MICROBIAL AND SENSORY EVALUATION OF HOMEMADE WINE PRODUCED FROM WATERMELON AND PINEAPPLE FRUITS BLEND

FOLORUNSO, A. A.
Department of Family, Nutrition and Consumer Sciences,
Faculty of Agriculture,
Obafemi Awolowo University, Ile-Ife, Nigeria.
Email: kunlefolly2@yahoo.com

ABSTRACT

This study focused on the sensory and microbial evaluation of homemade wines produced from watermelon and pineapple fruit blend. The wines were produced using standard methods with three different mixing proportions (50:50, 80:20 & 20:80) of fruit blends under the same conditions and procedures. The microbial evaluation was conducted on the wine samples to determine the consumption safety using standard methods. The samples were presented to a 100 member panelists to rate them on the hedonic scale where 9 was maximum and 1 was minimum. The result showed that WP1 (50:50) had the lowest value of Total Heterotrophic Bacterial Count and Fungal Count of 1.0×10^2 Cfu/ml and 0.00Cfu/ml respectively. Also, results showed that there were significant difference at ($p<0.05$) in the results for sensory evaluation between WP1 (50:50), WP2 (80:20), and WP3 (20:80), as WP3 had the highest in all the sensory qualities of appearance, aroma, taste, consistency and general acceptability respectively It was concluded that wine produced from 20% watermelon, and 80% pineapple (WP3) was most preferable by the panelists, while wine produced from 50% watermelon and 50% pineapple (WP1) was the safest. However, all samples were safe for consumption because their values met the safe levels of both the heterotrophic and fungal counts.

Key words: Perishable product, homemade, microbial load, sensory, wine

INTRODUCTION

Wine is an alcoholic beverage produced through the partial or total fermentation of grapes. Other fruits and plants, such as berries, apples, cherries, dandelions, elder-berries etc., can also be fermented (Lech, 2011). Wine can be made in the home and in small, medium, or large-sized wineries by using similar methods. Wine is made in a variety of flavors, with varying degrees of sweetness or dryness as well as alcoholic strength and quality. Generally, the strength, color, and flavor of the wine are controlled during the fermentation process (Lech, 2011).

Home-made wine production has been practiced with various fruits such as apple, pear and strawberry, cherries, plum, banana, pineapple, oranges, cucumber, watermelon, guava, etc. Using 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 (Fleet, 2003; Duarte et al., 2010; Isitua & Ibeh, 2010). Grapes are usually preferred because of the natural chemical balance of the grape juice which aids their fermentation process without the addition of sugars, acids, enzymes, or other nutrients. However, fruits such as banana, cucumber, pineapple and other fruits are used in wine production (Obaedo and Ikenebomeh, 2009; Chilaka et al., 2010; Noll, 2008).

Mixed fruit wine is the combination of two or more fruits for the production of wine. Not everyone likes all fruits; those who don't like all the fruits may choose to drink mixed fruit wine. Having more portions from the fruit you like the most, it will highlight the strong desirable taste and mask the other. Mixed fruits are significance because each fruit have a unique range of nutrients and beneficial compounds. They provide variety of vitamins, minerals and a good amount of fiber. Consumption of mixed fruit wine helps to combat diseases and provide us an extra energy (Rani, 2014).

Fruits are one of the most perishable agricultural produce and the post-harvest losses of these are tremendous. They are highly prone to losses because they are composed of living tissues. These tissues must be kept alive to maintain their quality. Producers have to suffer a huge economic loss due to lack of proper understanding about causes and nature of loss, proper preservation methods, safe transportation and marketing techniques.

Pineapple and Watermelon are tropical fruits with short shelf-lives under the prevailing temperatures and humid conditions in tropical countries like Nigeria. Production of wine from these fruits was aimed at reducing the level of post-harvest loss and increase variety of wines.

METHODOLOGY

The production and sensory evaluation of the mixed fruits wines (watermelon and pineapple) were carried out in the Food production laboratory, Department of Family, Nutrition and Consumer Sciences, while the microbial evaluation was done at the Department of Microbiology, Obafemi Awolowo University Ile-Ife, Osun State. Ripe watermelon fruits (*Citrullus lanatus var lanatus*) and pineapple fruits (*Ananas comosus*) were the selected fruits due their abundance in the study area (Ile-Ife)**.** Fruits percentages in wine formulation are**;**

WP1: 50% Watermelon and 50% Pineapple

WP2: 80% Watermelon and 20% Pineapple

PW: 20% Watermelon and 20% Pineapple

Note: The water holding capacity of the fruits differs, so the amount of water added to each wine proportion differs.

Methods

The pineapples and watermelons were washed thoroughly with water, peeled, chopped into smaller sizes and properly crushed with a clean fruit masher or fruit press to form pulp. 2.75liters of hot water (95ºC) was added into the pulp. The fruit pulps were separated from the juices, followed by addition of 640g of granulated sugar into the juices and stirred. 1tablet of sodium metabisulphite was added for sterilization and left for 24hours. This killed any natural growing bacterial. All equipment used was sterilized thoroughly with 0.567g (1tablet) of sodium metabisulphite dissolved in water. After 24hours, the juices were inoculated with 8g of yeast and stirred. The mixtures were transferred into sterilized gallons carboy and locked with the airlock for one week, which is the primary fermentation. After one week, the processed wines were transferred into another sterilized gallon carboys using a sterilized siphon, and then locked with

airlock for another two weeks which was the secondary fermentation. The wines were siphoned into sterilized containers after the secondary fermentation for clarification; this lasted for three weeks (Swami et al., 2014). The wines were portioned into sterilized wine bottles, sealed, and stored for the microbial evaluation.

Production of Mixed Fruits Wine with 50% of watermelon, and 50% of pineapple (WP1).

Ingredients

- 1.5kg of peeled watermelon (50%)
- 1.5kg of peeled pineapple (50%)
- Granulated sugar (640g)
- Yeast *(Saccharomyces cerevisiae*) (8g)
- Sodium Metabisulphite (1.134g, approximately 2tablets)
- Water (2.75liters)

washing (Washing of fruits and utensils)

↓

peeling (Removing the outer surface of fruits)

↓

cutting (cutting of fruits into smaller pieces)

↓

pulping (Mashing of fruits into soft pulps)

↓

addition of hot water (1.8liters Approximately)

↓

juicing (Separation of juice from the pulp)

↓

addition of sugar (with continuous stirring)

↓

addition of sodium metabisulphite (Leave for 24hours)

↓

inoculation with yeast (*Saccharomyces cerevisiae*) (8g)

↓

transfering into a sterilized gallon carboy (Primary fermentation for one week)

↓

siphoning (separation of sediments)

↓

transfering into another sterilized gallon carboy (Secondary fermentation for two weeks)

↓

filling into sterilized containers (Clarification of wine for three weeks)

↓

portioning into sterilized wine bottles and sealed

↓

Storage

Figure 1: Flow chart for the Production of 4.5liters of Mixed Fruit Wine with 50% watermelon, and 50% of pineapple (WP1).

Source: Walters, 2014; Jones, 2014; Swami et al., 2014

Production of Mixed Fruits Wine with 80% of watermelon, and 20% of pineapple (WP2).

Ingredients

- 2.4kg of peeled watermelon (80%)
- 0.6kg of peeled pineapple (20%)
- Granulated sugar (640g)
- Yeast *(Saccharomyces cerevisiae*) (8g)
- Sodium Metabisulphite (1.134g, approximately 2tablets)
- Water (2.5liters)

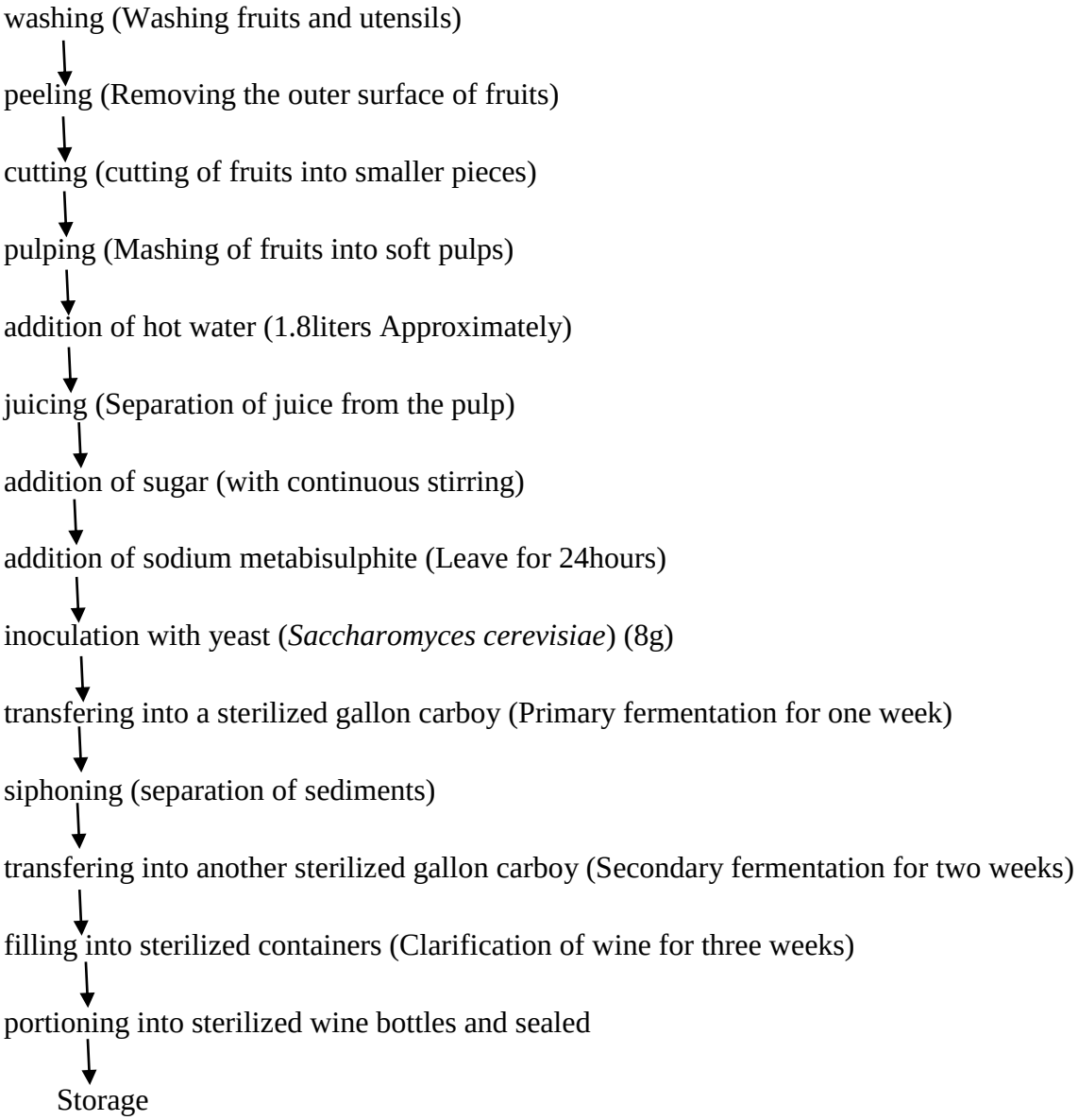

Figure 2: Flow chart for the Production of 4.5liters of Mixed Fruit Wine with 80% watermelon, and 20% of pineapple (WP2).

Source: Walters, 2014; Jones, 2014; Swami et al. 2014

Production of Mixed Fruits Wine with 80% of pineapple and 20% of watermelon (PW).

Ingredients

- 2.4kg of peeled pineapple (80%)
- 0.6kg of peeled watermelon (20%)
- Granulated sugar (640g)
- Yeast *(Saccharomyces cerevisiae*) (8g)
- Sodium Metabisulphite (1.134g, approximately 2tablets)
- Water (3liters)

washing (Washing of fruits and utensils)

↓

peeling (Removing the outer surface of fruits)

↓

cutting (cutting of fruits into smaller pieces)

↓

pulping (Mashing of fruits into soft pulps)

↓

addition of hot water (1.8liters Approximately)

↓

juicing (Separation of juice from the pulp)

↓

addition of sugar (with continuous stirring)

↓

addition of sodium metabisulphite (Leave for 24hours)

↓

inoculation with yeast (*Saccharomyces cerevisiae*) (8g)

↓

transfering into a sterilized gallon carboy (Primary fermentation for one week)

↓

siphoning (separation of sediments)

↓

transfering into another sterilized gallon carboy (Secondary fermentation for two weeks)

↓

filling into sterilized containers (Clarification of wine for three weeks)

↓

portioning into sterilized wine bottles and sealed

↓

Storage

Figure 3: Flow chart for the Production of 4.5liters of Mixed Fruit Wine with 20% watermelon, and 80% of pineapple (PW).

Source: Walters, 2014; Jones, 2014; Swami et al. 2014

Microbial Evaluation

The total heterotrophic bacterial count and fungal count using total viable count was intended to indicate the level of microorganism density in the wine samples produced before consumption. This was conducted according to the procedure described by Royal society of chemistry, (2018).

Sensory Analysis Test

The wine samples (WP1, WP2 and PW) were evaluated by using a 9- point hedonic scale. Random selection was used to choose one hundred (100) well trained panelists who enjoy wine and are acquainted with the samples within Obafemi Awolowo University to perform consumer test and rate them on the hedonic scale where 9 was maximum and 1 was minimum. All evaluation sessions were held in the Food Production laboratory of Family, Nutrition and Consumer Sciences, Obafemi Awolowo University, Ile-Ife in Osun State. 50ml of wines from each sample were presented before the panelists under normal lighting conditions in white disposable cup. The samples were assessed for appearance, aroma, taste, consistency, and general acceptability.

Data analyses

Data were subjected to analysis of variance and means were separated at α 0.05 using the Duncan's option of the same software.

RESULTS AND DISCUSSION

The Microbial load of "Wine" samples (CFU/ml) is shown in Table I. From Table 1, it can be seen that WP1 had the lowest value of Total Heterotrophic Bacterial Count and Fungal Count, hence making it the safest for consumption. PW had a lower value of total heterotrophic bacterial count when compared to WP2, but had a higher value of fungal count when compared to WP2. However, all samples were safe for consumption because their values met the safe levels of both the heterotrophic and fungal counts. This is due to the production technique used and is in line with Clarke (2003) who stated that the process in the making of red wine is malo-lactic conversion. The bacterial process which converts "crisp, green apple" malic acid to "soft, creamy" lactic acid softening the taste of the wine.

Table I Microbial load of "Wine" samples (CFU/ml)

Sample	Total Heterotrophic count (Plate Count)	Fungal Count (Plate Count)
WP1	1.0×10^{2}	0.00
WP2	4.0×10^{4}	10.0
PW	2.0×10^{4}	3.0×10^{2}

NB: Values on the table are colony forming units/ml (CFU/ml)
Key: WP1=50% Watermelon, 50% Pineapple

WP2=80% Watermelon, 20% Pineapple
PW =20% Watermelon, 80% Pineapple

From Table II it was discovered that PW had the highest acceptability in terms of appearance, followed by WP2 and while WP1 had the least. In terms of Aroma, PW had the highest acceptability, followed by WP1, while WP2 was the least. For taste, PW had the highest acceptability, followed by WP2, while WP1 had the least. PW had the highest acceptability in consistency, followed by WP1, while WP2 was the least. In general acceptability, PW had the highest. This result is in agreement with Robinson (2006) that wines can be produced from a wide variety of fruits all over the world.

Table II. Mean Distribution of the sensory evaluation properties of wine

Samples	Appearance	Aroma	Taste	Consistency	General Acceptance
WP1	6.52 ± 0.17^{c}	5.36 ± 0.26^{b}	5.44 ± 0.24^{c}	6.72 ± 0.19^{b}	6.08 ± 0.22^{b}
WP2	6.54 ± 0.20^{b}	5.28 ± 0.27^{c}	5.56 ± 0.29^{b}	6.42 ± 0.22^{c}	6.08 ± 0.21^{c}
PW	6.66 ± 0.17^{a}	6.28 ± 0.25^{a}	6.82 ± 0.25^{a}	6.82 ± 0.22^{a}	6.76 ± 0.16^{a}

NB: 1. Values on the table are mean ±standard deviation (n=3)

2. Different superscripts along the column are significantly different ($P < 0.05$)

Key: WP1=50% Watermelon, 50% Pineapple

WP2=80% Watermelon, 20% Pineapple

PW =20% Watermelon, 80% Pineapple

CONCLUSION

All the wine samples produced were safe for consumption because their values met the safe levels of both the heterotrophic and fungal counts However; WP1 had the lowest counts, hence making it the safest for consumption. The result of the sensory evaluation showed that PW was the most accepted out of the three wine samples in all sensory qualities by the panelists. Production of wine from fruits blend play a vital role in drastic reduction of post-harvest loss and this will reduce economical loss for fruit producers.

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