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Production And Quality Evaluation of Wine from Soursop (*Annona Muricata*) And Water Melon (*Citrullus lanatus*) Fruit Juice Blend

Momoh Clement Owoicho[1*], Felicia A. O. Idoko[2], Zebere Grace N. G[2] and Alonge Zainab[2]

[1]*Department of Food Science and Technology, University of Agriculture, Makurdi, Nigeria*

[2]*Department of Food Science and Technology, Kaduna Polytechnic, Kaduna, Nigeria*

***Corresponding Author**: Momoh Clement Owoicho, Department of Food Science and Technology, University of Agriculture, Makurdi, Nigeria.

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Abstract

In this study, the production and quality evaluation of wine from soursop (*Annona muricata*) and watermelon (*Citrullus lanatus*) fruit juice blend was studied. A preliminary was carried out to ascertain the optimum blend acceptable level of soursop and watermelon wine production using 0-50 % v/v juice, samples were subjected to sensory evaluation, and the most acceptable samples were chosen. Hence, in the main study, the level of watermelon juice was varied using 0, 20, 40, and 60 % w/w inclusion giving rise to four samples. Physico-chemical properties, selected mineral and vitamin C content, total phenols, antioxidant properties, microbiological content, and sensory evaluation were done using standard methods. The effects of fermentation on physicochemical properties were also studied. pH and ^{Brix} value decreased while TTA and specific gravity increased with increasing fermentation days beginning from day 1 to day 7. Na, K, Fe, and vitamin C ranged from 82.52-107.50, 208.20-282.20, 2.04-2.84, and 15.0-316.30 mg/100g respectively, there were significant differences (P<0.05) in mean samples. Potassium and sodium were the predominant minerals in the formulated wine while Iron and magnesium were found in low concentrations. The values of total phenol and anti-oxidant ranged from 0.90 to 1.34 mg/100g and 82.52-107.50 % (DPPH), 13.37-15.93 mmol/GAE (FRAP), 208.20-282.08 % (OH. Radical) and 2.04 to 2.84 % (Chelation metal) as the proportion of watermelon juice increases from 0 to 60 % in the blends used in wine preparation. The results for total bacteria count and fungi count for wine samples from soursop wine (control) were 2.71×10^{2} and 1.81×10^{2} CFU/ml respectively. The corresponding values for wine from 40 % soursop juice and 60 % watermelon were 2.28×10^{2} and 1.43×10^{2} CFU/ml respectively. Blend formulation 40:60 soursop: watermelon was mostly acceptable. This study therefore has presented a way of increasing consumption and utilization of soursop: with low economic value and high nutritional content yet is underutilized increasing food security, creating varieties of wine from locally available food sources, and further converting waste to wealth.

Keywords: *Wine, Soursoup, watermelon, and juice*

Introduction

Wine is an alcoholic beverage made by fermenting grape juice. It can also be referred to as an alcoholic beverage produced through the partial or total fermentation of wine producing fruits. It is the fermented product of the fruit of several species of grape (Ogodo *et al.,* 2015). The suitability of fruits other than grapes i.e., sugar beet, banana, soursop, watermelon, pineapple, beetroot etc. has been investigated all over the world (Kumar *et al.,* 2012). Fruit wines are generally qualified by the name of the produce used, such as gooseberry wine and blueberry wine and apple wine. Wines come in various colors including red, white and rose, others include dry, sweet, still, sparkling and wines fortified with grape spirit (brandy). There are also many wine-based drinks, such as wine kiwi and strawberry wines with many different flavors allowing wine to satisfy a wide range of individual tastes, occasions and permitting wine to accompany many styles of food (Fleet. 2003). Production of wine was first discovered by ancient people using application of fermentation technology of fruits having sugar (Isitua and Ibeh, 2010). Today amateur winemaking is enjoyed by thousands of people throughout the world (Duarte *et al.,* 2010). The wine consists of flavoring, sugar, acid, tannin, and water (Kumar *et al.,* 2012). The production of wine has since been nurtured to perfection. Home-made wine production has been practiced with various fruits such as soursop, pineapple, and orange. Cucumber, watermelon or guava use species of *Saccharomyces cerevisiae* which converts the sugar in the fruit juices into alcohol and organic acids, that later react to form aldehydes, esters, and other chemical compounds which also help to preserve the wine (Ogodo *et al.,* 2015)

Soursop (*Annona muricata*) belongs to the family *Annonaceae.* and it is widespread in the tropics and frost-free subtropics of the world (Samson. 1980). The fruit is compound in and covered with reticulated, leathery appearing but tender, inedible bitter skin from which protrudes a few or many stubby, or more elongated and curved soft. pliable spines. The fruit makes an excellent drink or ice cream after straining (Schultes and Raffauf, 1990). Several studies have described the medicinal purposes of *Annona muricata* and have outlined the social history of the plant's use (Ayensu, 1981). Soursop juice contains 80-8 % water. 4 6 % protein, 18 % carbohydrate, 3.43 % titratable acidity, 24.5 % non-reducing sugar, vitamins BI, B2, and C (Kun *et al.* 2006). The fruit juice is taken against intestinal worms and parasites to cool fevers to increase mother's milk after childbirth and as an astringent for diarrhea and dysentery. Soursop fruit also contains anti-nutritional components like tannins and phytate, however, these anti-nutrients are greatly reduced to acceptable levels during the application of heat and processing, despite the enormous nutritional and health benefits of soursop, it is underutilized in Nigeria.

Watermelon (*Citrullus lanatus*) is a large, sprawling annual plant with coarse. hairy pinnately-lobed leaves and yellow flowers. It is grown for its edible fruit. which is a special kind of berry botanically calling a pepo. The watermelon fruit has a deep green smooth thick exterior rind with grey or light green vertical stripes. Inside the fruit is red in colour with small black seeds embedded in the middle third of the flesh (Wehner *et al.,* 2001).

Water melon contains 91 % water, 1.2 % protein, 7.6 % carbohydrate, 569 mg/100g Pro-vitamin A and 8.9 mg/100g vitamin C. Watermelon juice is a unique source of citrulline and arginine amino acids (Perkins-Veazie, 2013). The amino acids citrulline and arginine have been studied by medical researchers for their usefulness in sickle cell anemia. immune function, wound healing, and cardiovascular health (Tong and Barbul. 2004). Citrulline. is a non-essential amino acid, is a precursor of arginine, a semi-essential amino acid needed by infants and seriously ill or injured adults (Flynn *et al.*, 2002). Arginine can be generated through nitric oxide synthase or through arginase in the urea cycle (Tong and Barbul, 2004). In addition, watermelon juice also contains lycopene. Lycopene is the pigment that imparts red color to some fruits, most notably tomato and watermelon. It is also a highly efficient oxygen radical scavenger and has been implicated in human studies as providing protection against cardiovascular disease and some cancers particularly that of the prostate (Tong and Barbul. 2004).

The utilization of soursop and watermelon in wine production could be advantageous and will go a long way in enhancing their utilization. Therefore; in view of the above benefits of watermelon and soursop, conversion into a value-added product like wine through fermentation will be very useful. This study thus seeks to produce and evaluate the quality of wine from blends of soursop and watermelon juice with the view of controlling the post-harvest losses of these valuable plant foods and further conversion of waste to wealth.

Materials and Methods

Procurement of Materials

Soursop (*Annona muricata*) and watermelon (*Citrullnus lanatus*) were purchased from Makurdi Railway fruit market, Makurdi, Benue State. *Saccharomyces cerevisiae* Var was purchased from Mekang Chemicals, Lagos, Nigeria.

Preparation of Samples

Preparation of soursop and watermelon musts (Juice)

The fruit musts were prepared following the method described by Ogodo *et al.,* (2015) with slight modifications. The Soursop and watermelon fruit were thoroughly sorted and graded to remove bad ones from the lot. The sorted fruits were then washed to remove adhering soils; dirt and extraneous materials. The soursop and watermelon were peeled and then the seeds were removed. They were then sliced into smaller pieces for easy blending using a blender for juice extraction. Exactly 2.5 kg each of the soursop and watermelon pulps were transferred to a clean laboratory blender previously disinfected with 70% v/v ethanol for crushing. The crushed samples was transferred to a clean white transparent bucket and mixed with distilled water (1:1 w/v). Exactly Ig of sodium metabisulphate ($Na_2S_2O_2$) was dissolved in 100 ml of distilled water and transferred to the must and stirred. Sugar and yeast were added and left to ferment for 7 days for primary fermentation. It was then clarified; preserved using potassium meta bisulphite; pasteurized; cool; bottled; labeled; sealed and allowed to age for one month. Figure 1 and 2 shows the production of soursop and watermelon juice respectively.

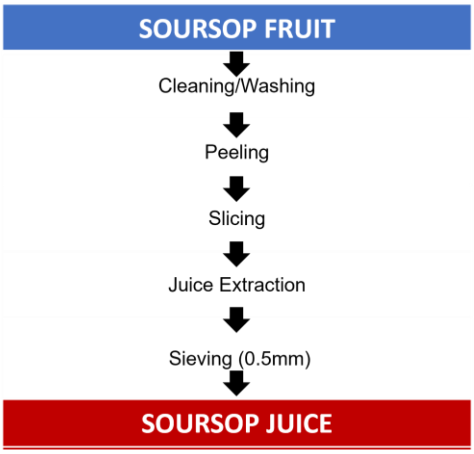

Fig 1: Process flow chart for soursop juice production Source: Ogodo *et al.,* (2015)

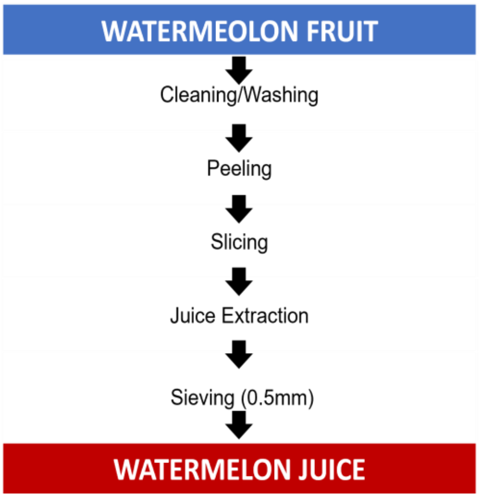

Fig 2: Process flow chart for watermelon juice production Source: Ogodo *et al.,* (2015)

Fermentation of juice to wine, clarification, and filtration

The juice was filtered using a muslin cloth. It was treated with potassium metabisulphate (SMS) (100 u/ml) to inhibit the growth of undesirable micro-organisms such as acetic acid bacteria, wild yeast, and mold. The pH of the juice was adjusted to 3.8 by using 1 N Tartaric acid and inoculated with 2 % (v/v) starter culture, prepared with grape juice of *S. cerevisiae Lar.* Fermentation was carried out at 30 ± 2^0 C for 7 days, and the wine was clarified by adding 0.04 % bentonite. Another dose of SMS (100 u/m) was added as a preservative before bottling (Ogodo *et al.,* 2015). The flow chart for the production of wine from soursop and watermelon is shown in Figure 3

Table 1: Juice Blend Formation

Juice Blends (% w/w)				
Soursop Juice	100	20	40	60
Watermelon Juice	0	80	60	40

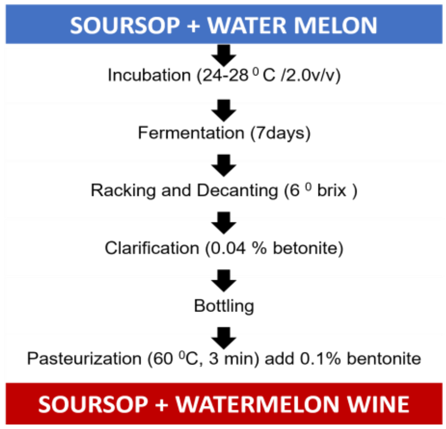

Fig 3: Process flow Chart for Soursop and Watermelon Wine Making Source: Modified Yusufu et al., (2018)

Materials and Methods

The proximate analysis and mineral elements (Na, Ca, K, Mg, and Fe) to determine how much of major or macro components which include Moisture, Ash, Fiber, Fat, and Protein were determined according to standard methods AOAC, (2012), The carbohydrates were determined by difference using the formula: % carbohydrate = 100 -% protein + % ash + % crude fiber + % crude fat + % moisture. Determination of Total Titratable acidity, determination of pH, Total soluble Solids, and color determination was done using according to the standard methods AOAC, (2012).

Sensory Analysis

Sensory evaluation of the wine was carried out using twenty (20) panelists comprising of students and staff of the Department of Food Science and Technology. Joseph Sarwuan Tarka University. Testing was conducted in the Sensory Laboratory of the Department of Food Science and Technology. Panelists were required to evaluate the aroma, appearance, taste, mouth feel and overall acceptability of the wine using a 9-point Hedonic scale with 1-dislike extreme. 2-dislike very much. 3-dislike moderately. 4-dislike slightly, S=neither like nor dislike, 6=like slightly, 7=1like moderately. 8-like very much. And 9-like extremely, (Ihekoronye and Ngoddy, 1985).

Statistical Analysis

All analytical determination was conducted in triplicates. Data was subjected to Analysis of Variance (ANOVA) followed by the Duncan Multiple Range Test (DMRT) test to compare treatment means; differences was considered significant at 95%

(p<0.05) significant level, using the Statistical Package for Social Sciences for Windows program (SPSS V23 software).

Result and Discussion

Effect of Fermentation on pH of Wine Prepared from Soursoup and Watermelon Fruit Juice Blends

pH is a measure of how acidic or basic a food product is. The letter pH stands for the potential of hydrogen ions since it is the effective measure of the concentration of the hydrogen ions or protons in a food substance. It is the expression of alkalinity or acidity of a solution on a logarithmic scale with 7 being neutral, a pH of less than 7 indicates acidity, whereas a pH of greater than 7 indicates a base. The pH of a food product is actually the measure of the relative amount of free hydrogen and hydroxyl ions in the water or food product (Okafor and Usman, 2015). The range goes from 0 to 14. It was observed that the pH decreased gradually with increasing fermentation days (day 1-day 7). The pH decreased with the level of watermelon with a significant difference and the least is sample D. The variation of the pH may be due to the concentration of the yeast in the same formulations and as a result of fermentation. The decrease in the pH values after fermentation could be attributed to the production of acids in the fermenting medium. Studies have shown that during fermentation of fruits; low pH is inhibitory to the growth of spoilage organisms but create conducive environment for the growth of desirable organisms. Also; low pH and high acidity are known to give fermentation yeast comparative advantage in natural environments and maximum pH for mixed fruit wine was reported to be 3.9 (Okafor, 2007, Reddy and Reddy, 2005). A similar observation has been reported by Reddy and Reddy, (2005). This property has a great influence on the sensory attributes and microbiological stability of the wine, lower values of pH increase the microbiological stability of the wine samples, a good acid-sugar balance is very important for acid taste (Sonja et al., 2013). Sonja et al., (2013) also reported similar values for pH during fermentation of peach wine made from red haven cultivar in a physicochemical, antioxidant, and sensory properties study.

Effect of Fermentation on º Brix of Wine Prepared from Soursoup and Watermelon Fruit Juice Blends

The Brix degree (percentage of dissolved solids) of soursop fruit juices wine was measured at 5.0 °Bron at the first day of fermentation, this decreased to 4. on at the seventh day of fermentation, the decreased may be due to some dissolved solids such as sugars solubilized as a biochemical reaction to produce alcohol, carbon dioxide, and organic acids (Lee et al., 2015). In this study, the Brix degree measured slightly greater than the wines produced from sapota (Achras sapota Linn.) (2.38°Brix) and bael (Aegle marmelos L.) (2.91°Brix) fruits and potato (4.0°Brix) (Panda et al., 2013: Panda et al., 2014). The reduction of soluble solids after the fermentation process was similarly reported by other studies (Chavev-santoscoy et al., 2009), However, a Higher Brix degree value of the fruit juices wine was observed in the current study as compared to other reported studies (Ayed and Hamdi, 2015: Panda et al., 2017). The decrease in degree brix after fermentation could also be due to microbial succession; available nutrients; sugar and alcohol resulting in the production of acids. These results are in agreement with the report by Querol et al., (2003).

Effect of Fermentation on Specific Gravity of Wine Prepared from Soursoup and Watermelon Fruit Juice Blends

The specific gravity of soursop fruit juice wine was measured 0.99 at the first day of fermentation, this increased to 1.03 at the six days of fermentation, the increased may be due to the production of higher molecular ethanol from the biochemical reaction to produce alcohol, carbon dioxide, and organic acids (Lee et al., 2015). In this study, the specific gravity measured slightly greater than that of the wines produced from sapota (Achras sapota Linn.) (1.03) and bael (Aegle marmelos L.) (1.02.) fruits (Panda et al., 2013: Panda et al., 2014). The increase in specific gravity after fermentation process was similarly reported by other studies (Chavev-santoscoy et al., 2009), However, Higher low specific gravity value of the fruit juices wine was observed in the current study as compared to other reported studies by Ayed and Hamdi, (2015) and Panda et al., (2017). These results are in agreement with the report by Querol et al., (2003).

Effect of Fermentation on Total Titrate able Acidity (TTA) of Wine Prepared from Soursoup and Watermelon Fruit Juice Blends

Acidity plays a vital role in determining wine quality by aiding the fermentation process and enhancing the overall characteristics and balance of the wine. A lack of acidity will mean poor fermentation (Berry, 2000). The pH is slightly acidic; this confers stability in the wine sample (Odise and Ofiyai, 2011). There exists a correlation between PH and the acidity of the wine sample. The higher the acidity; the lower the pH of the wine, as the acidity was increasing; the pH value of the wine was decreasing. A similar study conducted by Okafor, 2007; Jacobs, 2001 and Larmache et al., 2004 revealed that there is a corresponding reduction in pH as the acidity increased in soursop juice. Studies have shown that low pH is inhibitory to the growth of spoilage organisms but create conducive environment for the growth of desirable organisms. Also; low pH and high acidity are known to give fermentation yeast comparative advantage in natural environments and maximum pH for mixed fruit wine was reported to be from 3.5 to 4.9 (Agbor et al., 2011; Berry, 2000). A similar observation has been reported by Reddy and Reddy in their study on mango fruit; optimum pH and temperature values for quality wine production was 5.0 and 30° C respectively (Reddy and Reddy, 2005)

Selected Minerals and Vitamin C (mg/L) Composition of Wine Prepared from Soursoup and Watermelon Fruit Juice Blends

The mineral and vitamin C content of Wine Prepared from Soursoup and Watermelon Fruit Juice Blends was found to vary significantly ($P< 0.05$) with increasing water melon juice. This increase could be attributed to the relatively high mineral content of water melon juice. The mineral contents of the wine samples could be categorized into two major parts, namely; macro minerals and micro minerals or trace elements. The macro minerals or the major elements in the wine samples include Sodium and Potassium. These values ranged between 82.52 to 107.50 mg/ 100 g and 208.20 to 282.08 mg/ 100 g, for Sodium and Potassium respectively. These minerals are not produced by the body system and needs to be supplied by the food into the body and they are very important in the body due to various functions they perform in the body, for example, sodium is involved in the regulation of the fluid balance of the body and hence, influences the cardiac output (Zdu et al., 2015). Magnesium is very important in the body because it involves in the respiratory process in the body (Cordenunsi et al., 2004). Potassium is an important mineral that functions as an electrolyte and helps to regulate fluid balance, nerve signals and muscle contractions (Ban et al., 2012). Sample D had the highest values for all minerals analysed. Potassium (282.08 mg/100g) and Sodium (107.50 mg/100g) and were the predominant minerals in the wine sample while Iron was found in low concentration, this is similar to the report of Zenebe and Kidu. (2019) that showed low concentration was found of iron and zinc in physicochemical and sensory properties of wine produced from blended cactus pear and lantana camara fruits and Okeke et al., (2015) for high content of potassium and sodium in wine production from water melon and pineapple using yeast isolated from palm wine. Higher mineral and content were found in sample containing higher volumes of water melon, this could lead to relative high ash content in wine samples. Lea et al. (2013) reported similar values for calcium and Magnesium of apple wines in evaluation of physicochemical and fermented qualities of apple wine added with medicinal herbs. Similar trend was also reported by Yusufu et al., (2018) in production and quality evaluation of wine from water melon and ginger extract. Vitamin C content were also found higher in sample containing higher volumes of water melon, this could lead to relative high antioxidant activities in wine samples (Lea et al., 2013). Ascorbic acid act as an antioxidant to help prevent molecular changes caused by oxidation and as a promoter of iron absorption (Wardlaw, 1999). Though iron is classified as trace elements in the body, probably because they are available in the body to a large extent, and therefore needs little supply from food to augment them. The supply of these minerals to the body, though in minute are very important in the body. Iron has a very important role in preventing anemia and helps form the hemoglobin. (Otunola et al., 2010).

Total Phenol (mg/100 g) and Anti-oxidant (μmol/100g Garlic Acid) Composition of Wine Prepared from Soursoup and Watermelon Fruit Juice Blends

Table 9 shows the total phenol (mg/100 g) and anti-oxidant (μmol/100g Garlic Acid Equivalent) composition of wine prepared from Soursoup and Watermelon fruit juice blends. The values reported in this study are similar to those reported by Kelebek and Selli, (2014) for identification of phenolic composition and antioxidant capacity of mandarin juices and wines. Antioxidants, in principle, have the potential to prevent molecular damage in the human body, and foods rich in antioxidants have been considered potentially beneficial in the prevention of cardiovascular and other diseases (Zielińska et al., 2016). The increase in the value of the antioxidant capacity with increase in the addition of water melon confirms the antioxidant properties of water melon, thus buttressing the fact about water melon as health promoting food product, this helps the body develop resistance against infectious agents and scavenge harmful oxygen-free radicals (Lee et al., 2005).

The increasing total phenol content is related to the total phenolic content of the added water melon juice. Total phenolic content of fruit wines can be affected by color of fermentation substrate and different winemaking procedures such as prolonged extraction time (Yildirin, 2019). Therefore, in this study, the total phenolic content is enhanced since watermelon used had strong purple color. Polyphenols are responsible for free radical scavengers which shows antioxidant activities by quenching hydroxyl radicals or superoxide ion radicals (Panda et al., 2014). The antioxidant activity of phenolics is mainly due to their redox properties, which allow them to act as reducing agents, hydrogen donors, and singlet oxygen quenchers (Rice-Evans et al., 1995). Phenolic phytochemicals inhibit autoxidation of unsaturated lipids thus preventing the formation of oxidized low-density lipoprotein (LDL) which is considered to induce cardiovascular disease (Amic et al., 2003). The increasing phenolic content of the wine samples is advantageous because it shows that wine contribute to anti-oxidative properties.

The results of the DPPH radical scavenging activities of wine samples ranged between 82.52 to 107.50 %. The samples were significantly ($p<0.05$) different from one another. The differences observed in the samples may be attributed to the level and extent of protein enrichment of the samples. DPPH is a stable free radical even at room temperature with a peak absorbance at 517 nm. When this stable free radical comes in contact with substance that has the ability to donate proton, the free radical is scavenged, leading to the reduction in the absorbance. Such a substance with a proton donating activity is categorized as antioxidative substance with the ability to scavenge DPPH free radicals (Ajibola et al., 2011). This assay is therefore popularly used as one of the screening antioxidant assays for natural products. The high DPPH radicals scavenging activities of the wine samples suggest that they could find applications in the development of functional food in food industries to manage some chronic diseases in society that are free radical induced.

The results of the hydroxyl radical scavenging activities of wine samples ranged between 208.20 to 282.08 % and the mean values of samples were significantly ($p<0.05$) different. All the wine samples had better hydroxyl radical scavenging activities, suggesting that the samples may be better hydroxyl radical scavengers. The results in this study showed that the samples exhibited better hydroxyl radical scavenging activities compared to superoxide radical scavenging activities and DPPH, and this has implications in the prevention of free radical-induced diseases in the body. The use of more than one free radical assay to screen the antioxidant potentials of natural products have been advocated by various researchers (Li et al., 2008; Kim et al., 2007 and Udenigwe et al., 2009). This is because oxidation in human and food systems could occur through different radical mechanisms. Hydroxyl radical is one of the most reactive radicals generated from a reaction between hydrogen peroxides and metal ions such as Fe^{2+} or Cu^{2+} (Jamdar et al., 2012). Hydroxyl radicals are very reactive radicals that have affinities for food and body 's vital macromolecules such as DNA, proteins and haemoglobin, resulting to various cardiovascular disorders such as cancer and diabetes, which are hydroxyl radicals induced likely give better protection to the cells compared with the higher molecular size peptides against the dangerous effects of hydroxyl radicals in the body.

The results for the metal chelating activities of wine samples ranged between 2.04 to 2.84 %. Among the samples, D had the highest metal chelating activities while sample A was the least. The increasing metal cheating activities of the caterpillar protein hydrolysate may be attributed to the release of peptides that are metal chelating active during the hydrolysis of the proteins with pancreatin-pepsin enzymes. Studies have shown that transition metals ions such as iron and copper are actively involved in several oxidation processes in the body (Ajibola et al., 2011). Ferrous ions have been recognized to participate actively in Haber-Weiss reaction, whose products, such as superoxide's results in the formation hazardous hydroxyl radicals (Xie et al., 2008). Therefore, chelation of ferrous ion (Fe2+) will decrease the amount that will participate in the reaction and hence, reduction in the formation of damaging hydroxyl radicals. The type of amino acid group present in the proteins has been found to play significant roles in the chelating activities of proteins (Girgih et al., 2011). For instance, high concentration of carboxylic and amine groups in the acidic and amine groups have been found to enhance the chelating activities of peptides due to their abilities to remove oxidative-supporting free metal ions from the hydroxyl radical system (Nam et al., 2008 and Ajibola et al., 2011). Therefore, the high chelating activities exhibited by the wine samples suggests that they could find applications in food industries to decrease the rate of lipid oxidative deterioration that could result from the actions of ferrous ions.

The results of the ferric-reducing activities of the wine samples ranged between 14.70 to 015.93 mMol/LGAE. The results showed that there was a significant ($p>0.05$) difference in the metal chelating abilities of the wine samples. The ferric reducing ability (FRAP) assays evaluates the potentials of materials to donate electron/hydrogen ion to reduce the free radical caused by metal ions and interrupt the chain reactions. The interruption of the chain reactions by accepting the electrons donated by the antioxidant compound lowers the rates of oxidation which could have resulted from the free radicals (Dorman et al., 2003). The high ferric-reducing ability of the wine samples, especially sample D suggested that the wine samples may serve as potential functional ingredients in food systems in the management of some long-aged chronic diseases in the society

Mean Sensory Scores of Wine Prepared from Soursoup and Watermelon Fruit Juice Blends

Sample 40:60 (soursop: watermelon) was the most accepted. Sensory perception varied significantly (P<0.05) among samples. Values obtained for taste showed a high level of acceptance of wine samples with increasing levels of water melon. A significant difference (P>0.05) was obtained for the appearance (color) and flavor of the samples with a change in quantity (%) of water melon. All wine samples were generally accepted for all attributes evaluated as none scored below the minimum acceptable rating of 5 on a 9-point Hedonic scale. This indicates a high level of acceptance of the wine prepared from soursop and water melon composite juice, this has thereby improved the nutritional composition and as well as increasing the utilization of soursop which was used as part of the ingredients for wine production

Conclusion

This study has demonstrated that wine of good quality could be produced from soursop and watermelon fruits blend. Physicochemical properties of wine produced from soursop and watermelon fruit juice blends compared favorably with other wines and fruit juice food hence it could find application in food industries.

The wine could contribute significant amounts of mineral with respect to FAO/WHO/UNU recommended daily intakes for Mg (130mg/day), Na (1000mg/day), Ca (500mg/day), K (3000mg/day) and Fe (10mg/day). Increasing phenol content which was however within acceptable range confirms its importance in therapeutic usage, the antioxidant properties determined by DPPH, FRAP, TEAC and Metal Chelating ion has also demonstrated improved antioxidant activities in the water melon-soursop wine.

The sensory attributes showed that acceptable wine can be produced from soursop and water melon fruit juice blends. Blend formulation D was mostly acceptable. This study therefore presents a way of increasing the consumption and utilization of soursop and watermelon in wine production. Soursop and watermelon could therefore serve as ingredients in wine formulation to reduce hidden hunger, increase food security and further contribute its therapeutic properties to improving human health systems.

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