Nutritional analysis of Sugarcane - Papaya wine

Pallavi S. Patil, Umesh B. Deshannavar, Sneha S.Kagale, Apurva P.Karve

Abstract— Wine, an adjunct food beverage, is nutritional and has health benefits on humans. Since the middle ages, wines have grabbed the attention of the consumers and thereafter the contribution of the non-grape fruits in wine production is being widely studied till date. Highly perishable, surplus or ripen fruits like papaya can be used for the production of fruit wine which helps in generating additional revenue for the horticulturist. Papaya a tropical fruit contains minerals, phenols, vitamin C and salts like sodium, potassium. Sugarcane juice significantly contributes to the wine production. The Sugar content during the fermentation of wine is of paramount importance. Sugarcane juice was blended with papaya pulp to produce the fruit-crop wine, thus avoiding the use of external sugar. The present work focuses on the nutritional analysis of sugarcane –papaya wine. The proximate analysis of wine revealed 99.17 % moisture, 0.23% crude protein, 0.06% crude fat, 0% fiber, 0.41% carbohydrate and 0.13% minerals. The Polyphenol content of sugarcane-papaya wine was found to be 11.54 mg/100g. The salts sodium and potassium were found to be 72 ppm and 168 ppm respectively. Iodometric titration method was used to estimate vitamin C and the concentration was found to be 13.13 mg/100g.

Keywords— Nutritional Analysis, Papaya Pulp, Sugarcane Papaya Juice, Sugarcane Papaya Wine, Wine

I. INTRODUCTION

Wine can be outlined as "The fermented beverage product produced by the Yeast cells". Wine is a complex beverage that contains alcohol, water, sugar, acids, phenols, minerals, fats, salts, and various other compounds. It also has several volatile components which give special flavor, aroma, and taste of wine. The health benefits of wine are mainly attributed to the phenols and the polyphenols present in them, which will act against negative effects of the free radicals, has antimicrobial activity and have motivated several studies since many years.

Sugarcane is one of the major crops in the Gramineae family. The height of the Sugarcane plant is approximately 2-6 m. [1] It contains sugars (sucrose, glucose, and fructose), nutrients, sugars, salts, organic acids, proteins, and moisture. [2] The composition of Sugarcane juice may alter according to the variety of sugarcane, topographical location, agricultural practices, maturity, soil, quality and availability of water, harvesting, and transportation.[3]

Papaya or Pawpaw (mainly named in Nigeria), belongs to the family Caricaceae. [4]Papaya is an important source of vitamin C and vitamin A, high concentrations of lycopene and also contains numerous minerals. The contents in the papaya fruit depend on the geographical location and the harvesting time of fruit. It has huge health benefits like the vitamin C content in the papaya attributes to the antioxidant activity and vitamin A is important for the good vision and maintains the immune system. [5]

The objectives of this work were to analyze the nutritional content of sugarcane-papaya wine. The proximate and mineral analysis was performed for papaya pulp, sugarcane juice, Sugarcane-papaya fresh wine, and aging wine. GC analysis depicted the presence of ethanol in fresh Sugarcane-papaya Wine. The Polyphenol, vitamin C, Sodium and Potassium contents were analyzed from papaya pulp, sugarcane juice, sugarcane-papaya fresh wine, and aging wine.

II.METHODOLOGY

1. Wine production

Sugarcanes were washed and crushed. The Juice obtained was filtered, pasteurized at 80oC and then centrifuged. The supernatant was filtered and treated with sodium metabisulphite, incubated at 4oC for 24hrs. The treatment was similar to papaya as that of sugarcane. A mixture of sugarcane juice and papaya pulp in the proportion of 60:40 was adjusted to 16oBrix, pH 5 and inoculated with Saccharomyces cerevisiae. The fermentation was carried out for 5 days in anaerobic condition. After fermentation, the wine was centrifuged and filtered.

2. Wine analysis

2.1. Proximate Analysis of Wine

Carbohydrate, Protein, Moisture, Fiber, Fat and Energy content of wine was estimated. [6][7][8]

2.2. Analysis of Mineral Content of Wine

Atomic absorption Spectroscopy was used to determine the mineral content of wine.[8] [9]

2.3. Analysis of sodium and potassium Content in Wine

Flame photometry was used to determine the sodium and potassium content of wine.[10]

2.4. Analysis of Total Phenolic Content in Wine

Total phenolic content was estimated Folin's Reagent Method.[11]

2.5. Analysis of Vitamin C Content in Wine

Iodometric Titration method was used to estimate Vitamin C.[12]

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2.6. Estimation of ethanol (GC)

Agilent gas chromatograph with a flame ionization detector was used to detect the presence of ethanol content in fresh wine.

III.RESULTS AND DISCUSSION

1. Wine analysis

1.1. Proximate Analysis of Wine

Proximate composition of wine is dependent on the raw material used for the production of wine.

Table 1 Proximate Analysis of Wine

Parameter (%)	Sugarcane Juice	Papaya Pulp	Fresh Wine	Aged wine
Moisture	77.86	90.90	99.17	99.52
Total Minerals	00.23	0.43	00.13	00.10
Crude Protein	0.44	0.54	00.23	00.04
Crude Fat	0.00	0.08	00.06	00.00
Crude Fiber	0.00	0.98	00.00	00.00
Carbohydrate	21.47	07.07	00.41	00.34

Table 2 Energy content of Wine

Parameter (kcal/100g)	Sugarcane Juice	Papaya Pulp	Fresh Wine	Aged wine
Energy	87.64	31.16	3.10	1.52

The table illustrates that the moisture content was > 99% in both fresh wine and 11 months aged wine, sugarcane juice contained less moisture than papaya pulp. The total mineral content decreased in the 11 months aged wine as compared to fresh wine. The crude protein and carbohydrate were found to be decreased in aged wine than fresh wine. The fat content in the 11 months aged wine was nil, which proves that the wine helps to protect against the excessive lipids. Table 2 illustrates that there was a decrease in energy content in aging wine than the fresh wine.

1.2. Analysis of Mineral Content of Wine

Nutrients are essential for the metabolic functioning of the body. Though, the micronutrients are required in trace amount they play an important role in various metabolic pathways which when not provided can cause disorders in the human body. Minerals the essential micronutrients viz., Copper, Iron, Manganese, and Magnesium were analyzed in this study. The content of Copper, Manganese, and Magnesium increased in the 11 months aged wine than fresh wine. These minerals have many health benefits. [13] [14]The mineral content of the wine was distinctive as it contains Copper, Iron, Manganese, and Magnesium also sodium and potassium.

Table 3 Analysis of Mineral Content of Wine

Mineral (ppm)	Sugarcane Juice	Papaya Pulp	Fresh Wine	Aged wine
Copper (Cu)	1.15	9.2	0.135	0.80
Iron (Fe)	0.39	0.25	1.194	0.43
Manganese (Mn)	58	20	0.3808	36
Magnesium (Mg)	85	9	0.0000	115

1.3. Analysis of sodium and potassium Content in Wine

In this study, sugarcane juice and papaya pulp had an adequate amount of sodium and potassium. Sodium content was increased in 11 months aged wine than fresh wine. This reveals that the wine can be moderately consumed which reduces the risk of cardiovascular disease, maintains heartbeat and blood pressure level.

The potassium content was found to be decreased in the 11 months aged wine. Potassium helps to regulate cell growth[15][16], maintains blood pressure[17]. The ratio of sodium and potassium is important than individual ion concentration.

Table 4 Analysis of sodium and potassium Content in wine

Salts (ppm)	Sugarcane Juice	Papaya Pulp	Fresh Wine	Aged wine
Sodium (Na)	42	43	7.2	50
Potassium (K)	56	60	168	62

1.4. Analysis of Total phenolic Content in Wine

The aging of wine can increase the phenolic compounds. [18] These Phenolic compounds have a positive relationship with the antioxidant activity of wine. [19] They are also responsible for the sensory attributes of wine. In this study, there was a significant increase in the total phenolic content of 11 months aged wine.

Table 5 Analysis of total phenolic content in Wine

Parameter (mg/100g)	Sugarcane Juice	Papaya Pulp	Fresh Wine	Aged wine
Total phenolic content	70.30	36.11	11.54	50.61

1.5. Analysis of Vitamin C Content in Wine

The table 6 illustrates that there is an increase in the vitamin C content of 11 months aged wine. Vitamin C is one of the important factors which add nutritional value to the food. It also has therapeutic value and antioxidant activity. [20] A study by Many et.al, showed that there was decrease in the vitamin C content in the 6 months aged wine[13]

Table 6 Analysis of Vitamin C Content in Wine

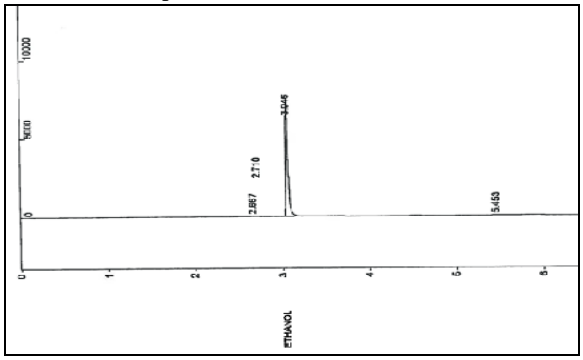
Parameter (mg/100g)	Sugarcane Juice	Papaya Pulp	Fresh Wine	Aged wine

Vitamin C	20.48	78.18	13.13	21.13

1.6. Estimation of ethanol (GC)

Gas chromatography is an efficient tool to separate the components in a mixture followed by the identification and quantification of components.

The following figure depicts the ethanol content in the fresh wine. The sharp peak in the graph represented the presence of predominant alcohol that is ethanol. The ethanol content of the fresh wine was 6.41 percent. The retention time was 3.046. The result also depicts the absence of higher alcohols in the sample.



IV.CONCLUSION

The study on nutritional analysis of sugarcane – papaya wine proved that the moisture content of wine increased whereas the contents of total minerals, crude proteins, crude fat, crude fiber, carbohydrate, and energy decreased. The mineral content of the 11 months aged wine was higher than that of fresh wine except for iron (Fe). In the 11 months aged wine the sodium content increased, on the contrary, the potassium content decreased. From this study, it can be said that the 11 months aged wine is antioxidant, has therapeutic values and may have antimicrobial activity as the aged wine showed the increase in the contents of vitamin C and total phenolic content. Due to the increase in the total phenolic content the sensory quality parameters might have enhanced with the aging of wine. Future aspects of the current study would concentrate on analyzing sensory attributes of 11 months aged wine.

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