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Evaluation of grape raisin varieties for growth and yield parameters under northern dry zone of Karnataka

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Abstract
An experiment entitled "Evaluation of Grape raisin varieties for growth and yield parameters under northern dry zone of Karnataka" was conducted at Horticulture Research and Extension Centre, Vijayapur (Tidagundi), UHS Bagalkot (Karnataka) during the year 2020-21, with an objective to study the performance of different grape raisin varieties for growth and yield parameters. The experiment was laid out in randomized block design (RBD) with four treatments and five replications. The result revealed that among the different varieties evaluated, the minimum number of days taken to bud burst (9 days), highest number of matured canes per vine (49.20), fruitful canes per vine (43.20), highest leaf area (186.06 cm^2) and maximum shoot length (76.42 cm) at 60 days after fore pruning was recorded in Thompson Seedless. The variety Manjari Kishmish took less number of days for harvesting (130.80 days). The performance with respect to yield pointed out that the variety Thompson Seedless recorded the maximum number of bunches per vine (54.20), bunch weight (313.40 g), bunch width (10.26 cm), raisin length (16.46 mm), raisin diameter (8.66 mm) and yield (16.84 kg/ vine). Whereas, the maximum bunch length was recorded in 2A-Clone (22.75 cm).

Keywords: Grape, raisin varieties, evaluation, yield

Introduction
Grape (*Vitis vinifera* L.) is one of the important commercial and export-oriented fruit crop grown under wide range of soil and climatic conditions in India. It belongs to vitaceae family and believed to have originated near Caspian Sea. Grape used both as fresh fruit (table grape) and processed into wine, juice, molassa and raisins. Grape occupies total area of about 2.21 per cent under fruit cultivation. In India, grape is grown over an area of 139 thousand hectares with an annual production of 2958 thousand MT (Anon., 2019) [3].

In recent years, demand in grape products has greatly increased. The interest in consumption of grape products also increased due to numerous health benefits of the grape products. Among grape products, raisins are second most important product after wine. Usually, seedless grapes are required for raisin preparation but in India both seeded and seedless grapes are used. 'Naturals' are the seedless grapes dried under sun without dehydration have distinctive dark raisins. The seeded raisins known as 'Manuka' are used for therapeutic value and seedless raisins known as 'Kishmish' are used in preparation of festive recipes, variety of sweets and in bakery products. Raisins are dried fruit, which are rich source of carbohydrates, amino acids, mineral salts and vitamins. Important minerals in raisins are calcium, magnesium and phosphorous. Large quantities of seedless grapes dumped in Indian markets during peak season forcing growers to make a distress sale besides post harvest losses. To avoid these problems, partial diversion of grapes for post harvest processing such as to raisin making is necessary.

Vijayapur district is the major grape growing area of Karnataka, with an area of 10,582 hectares and 1,90,856 MT of production in 2015-16 (Anon., 2016) [4]. There is abundant scope for processing of grapes in the form of raisins in Vijayapur district. Since the harvest period is summer (February-May) with low RH, it is excellent for raisin making naturally or by different methods. The different varieties of seedless grapes grown here are vigorous, highly productive and have suitable physico-chemical qualities for raisin making. Hence, it is planned to evaluate some seedless varieties of grape grown in northern dry zone of Karnataka for quality raisin making with following objectives.

Material and Methods

The experiment was carried out at Horticulture Research and Extension Centre, Vijayapur (Tidagundi), UHS Bagalkot during the year 2020-21, which comes under northern dry zone of Karnataka. It is geographically located at a latitude of 16^0 49′ North and longitude 75^0 43′ East. The experimental vineyard is three years old grafted on Dog Ridge rootstock, planted at a spacing of 2.74 × 1.52 m and trained using Y-trellis system. The experiment was laid out in randomized block design (RBD) with four treatments, five replications and six vines per treatment. The experiment comprised of treatments *viz.*, T_1- Merbein Seedless, T_2- 2A-Clone, T_3- Manjari Kishmish (Kishmish Rozavis White), T_4- Thompson Seedless (Check). The observations were recorded on growth and yield parameters. Days taken to bud bursting recorded after October pruning. Mature canes per vine and fruitful canes per vine were recorded by counting. Shoot length was measured using measuring scale at 60 days after fore pruning and leaf area (cm^2) was calculated by the linear method (LBK method) *i.e*., Leaf area (LA) = L x B x K (0.81), Where L = maximum length, B = maximum breadth and K = Correction factor. Bunch weight (g) was recorded using the digital weighing balance. Bunch length (cm) and bunch width (cm) were recorded using the measuring scale during harvest. Raisin length and diameter were recorded by digital vernier califer. Yield per vine (kg) was calculated by multiplying the mean bunch weight by the average number of bunches per vine.

Result and Discussion

Growth parameters

Data presented in Table 1 clearly indicated that, a significant difference with regard to days taken to bud bursting, mature canes per vine, fruitful canes per vine, shoot length at 60 days after fruit pruning and leaf area recorded among different treatments. The minimum number of days taken to bud burst were noticed in Thompson Seedless (9.00 days). Whereas, the maximum number of days taken to bud burst was recorded in Merbein Seedless (10.20 days). In the present study, probable cause for the variation in budburst was climatic factor and was in accordance with the results of Williams (2000) [20]. Similar results also obtained by Parker *et al.* (2011) [14] and Joshi *et al.* (2015) [12] as they noted increase in temperature was a major effect on earliness in phonological stages like bud break, flowering, veraison and ripeness.

The highest number of matured and fruitful canes per vine was noted in Thompson Seedless (49.20 and 43.20 respectively). While, the lowest was recorded in Merbein Seedless (41 and 34 respectively). These differences with respect to number of matured and fruitful canes might be due to the differences in the pruning weight. These findings were supported by Joshi *et al.* (2015) [12]. Similar findings were recorded by Anjanawe *et al.* (2020) [1] as they revealed that high pruning weight can be attributed to high number of matured and fruitful canes per vine.

The maximum shoot length (76.42 cm) at 60 days interval after fore pruning recorded in Thompson Seedless. While, the minimum shoot length (52.10 cm) was recorded in Merbein Seedless. The reason for highest shoot length may be because of the vines grafted on Dogridge rootstock, which agrees with the observations of Sommer *et al.* (1993) [18] and Satisha *et al.* (2010) [15] that the Ramsey and Dogridge rootstocks showed high shoot length and also the vine vigour.

The highest leaf area was noticed in Thompson Seedless (186.06 cm^2) and the lowest leaf area in Merbein Seedless (144.22 cm^2). Variation in leaf area could be due to varietal characteristics and also due to increase in shoot vigour. These findings were consistent with Ghule *et al.* (2019) [6] and Somkuwar *et al.* (2020) [17].

Yield parameters

The data presented in the Table 2 (a and b) showed significant difference with regard to period of panicle appearance, days taken for harvesting, number of bunches per vine, bunch weight, bunch length, bunch width, raisin length, raisin diameter and yield per vine among different treatments. The minimum period of panicle appearance was recorded in Thompson Seedless (18.40 days) and maximum was recorded in Merbein Seedless (23.34 days).

The minimum days taken to harvesting was noted in Manjari Kishmish (130.80 days). Whereas, the maximum days taken to harvesting was noted in Thompson Seedless (138 days). This might be because of temperatures above 30 ^{0}C during floraison and veraison result in an earlier harvest according to Jones and Davis (2000) [11].

The highest number of bunches per vine was noted in Thompson Seedless (54.20), while the lowest number of bunches per vine was noted in Merbein Seedless (46.40). The difference in number of bunches was due to variances in phenotypic and genotypic expression under current environmental conditions. The findings obtained were in accordance with the results reported by Coombe (1987) [5], Khan *et al.* (2011) [13] and Ghosh *et al.* (2012) [7].

The maximum bunch weight was recorded in Thompson Seedless (313.40 g) and the minimum bunch weight was recorded in Merbein Seedless variety (281.20 g). The genotypic nature of the cultivar could possibly explain the variation in bunch weight. Other factors associated with variation in bunch weight may include variation in size of berry, berries per bunch and also very accordingly to vine canopy size where the high bunch weight was noticed in the variety which had large canopy size. Similar observations were reported by Havinal *et al.* (2008) [9], Khan *et al.* (2011) [13] and Vijaya *et al.* (2018) [19].

The maximum bunch length registered in 2A-Clone (22.75 cm), While, the minimum bunch length recorded in Manjari Kishmish (16.86 cm). The maximum bunch width was recorded in Thompson Seedless (10.26 cm) and minimum in Manjari Kishmish (7.04 cm). The berries per bunch and size of the berries, as well as nutrients taken by the vine, can all contribute to variation in bunch length and width. These observations were in line with supporting reference of Ashwini *et al.* (2016) [2], Hachcholli (2016) [8] and Anjanawe *et al.* (2020) [1].

The highest raisin length and diameter was observed in Thompson Seedless (16.46 mm and 8.66 mm respectively). Whereas, the minimum raisin length and diameter was observed in Merbein Seedless (12.20 mm and 6.54 mm respectively).

The highest yield per vine was recorded in Thompson Seedless (16.84 kg) and lowest in Merbein Seedless (12.78 kg). Variation in yield might be because of climate of area, inherent character of varieties, number of bunches, weight of berries, age of the plant, nutrition and cultural practices adopted. These results are similar to those published by Somkuwar *et al.* (2012) [16], Hachcholli (2016) [8], Vijaya *et al.* (2018) [19] and Jayalakshmi *et al.* (2019) [10].

Table 1: Performance of different grape raisin varieties for growth parameters.

Treatment	Days taken to bud bursting	Matured canes/ vine	Fruitful canes/ vine	Shoot length (cm) (60 DAFP)	Leaf area (cm^2)
T_1	10.20	41.00	34.00	52.10	144.22
T_2	10.00	43.40	37.60	67.07	147.62
T_3	9.50	46.20	41.40	62.05	152.68
T_4	9.00	49.20	43.20	76.42	186.04
Mean	9.68	44.95	39.05	64.41	157.64
S.Em ±	0.33	1.82	2.07	3.50	0.44
CD at 5%	1.02	5.61	6.38	10.77	1.34

Note: DAFP – Days after fore pruning

Table 2(a): Performance of different grape raisin varieties for yield parameters.

Treatment	Period of panicle appearance	Days taken for harvesting	Number of bunches/ vine	Bunch length (cm)	Bunch width (cm)
T_1	23.34	135.40	46.40	13.27	8.60
T_2	22.20	132.20	48.60	22.75	7.80
T_3	20.80	130.80	54.00	16.86	7.04
T_4	18.40	138.00	54.20	21.44	10.26
Mean	21.19	134.10	50.80	18.58	8.42
S.Em ±	0.63	1.21	2.08	1.02	0.49
CD at 5%	1.93	3.72	6.40	3.14	1.50

Table 2(b): Performance of different grape raisin varieties for yield parameters.

Treatment	Bunch weight (g)	Raisin length (mm)	Raisin diameter (mm)	Yield (kg/ vine)
T_1	281.20	12.20	6.54	12.78
T_2	292.60	14.20	7.39	14.00
T_3	309.80	15.13	8.15	16.55
T_4	313.40	16.46	8.66	16.84
Mean	299.25	14.50	7.68	15.04
S.Em ±	7.42	0.28	0.33	0.76
CD at 5%	22.85	0.87	1.02	2.33

Conclusion

On the basis of results obtained in present experiment, it can be concluded that there was significant difference among the varieties with respect growth and yield parameters. Among the four varieties evaluated, Thompson Seedless performed well with respect to growth and yield components such as days taken to bud bursting, matured and fruitful canes per vine, leaf area, number of bunches, bunch weight, raisin length, raisin diameter and yield per vine, was followed by Manjari Kishmish. Hence, considering overall parameters Thompson Seedless was found better than other varieties based on yield components.

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