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(REVIEW ARTICLE)

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Nutritional and biochemical analysis of locally produced wine from *Cucumis melo* L. fruit

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Abstract

Cucumis melo L. (sweet melon) fruits are well known source of beneficial nutrients for human beings. They are highly perishable with short shelf life which made them susceptible to postharvest wastes. Therefore, processing them into other forms such as wine would help in preserving or utilizing the content of the fruit. The study investigated the biochemical content of locally produced wine from *Cucumis melo* L. fruit. The proximate, mineral, physicochemical, phytochemicals and amino acid content of the wine were analyzed. The result of the physicochemical analysis revealed that the *Cucumis melo* L. wine has a pH of 3.60, temperature of 23.0 °C, alcoholic content of 12.20 ± 0.122 % and total sugar of 2.8 ± 0.28 %. The study also revealed that *Cucumis melo* L. wine was high in proximate composition with moisture content of 87.54 %, ash content of 0.15 %, fat of 0.27 %, total carbohydrate 0.13 %, fiber of 0.12 %, and protein of 0.21%. The mineral content of the wine showed that it contained certain essential element such as calcium (3.80 mg/100 ml), magnesium (1.60 mg/100 ml), sodium (3.80mg/100ml) and other element. The phytochemicals found in the wine were tannin (321.21mg/100ml), flavonoid (301.26 mg/100 ml), saponins (284.14 mg/100 ml), terpenes (265.32mg/100 ml) and alkaloid (240.14 mg/100ml). Seven essential and eight non-essential amino acids were revealed in *Cucumis melo* L. fruit wine through this study. The essential amino acids include; Histidine (514.4±0.7 mg/100ml), Threonine (470.4±8.4 mg/100 ml), Valine (513.7±0.4 mg/100 ml), Isoluecine (632.10±0.5 mg/100 ml), Leucine (433.7±0.4 mg/100 ml), Lysine (311.2±1.5 mg/100 ml) and Phenylalanine (219.4±1.6 mg/100ml). The non-essential amino acids revealed in the study are; Aspartate (28.6±6.2 mg/100 ml), Glutamic acids (125.4±5.2 mg/100 ml), Serine (115.8±2.6 mg/100 ml), Glutamine (249.5±14.2 mg/100 ml), Arginine (22.4±0.7 mg/100 ml), Alanine (192.4±5.6 mg/100 ml), Tyrosine (27.7±1.4 mg/100 ml) and Proline (42.1±1.5 mg/100 ml). It could be concluded that tropically available fruit in Nigeria like *Cucumis melo* L. fruit is suitable for fruit wine production with high nutritional quality and good biochemical standards.

Keywords: *Cucumis melo L.*; Sweet Melon; Wine; Fruit; Biochemical Analysis; Nutritional Analysis

1. Introduction

According to [1] fruit wines are undistilled nutritive alcoholic beverages produced by fermentation of fruit juices either spontaneously or by known strain of microorganisms mainly a yeast species to develop a particular quality of wine and consequently, among fruits, grapes has been used as the main raw material in the production of wines whereas [2] reported that a number of alternative fruits have been found suitable for wine production such as mango, banana, guava, apple and pear; among this fruit, muskmelon (*Cucumis melo L.*) is considered one of the most important fruits in India. The Organisms that are responsible for alcoholic fermentation usually belong to the genus Saccharomyces [3].

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Cucumis melo L. commonly called sweet melon is also known as casabas or the inodorous group of melons belongs to the family *Cucurbitaceae*. It has a smooth or wrinkled rind and it is usually inconspicuously lobed or non-lobed. They are neither aromatic nor richly flavoured, but they are the sweetest of all the melons, and do not detach from the plant, and have a shelf-life of ≥1 month [4] It is cultivated in all tropical region of the world [5]. Sweet melon (*Cucumis melo L.*) is largely sought for due to its sweet refreshing fruit [6]. Also, [7] reported that the flavor and aroma of the fruit is dictated by the amount of volatile organic compounds present in it.

Cucumis melo L. is a sweet fruit containing more than 90% water and it is also enriched with phytochemicals, making it a suitable substrate for wine preparation [8]. However, [9] stated that *Cucumis melo L*. fruit with a total soluble solid (TSS) of 10- 13% has a juice recovery of 85%, but its juice has a pH of 5.7-6.7 making it susceptible to bacterial contamination. Thus, it is imperative to increase the shelf life of this fruit while retaining its useful constituents. In addition, *Cucumis melo L*. is hazy due to the presence of pectin that makes a turbid wine after fermentation. Hence, it is necessary to standardize the pre-fermentation and fermentation conditions for producing a high quality *Cucumis melo L.* wine [1] and possibly evaluate the nutritional and the biochemical parameters after the production. Therefore, this study investigated the impact of long storage on the nutritional and biochemical values of the wine produced from *Cucumis melo L*. fruits.

2. Material and methods

2.1. Sample collection

Two hundred milliliters (200 ml) of the *Cucumis melo L.* wine sample used for this project work was collected from previously prepared *Cucumis melo L.* wine from Microbiology Laboratory at Federal University Wukari, Taraba State. The wine sample was locally prepared and stored for about two years in a refrigerator.

2.2. Amino acid profile

Both ion-exchange chromatogram and colorimeter were used for determining 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 baker by eluding 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 acid and the pH of the amino acid thereby comparing it the standard. Same volume of each of the amino acids identified was collected in a test tubes and 1ml of ninhydrin solution was added to each. All the tubes were covered with aluminium foil and kept in boiling water bath for 15mins after which the test tube was removed and allowed to cool in cold water. And 1 ml of 50% ethanol was added to each of the tubes and mixed properly. The concentration of each of the amino acid in the tubes is then determined using colorimeter.

2.3. Proximate composition

2.3.1. Moisture determination

An aluminum dish was heated in a cabolite oven at 105°C for about 5 minutes 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. 10ml of the wine sample were poured into the dish and weighed. The dish containing the sample was placed in a cobaltite oven at 105°C for 24hours. It was then removes, cooled in a desiccator and was weighed [10]. The new weight of the dish containing the dried sample was recorded and the moisture was then calculated as follows;

Weight of moisture = weight of sample and dish – weight of dried sample and dish

% weight of dried sample = 100

Dry matter = 100 - % weight of moisture

2.3.2. Fat determination

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

ether. The aluminum beaker containing the extracted fat were removed and placed in an oven for the evaporation of the remaining petroleum ether for about 15 minutes after which it was cooled in a desiccator and was weighed. 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 = ×100

2.3.3. Crude fiber determination

Ten milliliters of the defatted sample were weighted and dispensed into a quick fit glass. About 50 ml of glacial acetic acid was added to the sample was placed in the heater in the fume cupboard (digestion flask) at about 200-400 °C for 45-60 minutes for proper digestion. After digestion, the digested sample was filtered thoroughly with an already weighed filter paper and dried in an oven at 100 °C for 24hours after which it was weighed and recorded. The residue was ashed in a weighed crucible at 580 – 600 °C for 4-5 hours in a furnace and was weighed and recorded.

Calculation of fiber content was as follows;

Weight of residue = weight of filter paper + residue – weight of filter paper Weight of ash = weight of ash + crucible – weight of empty crucible

Weight of crude fiber = weight of ash – weight of residue

2.3.4. Ash content determination

According to [10], an empty crucible was weighed and recorded; 10 ml of the sample was added into the crucible and was allowed to cool in a desiccator after which it was weighed. The new weight of the crucible plus ash was recorded. The ash content was calculated as follows;

Weight of ash = (weight of crucible + ash) – weight of crucible % weight of ash = ×100

2.3.5. Carbohydrate determination

The carbohydrate content in the sample was determined by calculation.

This is as follows;

Weight of carbohydrate = sum of values (protein, ash, fat, phosphorus, fiber, moisture and calcium) – 100

2.4. Physicochemical analysis

2.4.1. pH

The pH meter used for the analysis was first calibrated using distilled water. 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 is then inserted into the beaker containing the solution and the reading was taken directly from the screen of the meter.

2.4.2. Temperature

The temperature of the wine sample was determined using a laboratory thermometer. Exactly 2 ml of the wine sample and 20 ml of distilled water was added into a 100ml beaker and the thermometer was directly inserted into the solution. The temperature of the wine was then recorded.

2.4.3. Alcohol determination

The alcohol content of the wine sample was estimate using refractometer. Using a pipette 2 drops of the wine sample was collected on the prism of the refractometer and was viewed for the alcohol reading.

2.4.4. Sugar determination

Exactly 2 ml of the wine sample was collected in a beaker and distilled water was added to mark 100ml. 2-3 drops of phenolpthelene was added to it and then NaOH solution till the solution turns to pink colour. Again, HCL was continuously added till the solution turns to its original colour and distilled water was added to 200 ml mark (V1). Then

5 g of Curic acid was added to 50 ml of the above solution and boiled in a water bath for 10 minutes. The solution was removed and cooled after which distilled water was added to 200 ml mark (V2). To 2 ml of the wine sample 5ml of Fehling solution A and B was added and boiled for 2 minutes. The solution was removed and cooled after which 2-3 drops of ethylene blue was added and titrated with the wine solution of volume (V2) above till it turns into brick red.

Total sugar = Fehling solution constant 0.051 × 200 × 200 × 100 / 2 × 50

Volume of the wine solution used for titration.

2.5. Phytochemical Analysis

2.5.1. Saponin determination

Precisely 2 ml of the wine sample was weighed into a 125 cm conical flask and 100 ml of Isobutyl alcohol was added to it. Electric shaker was used to shake the mixture for 5 hours. The mixture was filtered with number one Whatman filter paper into 100 ml beaker containing 20 ml of 40 % saturated solution of magnesium carbonate ($Mg2CO_3$). The mixture obtained was filtered to obtain clean colourless solution. Then 2 ml of the colourless solution was taken into 50 ml volumetric flask using pipette; 2 ml of 5 % iron (iii) chloride ($FeCl_3$) solution was added and made up to the mark with distilled water. It was allowed to stand for 30 minutes for the colour to develop. The absorbance was read using spectrophotometer against the blank at 380nm [11].

2.5.2. Cardiac glycoside determination

2ml of the wine sample were pipette into a 250 ml conical flask. About 50 ml chloroform was added and mixed properly using the electric shaker for 1 hour. The mixture was filtered into 125 cm conical flask. And 10 ml of pyridine and 2 ml of 29 % of sodium nitroprusside were added and shaken thoroughly for 10 minutes. A measured 3 ml of 20 % NaOH was added to the mixture and a brownish yellow colour was developed. Glycosides standard (Digitoxin), a concentration which range from 0 – 50 mg/ml were prepared from stock solution the absorbance was read at 510 nm [12].

2.5.3. Flavonoid Determination

Total flavonoid content was determined by aluminium chloride method using catechin as a standard. 2 ml of the wine sample and 4 ml of distilled water were mixed properly in a 10 ml volumetric flask. After 5 ml, 0.3 ml of 5 % sodium nitrite and 0.3 ml of 10 % aauminium chloride was added. The mixture was incubated at room temperature for 6min and 2 ml of 1 M sodium hydroxide was added to the reaction mixture, the final volume was immediately made up to 10 ml with distilled water. The absorbance of the mixture was measured at 510 nm against blank using spectrophotometer [13].

2.5.4. Alkaloid determination

To 2 ml of the wine sample, 5ml of phosphate Buffer (pH 4.7) and 5ml BCG solution was added and mixed properly in a 10 ml volumetric flask. The solution was then diluted to adjust volume with chloroform. The absorbance of the complex in chloroform was measured at 470 nm against blank that was prepared without the sample. Atropine was used as a standard material and the mixture were compared with the atropine equivalents.

2.5.5. Tannin Determination

Exactly 2 ml of the wine sample was mixed with 0.5 ml folin-ciocalteau's reagent. Then 1 ml of saturated $Na2CO_3$ solution and 8 ml of distilled water were added to the mixture. The reaction mixture was allowed to stand for 30 minutes at room temperature. The supernatant was obtained by centrifugation and absorbance was recorded at 725 nm using uv-visible spectrophotometer. Increasing concentration of the standard tannic acid was prepared and the absorbance of the various tannic acid concentration s was plotted for a standard graph.

2.6. Mineral Analysis

The minerals in the wine sample were analyzed using the spectrophotometer. The wine sample (2 ml) was collected in a 50 cm volumetric flask followed with 2 ml of perchloric acid, 1 ml of H_2SO_4 and 5ml of HNO_3. The mixtures were placed on a water bath and evaporated almost to dryness. The solution was cooled and filtered into 100 ml standard flask and diluted to volume with distilled water. Atomic absorption spectrophotometer was used to analyze the minerals separately.

3. Results

3.1. Proximate composition of *Cucumis melo* L. wine

The results of the nutritional composition revealed that *Cucumis melo* L. wine is rich in proximate nutrient as shown in Table 1. The wine was shown to have moisture of 87.54 %, ash content of 0.15 %, fat of 0.27 %, total carbohydrate of 0.13 %, crude fiber of 0.12 % and protein of 0.21 %.

Table 1 Proximate Composition of *Cucumis melo* L. wine

Parameters	% Percentage composition
Moisture content	87.54
Ash content	0.15
Fat	0.27
Total carbohydrate	0.13
Crude Fiber	0.12
Protein	0.21

3.2. Physiochemical composition of *Cucumis melo* L.wine

The Table 2 shows that the hydrogen ion concentration of the wine determines it acidity. It also shows the temperature of the wine which is an important parameter in Oenology. The result revealed that the wine has a pH of 3.60, temperatures of 23.0 °C, sugar content of 2.8 ± 0.028 % and an alcoholic content of 12.20 ± 0.122 %.

Table 2 Physiochemical composition of *Cucumis melo* L. wine

Parameter	Values
pH	3.60
Temperature (°C)	23.00
Sugar (%)	2.8 ± 0.028
Alcoholic content (%)	12.20 ± 0.122

3.3. Mineral composition of *Cucumis melo* L. wine

Table 3 Mineral composition of *Cucumis melo* L. wine

Parameter	Concentration (mg/100ml)
Lead	3.80
Aluminum	1.00
Calcium	3.80
Sodium	3.80
Magnesium	1.60
Zinc	3.80
Sulphate	3.60
Phosphorus	3.50
Iron	0.25

The results of the mineral composition of *Cucumis melo* L. wine were revealed in the Table 2. Eight metals were revealed in the wine. The most abundant metals were; Lead (3.8 mg/100 ml), Calcium (3.8 mg/100 ml), Sodium (3.8 mg/100 ml), Zinc (3.8 mg/100 ml), Sulphate (3.6 mg/100 ml) and Phosphorus (3.5 mg/100ml). Other metals that were present in the wine as shown in the table below include Iron (0.25 mg/100 ml), Aluminum (1.0 mg/100 ml) and Magnesium (1.6 mg/100 ml).

3.4. Qualitative and quantitative phytochemical constituent of *Cucumis melo* L. wine

Table 4 shows the phytochemicals that were identified from the wine. The quantities of the various phytochemicals were also shown in the table. The most abundant phytochemicals present in the wine and their concentration are; Tannin (321.21 mg/100 ml), Flavonoid (301.26 mg/100 ml), Saponin (284.14 mg/100 ml) Terpenes (265.32 mg/100 ml) and Alkaloid (240.14 mg/100 ml). The table also shows that the wine contain glycoside of 194.16 mg/100 ml, resin of 189.12 mg/100 ml and cardiacglycoside of 174.24 mg/100 ml.

Table 4 Qualitative and quantitative phytochemicals analysis of *Cucumis melo* L. wine

Parameter	Concentration (mg/100ml)	
	Qualitative	Quantitative
Saponin	+	284.14
Tannin	+	321.21
Flavonoid	+	301.26
Glycoside	+	194.16
Resin	+	189.12
Alkaloid	+	240.14
Terpene	+	265.32
Cardiaglycoside	+	174.24

3.5. Amino Acid profile of *Cucumis melo* L. wine

Table 5 Amino acid profile of *Cucumis melo* L. wine

Parameter	Concentration (mg/100ml)
Aspartate	128.6 ± 6.2
Glutamic acid	125.4± 5.2
Serine	115.8 ± 2.6
Glutamine	249.5± 14.2
Histidine	514.4 ± 0.7
Arginine	22.4 ± 0.7
Threonine	470.4 ± 8.4
Alanine	192.4 ± 5.6
Tyrosine	27.7 ± 1.4
Valine	513.7 ± 0.4
Isoleucine	632.10 ± 0.5
Leucine	433.7 ± 0.4
Lysine	311.2 ± 0.9
Proline	42.1±1.5
Phenylalanine	219.4 ± 1.6

The essential amino acids were found to be higher than the non-essential amino acids as demonstrated in Table 5. Seven essential amino acids and their concentration were revealed, they include; Isoleucine (632.10±0.5 mg/100 ml), Histidine (514.4±0.7 mg/100 ml), Valine (513.7±0.4 mg/100 ml), Threonine (470±8.4 mg/10 0ml), Leucine (433.7±0.4 mg/100 ml) and Phenylalanine (219.4±1.6 mg/100 ml). The non-essential amino acids revealed were Glutamine (249.5± 14.2 mg/100 ml), Aspartate (128.6 ± 6.2 mg/100 ml), Glutamic acid (125.4± 5.2 mg/100 ml), Serine (115.8 ± 2.6 mg/100 ml), Alanine (192.4 ± 5.6 mg/100 ml), Proline (42.1±1.5 mg/100 ml), Tyrosine (27.7 ± 1.4 mg/100 ml) and Arginine (22.4 ± 0.7 mg/100 ml).

4. Discussion

Fruit wines are undistilled nutritive alcoholic beverages produced by fermentation of fruit juice using a known microorganism. *Cucumis melo* L. fruit contains high nutritional content but yearly, the content of this fruitsis wasted through postharvest losses. *Cucumis melo* L. fruit used in this study is consumed widely in Nigeria and beyond. The nutritional and biochemical analysis that was carried out were include proximate nutrient determination, physicochemical analysis, alcohol and sugar determination, minerals analysis, phytochemicals and amino acids analysis. The results of the nutrient analysis revealed that *Cucumis melo* L. wine is rich in nutrient. From the proximate analysis result in Table 1, *Cucumis melo* L. wine was shown to have moisture content of 87.54 %, ash content of 0.15 %, Fat of 0.27 %, carbohydrate of 0.13 % Crude fiber of 0.12 % and crude protein of 0.21 %. Therefore, from the proximate analysis carried on water melon (*Citrullus vulgaris* L.) and guava (*Psidium guajava*) wine confirmed that the proximate nutrient of the present studied wine was within range [14]. The high moisture content of *Cucumis melo* L. wine, account for the perishable nature of the fruit and their short shelf life under normal storage conditions.

The pH and temperature of *Musa acuminate* and *Citrulllus vulgaris* L. wine reported by [15] are 3.40 and 27.0 °C respectively. The pH of the present studied wine is 3.60 and expressed the acidic nature of the wine. Studies have shown that during fermentation of fruit, low pH is inhibitory to the growth of spoilage organisms but create a conducive environment for the growth of desirable organism. [16] Reported that there is correlation between pH and acidity of fruit wines. The temperature of *Carica papaya/Citrullus vulgaris* and *Musa acuminate/Citrullus vulgaris* wines reported by [15] were 28.0 °C and 27.0 °C respectively. These revealed that the temperature of the present study wine was lower than the ones reported by [15]. This could be due to the lower alcoholic yield of the present studied wine. [17] Reported that alcoholic yields of wines are higher at high temperature of fermentation. The alcoholic yield of *Cucumis melo* L. wine was 12.20 ± 0.122 % which was lower than the alcoholic yield reported by [15] and the alcoholic yield of the present study ranks it among table wine. [18] reported that wine that has 7-14 % of alcohol was considered as table wine.

Eight minerals elements were identified and quantified in analyzed sample of *Cucumis melo* L. wine. Phosphorus, Calcium, Magnesium and Sodium are essential for growth of the fruit. The level of Ca in the present study (3.8 mg/100 ml) was higher than the one in *Carica papaya* wine (12.00 mg/L or 1.2 mg/100 ml). The present study revealed lower level of Mg and Na than the level reported in *Carica papaya* wine. These variations in the level of Ca, Mg and Na might be as a result of the difference in the variety of the fruit that was used to produce the wine. The level of Lead (Pb) in the present study was revealed to be 3.80 mg/100 ml. [19] reported the present of lead in *Telfaira occidentalis* wine (3.60 mg/100 ml) and *Cucumis sativus* L. wine (4.70 mg/100 ml) which in is in line with the current finding. The revealed level of lead in the present studied wine might be due to the present of lead in the soil where the fruit was cultivated. According to [20], Lead (Pb) tends to be present in elevated concentrations in fruit grown in vicinity of roads or industrial areas. Hence such high lead content may point to serious contaminant at the growing site with this element. In the study, zinc level of 3.8 mg/100 ml was revealed. The level of Zn in the present study was higher than the level of Zn reported by [21]. [19] Reported the present of Zn in *Telfaira occidentalis* wine (4.37mg/100 ml). According to [20], Zn can be found in plant protection products, fertilizer, pesticides and fungicides. Hence, the present of Zn in the *Cucumis melo* L. wine might be related to the agricultural practices in use. Irons are micronutrient and are found to be essential for the formation of the green pigment in leaves of plant. The present study was found to contain 0.25 mg/100ml of Fe which was lower than in *Carica papaya* wine. In the present study, alminium level of 1.0 mg/100 ml and Sulphate level of 3.60 mg/100 ml was found. The absence of Al and Sulphate in the wines reported from literature could be due to different variety of the fruit used for the wine production or even as a result of the type of soil where the fruit were cultivated. It might be possible that these metals were not analyzed for in the wine reported from literature.

The phytochemical obtained were tannin, flavonoid, glycoside, resin, alkaloid, terpenes and cardiacglycosides. The most abundant phytochemical in *Telfaira occidentalis* wines as reported by [19] were flavonoid, glycoside and alkaloid while flavonoid, alkaloid and saponin were abundant in *Cucumis sativus* L. wine. On the other hand, the abundant phytochemicals in this study were tannin (321.21 mg/100 ml), flavonoid (301.26 mg/100 ml), saponin (284.14 mg/100 ml) and terpenes (265.32 mg/100 ml). Terpenes, cardiacglycoside and resin were found to be absence in the wine reported by [19]. However, tannin and saponin were found to be higher in the present study than the ones reported by

[19]. This might be due to the fact that different fruit contain different or similar phytochemicals in different quantities. The phytochemicals revealed in the present study account for the pharmacological important of the fruit as reported by [22] and [23].

Fifteen amino acids were identified and quantify from this study. Seven essential and eight non-essential amino acids were present in the wine. The abundant essential amino acids found are Isoluecine (632 ± 0.5 mg/100 ml), Histidine (514.4± 0.7 mg/100 ml), Valine (513 ± 0.3 mg/100 ml), Threonine (470 ± 8.4 mg/100 ml). The amino acids profile result of red wine as reported by [24], showed that the quantity of the essential amino acids present in red wine was higher than the non-essential amino acids which is in conformity with the current findings.

5. Conclusion

This present study was designed to reduce seasonal wastage of the *Cucumis melo* L. fruit thereby increasing their shelf life through the process of development of beverage (wine). The biochemical analysis carried out on this particular wine revealed that it is rich in proximate nutrient (such as carbohydrate, protein, fat, and fiber e.t.c), minerals, amino acids and phytochemicals. According to the biochemical analysis carried out on the wine, it confirmed that the quality of the wine is within the range as reported by literature but with exception to Pb whose concentration is higher than the once reported from literature. Therefore, *Cucumis melo* L. wine is suitable for consumption considering what was reported from literature and can also serve as table wine with high nutritional value and health benefits. However, this present studied wine is not suitable for consumption due to the high content of lead (Pb) that was revealed in the course of the study. It may be concluded that *Cucumis melo* L. wine is a nutritive alcoholic beverage rich in proximate nutrient, mineral, phytochemicals and amino acids but Pb contaminant makes this present wine unfit for consumption.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this document.

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