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Nutritional and Biochemical Analysis of Locally Produced Wine from a Blend of Sugarcane and Sweet Melon

[1,2]Tatah Verwiyeh Silas and [1]Moses Adondua Abah

[1]Department of Biochemistry, Faculty of Pure and Applied Sciences, Federal University Wukari, Wukari, PMB 1020, Taraba State, Nigeria

[2]Department of Biochemistry, Faculty of Biological Sciences, University of Nigeria. Nsukka, P.M.B 923, Enugu State, Nigeria

ABSTRACT

Background and Objective: Two well-known sources of healthy nutrients for humans are sweet melon fruit *(Cucumis melo* L.) and sugarcane (*Saccharum officinarum*). Sweet melons have a limited shelf life and are quite perishable, making them prone to postharvest waste. To preserve or make use of the fruit's content, turning them into other forms like wine would be beneficial. The study investigated locally produced wine's nutritional and biochemical content from sweet melon and sugarcane blends. **Materials and Methods:** Sugarcane and sweet melon were both obtained at the school gate of Federal University Wukari, Taraba State, Nigeria and processed. The 200 mL of the *Cucumis melo* L. wine sample used for this project work was fermented using yeast extract in the Microbiology Laboratory at Federal University Wukari, Taraba State. The wine sample was locally prepared and stored in a refrigerator. Proximate composition, mineral composition, physicochemical, phytochemical constituents and amino acid content of the wine were analyzed. **Results:** The sugarcane-sweet melon wine, according to the results of the physicochemical examination, has an alcohol content of 3.2%, a pH of 4.60 and a temperature of 28.1°C. With a moisture content of 96.73%, ash content of 0.17 %, fat content of 0.5%, total carbohydrate content of 0.07 %, fiber content of 0.3% and protein content of 0.12%, the sugarcane-sweet melon wine was also found to have a high proximate composition. The essential amino acids include; methionine (6.179 µL), phenylalanine (60.055 µL) and leucine (234.281 µL). The nonessential amino acids revealed in the study are; asparagine (82.357 µL), proline (87.365 µL), glutamic acid (225.686 µL), cysteine (52.923 µL) and glutamine (167.338 µL). **Conclusion:** It can be concluded that tropically available fruit in Nigeria like *Cucumis melo* L. fruit and the perennial grass sugarcane are suitable for fruit wine production with high nutritional quality and good biochemical standards.

KEYWORDS

Wine, sugarcane, sweet melon, fermentation, nutrient, blend, yeast

INTRODUCTION

Although domestic production of palm wines was accomplished some decades ago, the Nigerian wine industry is still in its infancy because the processing and bottling of palm wine is a relatively new development. The development of cocoa wine in 1983 was a significant advancement in wine making

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technique by Nigerians who were granted a patent[1]. While great efforts have been made to explore various fruit varieties from which wine can be made, resulting in the production of wines such as coconut wine, kola nut wine, pineapple wine, cashew apple wine and star apple wine, the majority of these wines are still produced on a very small scale[1]. According to Tatah *et al.*[2], wine provides many health advantages that are comparable to those of the fruits it is made from[2]. Many of these impacts have recently been reported in the literature. For example, when paired with other foods that are known to independently lower cholesterol, almonds have been proven to be more efficient in lowering blood levels of Low-Density Lipoprotein Cholesterol (LDLC), according to a 2013 FAO research as reported by Ayo *et al.*[3]. Majority of commercially produced wines are typically generated from fermented grapes; this fermentation is accomplished by adding various yeast species to the crushed grapes rather than using chemicals or sugar[4]. To produce various kinds of wines, yeast can turn grapes into an alcoholic compound and eliminate the sugar from them. Various fruits, such as pawpaw, mango, pineapple, banana, lemon, watermelon, etc., can be used to make wine. In these cases, the wine is named after the fruit or fruit combination that was used to make it.

A significant perennial grass of the Poaceae family, sugarcane (*Saccharum officinarum* L.) is native to tropical South and Southeast Asia. Because of the high-yielding crops' medical and commercial worth, it is planted all over the world[3]. Sugarcane juice is widely recognized for its use as a raw material in the manufacturing of refined sugar and its wax is being explored as a possible replacement for the pricey carnauba wax, which has potential use in cosmetic and medicinal fields. Tatah *et al.*[2] has shown the presence of different fatty acids, alcohol, phytosterols, flavonoids, higher terpenoids, -O- and -C-glycosides and phenolic acids in the leaves, juice and products derived from it.

Casabas or the inodorous group of melons are other names for the sweet melon (*Cucumis melo* L.). It is a member of the Cucurbitaceae family. Its rind is smooth or wrinkled and its lobed or non-lobed appearance is usually subtle. According to Sadh *et al.*[5], they have a shelf life of less than a month, are the sweetest melons available and do not separate from the plant. However, they lack flavor and perfume. Sweet melon is grown throughout the world's tropical regions. *Cucumis melo* L. is a sweet fruit that is rich in phytochemicals and contains over 90% water, which makes it an excellent substrate for the production of wine[6]. The juice of *Cucumis melo* L. fruit, which has a total soluble solid (TSS) of 10-13% and a juice recovery of 85%, is prone to bacterial contamination due to its pH of 5.7-6.7, as reported by Antoniewicz *et al.*[7] It is sweet and refreshing fruit, the main reason people seek it out[8].

Because industrial wine is made in large quantities and transported over great distances, its unique flavor and freshness tend to fade[2-9]. Additionally, because industrial wine production requires a lot of energy and resources for transportation, it is not environmentally beneficial. Due to these difficulties, there is a growing desire to promote wine made locally, as it is thought to have a better feeling of place and a more sustainable production process[10]. Additionally, it is said to be fresher, taste better and have a closer bond with the neighborhood. In order to improve the wine's quality and highlight its cultural and economic value in the area, this study examined the nutritional and biochemical characteristics of wine made locally from a blend of sugarcane and sweet melon.

MATERIALS AND METHODS

Sample collection: The present study was carried out from December, 2023 to March, 2024. Sugarcane and sweet melon samples were both obtained at the school gate of Federal University Wukari, Taraba State, Nigeria. Two hundred milliliters of the *Cucumis melo* L. wine sample used for this project work was fermented using yeast extract in the Microbiology Laboratory at Federal University Wukari, Taraba State. The wine sample was locally prepared and stored in a refrigerator.

Physicochemical analysis

pH: The 8684 AZ Water Quality Testing pH meter being designed and manufactured by AZ Instrument, located in Taiwan was used for this test. The pH meter used for the analysis was first calibrated using the buffer. Precisely 2 mL of the wine sample was weighed accurately and dissolved in 25 mL of distilled water in a conical flask. The solution is then transferred into a beaker. The electrode of the pH meter manufactured by AZ instrument, located in Taiwan was then inserted into the beaker containing the solution and the reading was taken directly from the screen of the meter.

Temperature: The temperature of the wine sample was determined using a laboratory thermometer manufactured by AZ instrument, located in Taiwan. The 2 mL of the wine sample and 20 mL of distilled water was added into a 100 mL beaker and the thermometer was directly inserted into the solution. The temperature of the wine was then recorded.

Alcohol determination: The alcohol content of the wine sample was estimated using a refractometer ((Waterproof), RFT-PD-F Series), manufactured by AZ instrument, located in Taiwan. Using a pipette 2 drops of the wine sample were collected on the prism of the refractometer and were viewed for the alcohol reading.

Amino acid profile: Both ion-exchange chromatography and colorimetric methods were used to determine the amino acid composition of the wine. The different amino acids in the sample were separated based on their charges and collected in a different beaker by eluding them with sodium extract buffer. The amino acid in each beaker was then identified by calculating the volume of the buffer used in eluding each of the individual amino acids and the pH of the amino acids, thereby comparing with the standard. The same volume of each of the amino acids identified was collected in test tubes and 1mL of ninhydrin solution was added to each. All the tubes were covered with aluminum foil and kept in a boiling water bath for 15 min after which the test tube was removed and allowed to cool in cold water. Then 1 mL of 50% ethanol was added to each of the tubes and mixed properly. The concentration of each of the amino acids in the tubes is then determined using a colorimeter designed and manufactured by AZ Instruments, located in Taiwan[10].

Proximate composition

Moisture determination: An aluminum dish was heated in a carbolite oven at 105 °C for about 5 min to eliminate any possible residue moisture from the dish and the dish was allowed to cool in a desiccator. The weight of the dish was taken and recorded. The 10 mL of the wine sample was poured into the dish and weighed. The dish containing the sample was placed in a cobaltite oven at 105 °C for 24 hrs. It was then removed, cooled in a desiccator and weighed[11]. The new weight of the dish containing the dried sample was recorded and the moisture was then calculated as follows:

$$\text{Weight of moisture} = \text{Weight of sample and dish} - \text{Weight of dried sample and dish}$$

$$\text{Weight of dried sample (\%)} = \text{Weight of moisture} \times 100$$

$$\text{Dry matter} = 100 - \text{Weight of moisture (\%)}$$

Fat determination: The 10 mL of the wine sample was collected in a beaker. The sample was transferred into the thimble and fixed into the machine accordingly. The beaker was filled with about 50 mL petroleum ether and placed under the fixed thimble containing the sample in the extraction chamber. The thimble was then lowered into a beaker using the adjustment knob. Water tubing was collected and the machine was then powered on and allowed for 10 min for boiling and extraction to take place after which the thimble was raised for another 10 min for rinsing down of the extracted fat into the beaker. The tap of the condenser was then closed for 10 min in other to remove the used petroleum ether.

The aluminum beaker containing the extracted fat was removed and placed in an oven for the evaporation of the remaining petroleum ether for about 15 mins after which it was cooled in a desiccator and was weighed[10]. The value obtained was used to calculate the fat content of the sample as follows:

Weight of fat = Weight of sample and beaker – Weight of empty beaker

weight of fat (%) = Weight of fat ×100

Determination of total fiber content: The 2 g (W) of the sample was added to a beaker with 1.2 mL of H_2SO_4 per 100 mL of solution and it was boiled for approximately 30 min. The residue was then filtered and cleaned with hot water. The residue was then moved to a beaker with 1.2 mL of NaOH per 100 mL of solution and boiled for approximately 30 min. The residue was then dried in an oven, cleaned with hot water and weighed (W2). The weighed sample was then burned at a temperature of approximately 550°C, removed to cool and weighed (W3)[11].

Fiber (%) = W2 - W3 × 100W

Ash content determination: The 10 mL of the sample was added to an empty crucible, which had already been weighed and recorded. The sample was then allowed to cool in a desiccator before being weighed again. The crucible's new weight plus ash was measured using the AOAC's 22nd edition and the ash content was computed as follows[11]:

Weight of ash = (Weight of crucible + ash) – Weight of crucible

Weight of ash (%) = Weight of ash ×100

Carbohydrate determination: A computation was used to determine the sample's carbohydrate content. This is what it looks like total values of protein, ash, fat, phosphorus, fiber, moisture and calcium multiplied by 100 equals the weight of carbohydrates[11].

Phytochemical analysis

Saponin determination: The quantitative determination of saponin was performed utilizing the methodology described by Obadoni and Ochuko[12] and Soto Vázquez *et al.*[13]. A 250 cm^3 conical flask containing 5 g of wine sample was filled to the exact volume with 100 cm^3 of 20% aqueous ethanol. The mixture was continuously stirred and heated to 55°C during 4 hrs in a hot water bath. After filtering, the mixture's residue was again extracted using 100 cm^3 of 20% aqueous ethanol and it was heated for 4 hrs at a steady 55 °C while being constantly stirred. At 90°C, the combined extract evaporated to a volume of 40 cm^3 over a water bath. After adding 20 cm^3 of diethyl ether to the concentrate in a 250 cm^3 separator funnel and agitating it strongly, the ether layer was disposed of and the aqueous layer was recovered. There were two iterations of this cleansing procedure. After adding 60 cm^3 of n-butanol, 10 cm^3 of 5% sodium chloride was used for two extractions. The leftover solution was heated in a water bath for 30 mins after the sodium chloride layer was discarded. It was then put into a crucible and dried in an oven to a consistent weight. A percentage was computed for the saponin content:

$$\text{Saponin (\%)} = \frac{\text{Weight of saponin}}{\text{Weight of sample}} \times 100$$

Determination of flavonoids: The method for determining flavonoids was described by Jose *et al.*[14]. The 2.50 g of the sample was placed in a 250 cm^3 beaker, filled with precisely 50 cm^3 of 80% aqueous methanol, covered and left to stand at room temperature for 24 hrs. The residue was extracted three times using the same volume of ethanol after the supernatant was discarded. The 125 mm Whatman filter paper

number 42 was used to filter the entire wine sample solution. The filtrate of the wine sample was then placed in a crucible and dried over a water bath. After cooling in a desiccator, the contents of the crucible were weighed until a consistent weight was reached. It was determined that the percentage of flavonoids was:

$$\text{Flavonoid (\%)} = \frac{\text{Weight of flavonoid}}{\text{Weight of sample}} \times 100$$

Alkaloid determination: Yakubu *et al.*[15] provided the methodology for the quantitative determination of alkaloids. The wine sample (2.50 g) was placed in a 250 cm^3 beaker with exactly 200 cm^3 of 10% acetic acid in ethanol and it was left to stand for 4 hrs. After reducing the extract's volume by one-quarter on a water bath, 15 drops of concentrated ammonium hydroxide were added to the extract dropwise till the precipitation was finished right away after filtering. Following 3 hrs of mixed sedimentation, the precipitates were filtered using Gem filter paper (12.5 cm) and 20 cm^3 of 0.1 M ammonium hydroxide. The supernatant was disposed of. The residue was dried in an oven using an electronic weighing scale Model B218. The percentage of alkaloids is represented mathematically as follows:

$$\text{Alkaloid (\%)} = \frac{\text{Weight of alkaloid}}{\text{Weight of sample}} \times 100$$

Tannin determination: As per the methods outlined by Puertas *et al.*[16], an analytical method was used to quantify tannin. To make the Folin-Denis reagent, 50 g of sodium tungstate (Na_2WO_4) was dissolved in 37 cm^3 of distilled water. Orthophosphoric acid (H_3PO_4) and phosphomolybdic acid (10 g) were added to the reagent that was previously made. The mixture was refluxed for 2 hrs, cooled and then diluted with distilled water to a volume of 500 cm^3. A 100 cm^3 volume of distilled water was mixed with 1 g of wine in a conical flask. After bringing it to a gentle boil for an hour on an electric hot plate, it was strained through a 100 cm^3 volumetric flask lined with number 42 (125 mm) Whatman filter paper. After being pipetted into a 100 cm^3 conical flask for color development, 5.0 cm^3 of Folin-Denis reagent and 10 cm^3 of saturated Na_2CO_3 solution were added to 50 cm^3 of distilled water and 10 cm^3 of diluted extract (aliquot volume). After vigorous stirring, the solution was let to sit for half an hour in a water bath set at 25°C. Spectrum Lab 23A spectrophotometer readings were taken at 700 nm for optical density, which was then compared to a reference tannic acid curve. To create the tannic standard curve, 0.20 g of tannic acid was dissolved in distilled water and diluted to a concentration of 200 cm^3 (1 mg/cm^3). The standard tannic acid solution was pipetted into five separate test tubes at concentrations ranging from 0.2 to 1.0 mg/cm^3. Each tube was then filled to 100 cm^3 with distilled water, Folin-Denis reagent (5 cm^3) and saturated Na_2CO_3 (10 cm^3). The solution was allowed to sit in a water bath set at 25°C for half an hour. The optical density was determined at 700 nm using a spectrophotometer from Spectrum Lab 23A. The tannic acid concentration was plotted against optical density (absorbance). The computation made use of the following formula:

$$\text{Tannic acid (mg/100g)} = C \times \text{extract volume} \times 100 \text{ Aliquot volume} \times \text{weight of sample}$$

Determination of phenols: A 2 g sample of wine was defatted in a Soxhlet device using 100 cm^3 of ether for 2 hrs. To extract the phenolic components, the defatted sample (0.50 g) was boiled for 15 min in 50 cm^3 of ether. For color development, 10 cm^3 of distilled water, 2 cm^3 of 0.1 N ammonium hydroxide solutions and 5 cm^3 of concentrated amyl alcohol were added to 5 cm^3 of extract. The mixture was then permitted to react for 30 mins. At 505 nm, the optical density was documented. To prepare for the phenol standard curve, 20 mg of tannic acid was dissolved in distilled water and diluted to a volume of 200 mL, reaching a concentration of 1 mg/cm^3. The standard tannic acid solution was pipetted into five separate

test tubes with varying concentrations (0.2-1.0 mg/cm^3). Each tube was then mixed with 2 cm^3 of NH_3OH, 5 cm^3 of amyl alcohol and 10 cm^3 of water. After adding enough volume to reach 100 cm^3, the solution was allowed to react for 30 mins to develop color. At 505 nm, the optical density was found by Ejeh *et al.*[17] and Umaru *et al.*[18].

Determination of minerals

Posphorus and potassium: Spectrophotometer readings revealed the presence of various minerals in the wine sample. In a 50 cm volumetric flask, 2 mL of perchloric acid, 1 mL of H_2SO_4 and 5 mL of HNO_3 were added to 2 mL of the wine sample. After being immersed in a water bath, the mixtures were allowed to evaporate until they were nearly dry. After cooling, the solution was strained into a 100 mL standard flask and then filled up with distilled water to volume. For each mineral, an atomic absorption spectrophotometer manufactured by AZ Instruments, located in Taiwan, was employed for analysis[10].

Statistical analysis: The statistical analysis was carried out using ANOVA and further with Duncan's multiple comparison test and results were expressed as Mean±Standard Error. The statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 23 and significance was at $p<0.05$.

RESULTS

Physiochemical parameters of produced wine: Table 1 shows the variation in temperature of the wine during fermentation at interval of 24 hrs until the fermentation was arrested. The findings indicate that the temperature ranges from 26.1-28.1°C, with pH values between 4.63 and 4.69. Density varies from 0.929-0.945 g/cm^3, while acidity fluctuates between 2.4 and 3.0 g/L. Alcohol content is relatively consistent, ranging from 2.5-3.2%.

Amino acid profile of wine: Table 2 shows the amino acid profile of produced wine. The amino acid profile revealed the presence, amount (uL) and percentage of 8 amino acids such as: Asparagine (82.357 µL), methionine (6.179 µL), phenylalanine (60.055 µL), proline (87.365 µL), glutamic acid (225.686 µL), cysteine (52.923 µL), leucine (234.281 µL) and glutamine (167.338 µL).

Proximate composition of produced wine: Table 3 below shows that wine made from a blend of sugarcane and sweet melon is rich in proximate composition having high moisture content (98.73%) and also rich in crude protein (0.1225%).

Phytochemical composition of produced wine: Quantitative determination of phytochemical revealed the quantities of saponin (2.18 mg/100 mL), flavonoid (4.55 mg/100 mL), alkaloid (9.05 mg/100 mL), tannin (9.74 mg/100 mL) and phenolic acid (11.58 mg/100 mL), respectively.

Potassium and phosphorus composition of produced wine: The results of the mineral composition of wine from a blend of sugarcane and sweet melon are revealed in Table 5 and 6. Potassium and phosphorus were revealed to be present in the wine. The most abundant mineral was phosphorus (3.689).

Table 1: Physicochemical parameters of produced wine

S/N	Temperature (°C)	pH	Density (g/cm^3)	Acidity (g/L)	Alcohol (%)
1	27.0	4.64	0.945	3.0	2.5
2	26.1	4.63	0.932	2.4	3.0
3	-	-	-	-	-
4	27.0	4.67	0.935	2.70	3.0
5	28.1	4.69	0.929	2.72	3.2

Table 2: Amino acid profile of produced wine

S/N	Amino acid	Amount (uL)	Amount (%)
1	Asparagine	82.357	9.0
2	Methionine	6.179	0.7
3	Phenylalanine	60.055	6.6
4	Proline	87.365	9.5
5	Glutamic acid	225.686	24.6
6	Cysteine	52.923	5.8
7	Leucine	234.281	25.6
8	Glutamine	167.338	18.3

Table 3: Proximate composition of produced wine

Parameter	Amount (%)
Moisture	98.7315
Crude Fat	0.5243
Crude fiber	0.3789
Ash	0.1749
Crude protein	0.1225
Carbohydrate	0.0492

Table 4: Phytochemical composition of produced wine

Phytochemical	Amount (mg/100 mL)
Saponin	2.18
Flavonoid	4.55
Alkaloid	9.05
Tannin	9.74
Phenolics	11.58

Table 5: Potassium mineral composition of wine

Absorbance	Concentration	SD	Actual concentration (ppm)
0.090	0.000	0.000	
1.020	5.000	0.000	
1.900	10.000	0.001	
2.730	15.000	0.001	
3.620	20.000	0.000	2.240±0.002

Table 6: Phosphorus mineral composition of wine

Absorbance	Concentration	SD	Actual concentration (ppm)
0.017700	0.00	0.000	
1.496000	2.00	0.000	
2.076000	3.000	0.001	
2.611000	4.00	0.001	
3. 22.700	5.00	0.000	
2.391413	3.589	0.002	3.689

DISCUSSION

While limited research specifically focuses on sugarcane-melon blends, studies on similar fruit wines offer valuable insights. This study analyzed the biochemical and nutritional composition of sugarcane-melon wine. Table 1 shows the variation in temperature of the wine during fermentation at intervals of 24 hrs until the fermentation was arrested. The temperature of wine decreased within the first two days (from 27.0-26.1°C) of fermentation and this increased (from 27.0-28.1°C) towards the end of the fermentation period. The pH and temperature of *Cucumis melo* L. wine reported by Tatah *et al.*[19] are 3.60 and 27.0°C, respectively. The pH of the present studied wine ranged from (4.60-4.69) and expressed the acidic nature of the wine. Studies have shown that during the fermentation of fruit, low pH is inhibitory to the growth of spoilage organisms but creates a conducive environment for the growth of desirable organisms. Zainab *et al.*[20] reported that there is a correlation between pH and acidity of fruit wines. The acidification of the medium during fermentation causes the pH of the wine to decrease as the acidity increases.

According to Awe and Nnadoze[21], this makes sense. This finding was consistent with research on watermelon and pawpaw wine that was done by Ebana *et al*.[22]. According to Chilaka *et al*.[23], the ability of a pure strain of *Saccharomyces cerevisiae* to produce fruit wine with appropriate alcohol levels is supported by the low pH that was detected. Several variables, including fruit variety, fermentation process and yeast variety, influence the acidity level in fruit wine. Heredia *et al*.[24] also made a similar finding. Results showed that as fermentation progressed, the fruit wine's total titratable acidity rose. The transformation of organic acids into lactic acids and carbon dioxide may be the cause of this rise in titratable acidity. According to Zainab *et al*.[20], a comparable finding was made. High acidity is known to provide fermenting yeast an edge in natural conditions and this benefit is seen during fruit fermentation. According to Awe *et al*.[25], acidity is a key component in wine quality since it aids in fermentation and improves the wine's overall qualities and balance. A bad fermentation process could be the outcome of insufficient acidity. As a quality indicator, the change in wine's volatile acidity throughout fermentation was observed. The temperature rose from 27.0-28.1 as a result of fermentation. The temperature may have risen because *Saccharomyces cerevisiae* cells produced metabolic heat during their sugar catabolic activities. In the research of Ogodo *et al*.[26] on fermenting palm wine using *Saccharomyces cerevisiae*, they made pawpaw, banana and watermelon wine. Yeast metabolism, which involves the continuous use of sugar content, leads to the production of ethanol and an increase in the alcohol content of the fermenting must. This finding was in line with the work of Zainab *et al*.[20]. The final alcohol percentage of the wine was 3.2%. The low alcohol content could be attributed to the yeast's specific fermentation requirements or the very short fermentation length. The ethanol content in wine can be affected by the way it is made, the yeast that is employed and the starting total soluble solids in the must. *Saccharomyces cerevisiae* may have broken down the fermentable carbohydrates in the must, which led to the alcohol output.

This study quantified eight amino acids and found seven more. According to Table 2, the wine included three essential amino acids and five non-essential ones. Essential amino acids lutein (234.281 µL) and glutamic acid (25.686 µL) are the most prevalent, followed by glutamine (167.338 µL) and proline (87.365 µL), which are non-essential. Contrary to what Portu *et al*.[27] found in their analysis of red wine's amino acid profiles, our results reveal that necessary amino acids are more abundant in this wine than non-essential ones.

According to the study's nutrient analysis, sugarcane-sweet melon wine has a lot of good stuff. Table 3 shows the results of the proximate analysis, which showed that sugarcane-sweet melon wine had the following composition: 98.33% moisture, 0.17% ash, 0.52% fat and 0.04% carbohydrates. There is 0.37% crude fiber and 0.12% crude protein. The fruit has a very high moisture content of 98.7%. This explains why it has a short shelf life when stored normally and how perishable it is. In a similar vein, Zainab *et al*.[20] reported an observation. Beverages are great since they are pleasant and satisfy thirst because of their high moisture content. The yield of ash was quite low, at 0.2%. This indicates the presence of mineral components in the fruit and wine. This was in contrast with the report of Inuwa *et al*.[28] who reported 0.5% ash content. A minimal amount of fat was obtained in the wine (0.5%). This indicates that the fruit contains a low level of fat . This suggested that the wine could protect against excess body lipids (cholesterol) and it demonstrates the desirable nutritive quality of the fruit wine produced as reported by Awe *et al*.[25]. The wine had low protein content, which agreed with what was reported by Zainab *et al*.[20]. Low protein content of the wine is good for maintenance of cellular organization as reported by Awe *et al*.[25]. The carbohydrate content of the wine was observed to be minimal. This might be due to a decline in the sugar content as a result of rapid and effective utilization of the sugar available in the must by the yeast cells. A similar observation was reported by Awe and Nnadoze[21].

Table 4 shows the phytochemicals obtained were saponin, flavonoid, alkaloid, tannin and phenolic acid. The most abundant phytochemicals in *Cucumis sativus* L. wine were flavonoid, alkaloid and saponin. On the other hand, the abundant phytochemicals in this study were phenolic acid (11.58), Tannin (9.74) and Alkaloid (9.05).

Phenolic acid and tannin were found to be higher in the present study than the ones reported by Vishwakarma *et al*.[29]. This might be because different fruits contain different or similar phytochemicals in different quantities. The phytochemicals revealed in the present study show that consuming sugarcane-sweet melon wine will provide potential health benefits. This agrees with the report of Vishwakarma *et al*.[29].

Two mineral elements were analyzed and quantified in the sample of wine: Phosphorus and potassium (Table 5 and 6). The level of phosphorus in the present study (3.689) was high. The high level of phosphorus (P) in wine is due to its presence in individual raw materials[30]. The present study revealed a lower level of potassium (K). These variations in the level of K and P might be a result of the difference in the variety of the fruit and sugarcane that was used to produce the wine

CONCLUSION

Tropical fruits grown in Nigeria, such as sugarcane and *Cucumis melo* L. fruit, are ideal for making fruit wines that meet stringent biochemical and nutritional requirements. Minerals, amino acids, phytochemicals and proximate nutrients (carbohydrates, protein, fat, fiber, etc.) abound in this wine, according to biochemical studies. Biochemical testing of the wine verified that it meets or exceeds standards set out in published works. Because of the findings in the literature, sugarcane-sweet melon wine is safe to drink. Fruit wines made from tropical fruits like sugarcane and perennial grasses like sweet melon have a lot of nutrients and may be good for your health, according to the results. The study highly recommends that fruits like *Cucumis melo* L. and perennial grasses like sugarcane should be explored for wine production as they offer high nutritional value and good biochemical standards.

SIGNIFICANCE STATEMENT

Both sugarcane (*Saccharum officinarum*) and sweet melon fruit (*Cucumis melo* L.) are well-known providers of healthy nutrients for people. In particular, sweet melons have a limited shelf life and are very perishable, making them vulnerable to waste from postharvest processes. Thus, turning them into something else, like wine, would aid in conserving or making use of the fruit's substance. The study examined the nutritional and biochemical makeup of wine made locally from a combination of sugarcane and sweet melon. From the current study findings, can be concluded that tropically available fruit in Nigeria like *Cucumis melo* L. fruit and the perennial grass sugarcane are suitable for fruit wine production with high nutritional quality and good biochemical standards.

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