reported increase in protein content and reducing sugar while reduction in phenolic concentration in raisin compared to fresh grapes of Thompson Seedless grafted on different rootstocks. The present study indicates the concentration of biochemical in dried grapes has been increased. In terms of evaluation based on biochemical constituents, Clone 2A has highest reducing sugar (71.84 %) and carbohydrate (77.05 %), whereas highest phenols 0.33 mg/g and tannins 0.35mg/g were present in Kishmish Rosavis.

From the findings it is concluded that Manjri Kishmish, a clone of Kishmish Rosavis identified at ICAR-National Research Centre for Grapes, Pune holds a promising future due to higher yield (17.47kg/vine) and raisin recovery (27.10%). In terms of varietal evaluation based on biochemical constituents, Clone 2A has highest reducing sugar (71.84 %) and carbohydrate (77.05 %), whereas highest phenols 0.33 mg/g and tannins 0.35mg/g were present in Kishmish Rosavis. Based on the above findings, the variety Manjri Kishmish can be a potential variety for raisin purpose in the raisin belt.

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