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M Nivedha

Department of Food Process Engineering,
Agricultural Engineering College and Research Institute,
Tamil Nadu Agricultural University, Coimbatore,
Tamil Nadu, India

IP Sudagar

Department of Food Process Engineering,
Agricultural Engineering College and Research Institute,
Tamil Nadu Agricultural University, Coimbatore,
Tamil Nadu, India

S Ganapathy

Department of Food Process Engineering,
Agricultural Engineering College and Research Institute,
Tamil Nadu Agricultural University, Coimbatore,
Tamil Nadu, India

D Amirtham

Department of Food Process Engineering,
Agricultural Engineering College and Research Institute,
Tamil Nadu Agricultural University, Coimbatore,
Tamil Nadu, India

P Aruna

Department of Floriculture and Landscaping,
Horticultural College and Research Institute,
Tamil Nadu Agricultural University, Coimbatore,
Tamil Nadu, India

Corresponding Author:

IP Sudagar

Department of Food Process Engineering,
Agricultural Engineering College and Research Institute,
Tamil Nadu Agricultural University, Coimbatore,
Tamil Nadu, India

Chemical properties of Cumbum valley grape varieties (Muscat Hamburg and Medika) for wine preparation

M Nivedha, IP Sudagar, S Ganapathy, D Amirtham and P Aruna

Abstract

Chemical properties of grapes like anthocyanin and antioxidants are well suitable in the wine preparation, due to its health benefits. Cumbum valley in Tamil Nadu produces around 90% of grapes out of which Muscat Hamburg and Medika are widely used in wine preparation due to rich in their chemical properties. Among Muscat Hamburg and Medika varieties, Medika grape variety contains more content of chemical properties. In our study, pH (3.8), total soluble solids TSS (17.3°Brix), anthocyanin content (35.61 mg/100g), antioxidant activity (93.15%) provides the conformation of better chemical properties in Medika variety for wine preparation.

Keywords: grapes, pH, titratable acidity, anthocyanin, antioxidant

Introduction

Tropical fruits like grapes contain more amount of anthocyanin and antioxidant contents, that provides good health by checking of cancer, cardiovascular troubles and anti-inflammatory problems^[9]. In India, the major grape producing states are Maharashtra, Karnataka and Tamil Nadu. Cumbum valley in Tamil Nadu is the major grape producer in South India.

Muscat Hamburg and Medika are the two major grape varieties grown in Cumbum valley in Tamil Nadu that are rich in anthocyanin and antioxidant properties. Hence they are mostly use in the wine preparation^[9]. The quality of wine decreases as chemical properties of grape decreases^[8]. Hence, selection of better variety of grapes plays a prominent role in the good quality of wine preparation. By knowing the chemical properties, we can suggest the best variety for the preparation of quality wine. The present study provides the chemical properties of Muscat Hamburg and Medika grape varieties to know the best quality in wine preparation.

Materials and Methods

Chemicals used

The chemicals used in the study was acetic acid and sodium acetate (HiMedia Laboratories Pvt. Ltd., Mumbai), HCl of AR grade (Avra Synthesis Pvt. Ltd, Hyderabad with 32% purity), phenolphthalein indicator (GRM 076, HiMedia Laboratories Pvt. Ltd., Mumbai), 0.1% NaOH from SDFCL (S D Fine Chem Limited, Mumbai), DPPH (HiMedia Laboratories Pvt. Ltd., Mumbai) and Tris HCl (Reagene Biosciences Private Ltd, Bengaluru, Karnataka).

Samples collection

Fresh grapes varieties were collected from Theni Grapes Research Station (GRS), Rayappanpatty village, Cumbum Valley of Theni district. The samples were kept under frozen storage.

Quality analysis of grape berries

Biochemical attributes are very essential in quality analysis, grading and in export purpose. In this research, five biochemical attributes were chosen for the quality analysis in grape berries such as pH, titratable acidity, total soluble solids, anthocyanin content and total antioxidant activity.

Biochemical attributes

pH

pH of grape berries was determined by using hand held digital pH meter (Model HI-98107, HANNA Instruments, Romania). Acetate buffer of pH 3.6 was prepared by using 0.2M solution of acetic acid (A) and 0.2M solution of sodium acetate (B). To obtain the pH of 3.5, 46.3 ml of solution A and 3.7 ml solution of B was taken. The solution was diluted to a total of 100 ml. Fruit juice weighing 75 ml was macerated using a pestle and mortar to obtain clear juice without any debris. The clear juice was transferred to the 50 ml beaker. The hand held digital pH meter was dipped into the clear juice for assessing pH, after calibrating with a standard solution.

Titrateable acidity

Grape berries weighing 5g was taken. The selected grape berries were macerated with 5ml of distilled water and pulp was filtered through filter paper. The volume was making up to 100ml and from that 20ml of juice was taken for the analysis. 2 to 3 drops of phenolphthalein indicator was added to the juice and it was titrated against 0.1% NaOH. The appearance of pale pink color determines the amount of NaOH consumed by the sample. TA was calculated by the formula,

$$\text{Total acid} = \frac{0.1 \times \text{titre value} \times \text{acid factor} \times \text{volume make up} \times 100}{20 \times 5}$$

Total soluble solids

Total soluble solids of grape berries were determined by using digital hand held pocket refractometer (Model PAL-1 ATAGO, Tokyo, Japan). Individual grape berry was pressed gently for the extraction of juice and a drop was placed in the digital refractometer for the TSS analysis.

Anthocyanin content

Grape berries weighing 10g were macerated using pestle and mortar to obtain pulp. The ethanol solution of 10 ml was mixed with the pulp and placed in a rotary shaker (Neolab DIGITAL Incubator cum Orbital Shaker) for 1h for agitation. The agitated pulp was centrifuged (REMI R-8C laboratory centrifuge) at 1800 rpm for 10 mins. The extract 0.2 ml was collected and transferred to the test tube containing 3.8ml of 1M HCl and it was sealed with aluminium foil. Then it was incubated at room temperature for 3h. The acidified diluted extract was measured using UV spectrophotometer (Model UV1800ENG240V, SOFT, Shimadzu corporation, Kyoto, Japan) at 520 nm wavelength [4]. Anthocyanin content was determined by using the formula,

$$\text{Anthocyanin (mg/fruit)} = \frac{520 \times \text{dilutionfactor} \times \text{fiterextract} \times 1000}{500 \times 100 \times \text{homogenateweight}}$$

Antioxidant activity

Antioxidant activity of the grape variety was determined by using 2,2-diphenyl-1-picrylhydrazyl (DPPH) method. DPPH was prepared by squeezing the grape berries for the extraction of complete juice and it was centrifuged using a REMI R-8C laboratory centrifuge at 5000 rpm for 10 mins at 4 °C. 0.1 ml of fresh juice was taken and 0.9 ml of 100 mM Tris HCl buffer was added with addition of 1ml DPPH. The mixture was shaken vigorously and it was left to stand for 30 mins. The absorbance was measured at 517nm using UV spectrophotometer (Model UV1800ENG240V, SOFT, SHIMADZU corporation, Kyoto, Japan). The reaction

mixture without DPPH was used for background correction [2].

$$\text{Antioxidant activity (\%)} = \left(1 - \frac{\text{sample (517nm)}}{\text{control (517nm)}}\right) \times 100$$

Results and discussion

The selected biochemical attributes namely pH, total soluble solids, titrateable acidity, anthocyanin content and antioxidant activity were analyzed for its quality purpose. The results are shown in table 1.

Table 1: Quality analysis of grape varieties

Biochemical attributes	Grape varieties*	
	Muscat Hamburg	Medika
pH	3.2 ± 0.3	3.8 ± 0.05
Titrateable acidity (%)	0.69 ± 0.04	0.36 ± 0.06
Total soluble solids (°brix)	15.1 ± 1.6	17.3 ± 0.1
Anthocyanin content (mg/100g)	12.64 ± 0.47	35.61 ± 3.30
Total antioxidant activity (%)	65.39 ± 3.6	93.15 ± 0.8

* All observations are mean of 30 replications ± SEd

pH

From the table 1, it was observed that the pH of the grape berries ranged from 2.9 to 4.6. The maximum pH of 3.8 was observed in Medika and minimum pH of 3.2 was observed in Muscat Hamburg. The difference in the pH among the grape varieties may be due to the ripening stage of the fruit, which could make the grape berries less acidic and might have great impact in sugar concentrations [7]. The decrease in pH helps in the increase of Anthocyanin content [10].

Titrateable acidity

The titrateable acidity of the grape varieties ranged from 0.21 percent to 0.78 percent. The highest titrateable acidity of 0.69 percent was recorded in Muscat Hamburg and lowest of 0.36 percent was recorded in Medika. As fruit matures the titrateable acidity decreases which helps in the increase of anthocyanin content [14].

Total soluble solids

The total soluble solids of the varieties Muscat Hamburg and Medika ranged from 10 °Brix to 17.5 °Brix. From the table, it was observed that Medika had the highest total soluble solids of 17.3 °Brix and Muscat had the lowest of 15.1 °Brix. As the TSS increases anthocyanin content also increases [6].

Anthocyanin content

The anthocyanin content of the Muscat Hamburg and Medika varieties ranged from 12.01 to 40.185 mg/100g. The highest anthocyanin content of 35.61 mg/100g was observed in Medika variety and lowest value of 12.64 mg/100g was observed in Muscat Hamburg. Medika (small sized berry) variety had greater solute to solvent ratio, therefore there would be more amount of anthocyanin presence on the skin when compared with Muscat Hamburg (larger sized berries) which had lesser ratio [3]. The degree of ripening and different stages of maturation affect the distribution of anthocyanin in Muscat Hamburg variety which showed lower anthocyanin content when compared with Medika [13].

Antioxidant activity

The antioxidant activity of the Muscat Hamburg and Medika grape varieties determined by using DPPH method ranged from 60.15 to 94.98 per cent. The maximum antioxidant

activity of 93.15 per cent was observed in Medika and minimum activity was observed in Muscat Hamburg variety having 65.39 per cent. The DPPH method is the effective analytical method for the determination of antioxidant activity in grapes [1]. Medika grape variety had increased antioxidant activity which is due to the presence of increased amount of anthocyanin content, total phenolic compounds and flavanoids when compared with Muscat Hamburg [5].

Conclusion

To conclude, the study suggests that Medika grape variety are well suitable than Muscat Hamburg variety based on the chemical properties like pH, titratable acidity, TSS, antioxidant and anthocyanin content respectively.

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