



Evaluation of Different Juice Varieties of Grape (*Vitis* sp.) for Qualitative Characteristics

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present investigation was conducted at College of Horticulture, Rajendranagar, during the year 2023. The experiment was laid out in completely randomized design. The research experiment was conducted to evaluate qualitative parameters of different juice varieties of grape. The results revealed that maximum TSS (21.05 °B) and brix/acid ratio (42.96) were recorded in T₁ – H-516. Maximum pH was recorded in T₆ – Manjari Medika (4.03) and highest titrable acidity was recorded in T₅ – Gulabi X Bangalore Purple (0.71%). Reducing sugars were highest in T₁ – H-516 (17.24%), whereas total sugars were maximum in T₄ – Concord (28.56%). Juice recovery was recorded maximum in T₆ – Manjari Medika (71.80 %).

Keywords: Juice varieties; parameters of juice; grape juice; fruit crops.

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1. INTRODUCTION

Grape is one of the important fruit crops that belongs to the family Vitaceae. The family contains about 1000 species belonging to 17 genera that are typically shrubs or woody lianas which climb by means of their tendrils [1]. Grape is a refreshing fruit, rich in sugars, acids, minerals, vitamins and tannins. Major constituents of fruits are carbohydrates (15%), minerals (0.2-0.6%), organic acids (0.3-1.5%), nitrogenous compounds (0.03-0.7%), iron (0.003-0.017%/100 g), calcium (0.004-0.025 %), potassium (0.15-0.25%), vitamin A (1-80 microgram), vitamin B complex (391-636 mg/100 g), and vitamin C (1-1.25mg/100 mg) [2]. In India grape is grown in Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Punjab, Haryana, Himachal Pradesh and Uttar Pradesh. It occupies an area of 162 thousand ha with the production of 3.49 million MT (NHB data, 2021-22 First Advance Estimate). As fresh fruit, grapes are very delicate and extremely perishable and have a very high rate of loss during harvest and distribution. Therefore, grapes are processed into different products like wine, raisins, juice, crush, jelly, canned grapes etc to reduce waste and improve the marketability and profit from grape cultivation [3]. Grape juice contains 81 to 86 percent of water, in which nutrient elements, sugar and natural acids are present in readily available forms. Hence grape juice assimilates in body fluid immediately after consumption, and act as an excellent health drink with instant source of energy [4]. The present study aims at evaluating the different juice varieties of grape for their qualitative parameters.

2. MATERIALS AND METHODS

The experiment was conducted at College of Horticulture, Rajendranagar, during the year 2023. Eight grape varieties (T₁ – H-516, T₂ – Arka Shyam, T₃ – Black Cornechen, T₄ – Concord, T₅ – Gulabi X Bangalore Purple, T₆ – Manjari Medika, T₇ – Pusa Navrang, T₈ – Bangalore Blue) were collected from grape vines planted at Grape Research Station, Rajendranagar.

2.1 Total Soluble Solids (TSS) (°Brix)

The TSS of grape juice was measured with the help of digital refractometer (HI 96801, Hanna, Romania). Data was expressed as degree Brix (°B).

2.2 pH

The pH was determined using pH meter. pH meter was calibrated with the help of standard buffer solutions (pH 4.0 and 7.0). The juice sample was taken in 100 ml beaker and electrode was kept in the sample and read on pH meter.

2.3 Titrable Acidity (%)

Titration acidity in juice of different varieties of grape was estimated by adopting the procedure suggested by Lunke and Hashizume [5].

$$\text{Acidity (\%)} = \frac{\text{TV} \times \text{Normality of alkali} \times \text{Eq wt of acid} \times \text{Vol made (ml)} \times 100}{\text{Volume of aliquot (ml)} \times \text{Weight of sample (g)} \times 1000}$$

2.4 Brix/ Acid Ratio

Brix-acid ratio was calculated by dividing the TSS value by the acid value.

$$\text{Brix/ Acid ratio} = \frac{\text{TSS value}}{\text{Acid value}}$$

2.5 Reducing Sugars (%)

The reducing sugars were analysed by Lane and Eynon method suggested by Ranganna [6].

$$\text{Reducing sugars (\%)} = \frac{\text{Factor} \times \text{Volume made up} \times 100}{\text{Titre value} \times \text{Weight or volume of sample}}$$

2.6 Total Sugars (%)

Total sugars in juice of different varieties were estimated by adopting the Lane and Eynon method suggested by Ranganna [6].

$$\text{Total sugars (\%)} = \frac{\text{Factor} \times \text{Volume made up} \times 100}{\text{Titre value} \times \text{Weight or volume of sample}}$$

2.7 Juice Recovery (%)

Representative berries weighing 1 kg were taken and juice was extracted with the help of juice extractor. The juice was weighed on a weighing balance and juice yield was calculated in percentage (%).

$$\text{Juice recovery (\%)} = \frac{\text{Weight of juice}}{\text{Weight of berries}} \times 100$$

3. RESULTS AND DISCUSSION

Trials were conducted to evaluate different juice varieties of grape for qualitative parameters. The data recorded were statistically analysed and the results obtained are presented in the Tables 1, 2 and 3.

3.1 Total Soluble Solids (°Brix)

The evaluation of TSS content established significant differences between different grape juice varieties. Among the different grape juice varieties, total soluble solids were significantly highest in T₁ – H-516 (21.05 °Brix) which was statistically on par with T₄ – Concord (20.87 °Brix), whereas significantly lowest total soluble solids were observed in T₅ – Gulabi X Bangalore Purple (17.47 °Brix). The variation in TSS may be attributed to changes in site, locality, topography and environment [7]. The variation in TSS of grape grown under same environment could be because of experimental conditions [8]. The results from current investigation are in accordance with the findings reported by Mehan et al. [9], Patil et al. [10] Gill and Arora [11], Ratnacharyulu [12] and Vijaya et al. [8] in different varieties of grape.

3.2 pH

pH was found significant in all treatments. Of all the varieties evaluated, T₆ – Manjari Medika had significantly highest pH (4.03), followed by T₁ – H-516 (4.00), while T₅ – Gulabi X Bangalore Purple recorded significantly lowest pH (3.22). The variation in pH of berry juice depends on genotypes, cultivars and environmental condition [13]. Karibasappa and Adsule (2008), Ratnacharyulu [12], Sahoo et al. [14] and Akram et al. [15] reported similar findings in different grape varieties.

3.3 Titrable Acidity (%)

Significantly maximum titrable acidity was obtained in T₅ – Gulabi X Bangalore Purple (0.71%) which was statistically on par with T₃ – Black Cornechen (0.68%), whereas the minimum titrable acidity was obtained in T₆ – Manjari Medika (0.48%). The difference in acidity among different varieties might be due to varietal difference and other factors like storage conditions [15]. The reduction in acidity at the time of harvest is also due to dilution effect caused by increased fruit size [16]. Similar observations in different varieties of grape were

reported by Ghosh [17], Kumar and Rajan [18], Patil et al. [10], Gill and Arora [11] and Soni et al. [7].

3.4 Brix/Acid Ratio

Among the different grape juice varieties, T₁ – H-516 recorded significantly highest brix/acid ratio (42.96) which was statistically on par with T₆ – Manjari Medika (41.52), while T₅ – Gulabi X Bangalore Purple recorded the lowest brix/acid ratio (24.61). The brix/acid ratio varies in different varieties of grape because amount of TSS/TA ratio is governed by genetical constitution, phenotypical factors and also the day and night temperature generally favours the accumulation of solutes [14]. Mehan et al. [9], Ghosh [17] and Gill and Arora [11] reported similar findings in various grape varieties.

3.5 Reducing Sugars (%)

All the varieties exhibited significant differences in the reducing sugars with significantly highest being T₁ – H-516 (17.24%) which was followed by T₄ – Concord (16.39%), whereas T₇ – Pusa Navrang recorded significantly lowest reducing sugars (10.86%). The difference in reducing sugars among the grape varieties might be because of the fact that the sugars in grapes are greatly influenced by varietal difference and environmental condition [19,15]. The results of present investigation are supported by findings of Ratnacharyulu [12] and Bahksh et al. [20] in different grape varieties.

3.6 Total Sugars (%)

Total sugars were found significant in all treatments. Of all the varieties evaluated, significantly highest total sugars were recorded in T₄ – Concord (28.56%) which was followed by T₁ – H-516 (25.60%), while lowest total sugars were recorded in T₂ – Arka Shyam (14.21%). The variation in the total sugars might be due to genetic makeup of the variety and environmental condition [21,16]. Similar findings were reported by Ghosh [17], Ratnacharyulu [12] and Akram et al. [15] in different grape varieties.

3.7 Juice Recovery (%)

All the different grape juice varieties showed significant differences in the juice recovery percentage. T₆ – Manjari Medika was found to have significantly maximum juice recovery (71.80%) which was statistically on par with T₇ –

Pusa Navrang (70.40%), while T₅ – Gulabi X Bangalore Purple recorded minimum juice recovery (60.12%). The highest juice recovery might be due to high bunch parameters like more bunch weight, high berry weight and diameter of berries. Similar findings were reported by Ratnacharyulu [12]), Brar et al. [22], Sharma et al. [23] and Vijaya et al. [9] in different grape varieties [24].

Table 1. Evaluation of different juice varieties of grape for TSS (°Brix), pH, titrable acidity (%) and brix/acid ratio

| Treatments | Total soluble solids (°Brix) | pH | Titrable acidity (%) | Brix/Acid ratio |
|--|------------------------------|------|----------------------|-----------------|
| T ₁ : H - 516 | 21.05 | 4.00 | 0.49 | 42.96 |
| T ₂ : Arka Shyam | 18.57 | 3.44 | 0.54 | 34.38 |
| T ₃ : Black Cornechen | 19.13 | 3.38 | 0.68 | 28.13 |
| T ₄ : Concord | 20.87 | 3.64 | 0.56 | 37.27 |
| T ₅ : Gulabi X Bangalore Purple | 17.47 | 3.22 | 0.71 | 24.61 |
| T ₆ : Manjari Medika | 19.93 | 4.03 | 0.48 | 41.52 |
| T ₇ : Pusa Navrang | 18.84 | 3.99 | 0.51 | 36.94 |
| T ₈ : Bangalore Blue | 20.67 | 3.34 | 0.58 | 35.64 |
| SEm ± | 0.09 | 0.01 | 0.01 | 0.60 |
| CD at 5% | 0.26 | 0.02 | 0.03 | 1.79 |
| CV | 0.76 | 0.27 | 2.74 | 2.94 |

Table 2. Evaluation of different juice varieties of grape for sugar content

| Treatments | Reducing sugars (%) | Total sugars (%) |
|--|---------------------|------------------|
| T ₁ : H - 516 | 17.24 | 25.60 |
| T ₂ : Arka Shyam | 12.82 | 14.21 |
| T ₃ : Black Cornechen | 11.36 | 15.16 |
| T ₄ : Concord | 16.39 | 28.56 |
| T ₅ : Gulabi X Bangalore Purple | 13.51 | 19.18 |
| T ₆ : Manjari Medika | 14.49 | 22.53 |
| T ₇ : Pusa Navrang | 10.86 | 16.34 |
| T ₈ : Bangalore Blue | 12.65 | 15.92 |
| SEm ± | 0.26 | 0.29 |
| CD at 5% | 0.78 | 0.86 |
| CV | 3.28 | 2.52 |

Table 3. Evaluation of different juice varieties of grape for juice recovery (%)

| Treatments | Juice recovery (%) |
|--|--------------------|
| T ₁ : H - 516 | 65.89 |
| T ₂ : Arka Shyam | 68.60 |
| T ₃ : Black Cornechen | 69.85 |
| T ₄ : Concord | 61.70 |
| T ₅ : Gulabi X Bangalore Purple | 60.12 |
| T ₆ : Manjari Medika | 71.80 |
| T ₇ : Pusa Navrang | 70.40 |
| T ₈ : Bangalore Blue | 63.90 |
| SEm ± | 0.88 |
| CD at 5% | 2.63 |
| CV | 2.28 |

4. CONCLUSION

The results from the present investigation revealed that TSS was recorded maximum in T₁ – H-516 (21.05 °B) which was statistically on par with T₄ – Concord (20.87 °B). T₆ – Manjari Medika recorded maximum pH (4.03) followed by T₁ – H-516 (4.00). The maximum titrable acidity was found in T₅ – Gulabi X Bangalore Purple (0.71%) which was statistically on par with T₃ – Black Cornechen (0.68%). Highest brix/acid ratio was recorded in T₁ – H-516 (42.96) which was statistically on par with T₆ – Manjari Medika (41.52). T₁ – H-516 recorded maximum reducing sugars (17.24%) followed by T₄ – Concord (16.39%), whereas maximum total sugars were recorded in T₄ – Concord (28.56%) followed by T₁– H-516 (25.60%). The maximum juice recovery was recorded in T₆ – Manjari Medika (71.80%) which was statistically on par with T₇ – Pusa Navrang (70.40%).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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