Production and Analysis of Lipton *Camellia sinensis* Wine

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Abstract

Wine was produced from lipton (yellow label) brand of tea and analysed for its pH, specific gravity, alcohol , total acidity, fixed acidity, vitamin C, some inorganic ions, Total Dissolved Solids (TDS), Total Suspended Solutes (TSS), phytochemical and microbial contents as well as its sensory evaluation. The must had pH and specific gravity values of 4.7 and 1.20, respectively. The pH of the tea wine (4.2) was significantly ($P \leq 0.05$) lower than that of the must (4.7) showing an increase in acidity. The specific gravity of the wine (1.09) was significantly ($P \leq 0.05$) lower than that of the must (1.20) showing a decrease in solute (sugar) content and an increase in alcohol content. The alcohol content of the wine was 10.5% while the total acidity, fixed acidity and volatile acidity contents (as tartaric acid) were 0.970 g / 100 ml, 0.960 g/100ml and 0.010g/100ml, respectively. The ascorbic acid (vitamin C) content of the wine was 0.01mg/100ml. The Fe^{2+}, Ca^{2+}, Mg^{2+}, SO_4^{2-}, PO_4^{3-} and NO_3^- contents (ppm) were 1.5, 49.5, 20.5, 29.0. 0.19 and 2.0 respectively. The TDS and TSS contents (ppm) were 1.0×10^5 and 1.5×10^5, respectively, and the wine was a white wine. Results of the phytochemical analysis showed that the wine contained alkaloids, saponins, flavonoids and tannins while the microbial analysis did not show any microbial growth. Sensory evaluation of the wine showed that it was generally accepted. The results showed that the wine was safe and also generally accepted.

Keywords: Lipton tea, wine, yellow label.

Introduction

Wine can be described as an alcoholic drink made by the fermentation of fruits other than grapes, in which case, the wine is qualified by the name of the plant or fruit from which is made eg mango wine, pineapple wine, paw-paw wine, etc. For several thousands of years, wine has been made with the aid of the yeast *Saccharomyces cerevisiae* (Okafor, 1987). Indeed, wine is believed by gourmets to be an inseparable companion of fine foods; having the ability to improve appetite and promote digestion (Jacobs, 2001). Tea (*Camellia sinensis*) decoction is normally consumed as a beverage drink after infusion in hot or cold water. Classed as a nonnutritive substance, partly because it yields no energy, it is known to contain caffeine, a popular stimulant, and thiaminase (thiamin splitting) activity. Tea is taken because of its numerous medicinal benefits which include antibacterial, antiseptic, antioxidant and detoxifying properties (Tourle, 2003), though excessive tea drinking can cause anaemia due to inhibition of iron uptake (Samman *et al*, 2001). Most elderly persons experience comfort and cheer from hot tea as it slightly stimulates the motility of the digestive tract (Briggs and Calloway, 1979).

Due to our inability to grow vines abundantly, grapes are presently not readily available to the winemaker in Nigeria, therefore, we make do with what we have. This work presents the laboratory production of lipton (yellow label) tea wine and its analyses.

Materials and methods

Preparation of must: 6.20g of lipton (yellow label) tea, 1.25kg of pure granulated sugar, 10.0g of citric acid and 15.0g of ammonium sulphate (yeast nutrient) were put in a bucket and 4.5 litres of boiling distilled water poured in. The tea was infused until cool.

Fermentation: The mixture was sieved into a fermenting jar with the aid of a muslin cloth. The filtrate was the must. When the must had cooled to 35^{0}C, 5g of baker's yeast (*Saccharomyces cerevisiae)* was

added and stirred-in. An air-lock was fitted and the must fermented for three (3) months . The wine was racked into another fermenting jar and re-fitted with an air lock. The wine cleared un-aided for 5 months.

Analysis of the wine: The pH, specific gravity, ethanol content, total -, fixed - and volatile acidities, vitamin C and phytochemical contents were analysed by the method of Agomuo *et al* (2002) while the TDS, TSS and inorganic contents were determined as reported by AOAC (1984). The microbial analysis was carried out by the spread plate method while the sensory evaluation was determined using questionnaires by a panel of 15 judges using a 5 point hedonic scale (Larmond, 1977). Mean score on each attribute was taken.

Statistical Analysis: The results were analysed by the use of the student's t-distribution test of significance as described by Steel and Torris (1960) and Pearson and Hartley (1966)

Results and Discussion

Citric acid is a common component of manufactured foods and is used for its acidity (tartness) (Briggs and Calloway, 1979) and also because it imparts brilliance and a pleasant fruity flavour to wines (Berry, 1996; Nelson and Cox, 2000). This acid may have contributed to the acidic nature of the must (Table 1).

Table 1: Results of the pH and specific gravity of the must*

pH	specific gravity
4.70+0.01	1.20+0.001

**Values are means + S.D of triplicate determination.*

The specific gravity of the must (Table 1) also showed that it contained dissolved solutes (sugars, say). The pH of the wine was however significantly ($P \leq 0.05$) lower than that of the must (Table 2) but was higher than the normal range of pH (3.0-3.6) recommended by Othmer *et al* (1970) for wines. The pH of the wine was also higher than that (pH 3.4) obtained by Akoma *et al* (2002) for the boiling – water - extract tsamiya wine. The specific gravity of the wine was significantly ($P \leq 0.05$) lower than that of the must, showing that much of the solute (sugars) had been fermented; leading to the production of a dry wine (with normal alcohol content range of 9-15%) (Table 2). The alcohol content was higher than that (8.5%) obtained by Akoma *et al* (2002).

Table 2: Results of some chemical properties of the tea wine*

Parameter	value
pH	4.2±0.14
Specific gravity	1.09±0.003
Ethanol content ($\%^{v}/_{v}$)	10.5±0.71
Total Acidity (as tartaric acid g/100ml)	0.970±0.02
Fixed Acidity (as tartaric acid g/100ml)	0.960±0.01
Volatile Acidity (as tartaric acid g/100ml)	0.010±0.03
Vitamin C (mg/100ml)	0.01±0.00
Fe^{2+} (ppm)	1.5±0.1
Ca^{2+} (ppm)	49.5±0.8
Mg^{2+} (ppm)	20.5±0.02
SO_4^{2-} (ppm)	29.0±0.00
PO_4^{3-} (ppm)	0.19±0.01
NO_3^- (ppm)	2.0±0.1
TDS (ppm)	$1.0 \times 10^5 \pm 0.01$
TSS (ppm)	$1.5 \times 10^5 \pm 0.05$
Colour	deeply straw

** Values are means ±SD of triplicate determinations*

The total and fixed acidity contents fell within the range (0.5 – 1%) of acidities for wine within which spoilage microorganisms cannot grow (Othmer *et al*, 1970). The total acidity content compared favourably with that (0.80% tartaric acid) got by Akoma *et al* (2003). The volatile acidity content was low, indicating that the wine could keep for a long time. Amerine *et al* (1979) had stated that wines with volatile acidities less than 0.3g/100ml could keep. The vitamin C content (Table 2) was very low confirming that the steps taken in processing tea leaves leave them with insignificant amounts of the vitamin (Briggs and Calloway, 1979). Tourle (2003) had however argued that tea was a good source of vitamin C.

The tea wine was shown to contain varying amounts of some inorganic ions (Table 2). This was because the tea used was an extract product of plant material. Tea is also known to be a good source of potassium (45 to 65mg) and fluoride (0.3 to 0.5mg) per cup serving (Briggs and Calloway, 1979). Roles of these ions in human nutrition are common knowledge.

The TDS and TSS values showed that we produced a fairly clear wine that was deeply straw coloured (Table 2) thus classified by Amerine *et al* (1979) as a white wine.
The phytochemical contents of the wine included alkaloids, saponins flavonoids and tannins (Table 3).

Table 3: Phytochemical contents of the tea wine*

Phytochemical	Values
Alkaloids	+
Saponins	+
Flavonoids	+
Tannins	+

** values are means of triplicate determinations, + = present*

Tea is known to be an appreciable source of the pharmacologically important alkaloids (example caffeine and nicotine) as well as a good source of tannins, that have astringent properties (Briggs and Calloway, 1979).Tea tannins, called catechins, have been found to moderate free radical damage sustained by DNA, even when present in low concentrations (Anderson *et al* ,2001). Flavonoids and saponins act as anti-oxidants that protect foods from being oxidized (Gordon, 1993); just like tannins (Berry, 1996). Flavonoids and tannins also have antiseptic properties. These phytochemicals may help preserve the wine as well make it a wine with some medicinal properties. Microbial analysis showed that there was no microbial growth on cultured wine sample (Table 4).

Table 4: Results of microbial analysis of the tea wine*

Microbe	Value
Yeast	-
Others	-

**Values are means of triplicate cultures, - = absent*

The high level of alcohol contained in the wine (Table 2) may have inhibited the growth of microorganism(s). Alcohol is known to have both antiseptic and disinfectant properties (Taylor *et al*, 1998). The interpretation of the summary of the sensory evaluation (Table 5) carried out showed that the tea wine was generally accepted.

Conclusion: In conclusion, the study showed that lipton yellow label tea could be used in producing a safe and acceptable dry table wine.

Table 5: Summary of sensory evaluation of tea wine*

Attribute	Mean score	Interpretation
Aroma	3.0±1.41	Good
Clarity	4.0±0.41	Very Good
Colour	3.7±0.82	Good
Mouth feel	3.3±0.82	Good
Overall acceptance	4.7±1.16	Very good
Taste	3.3±0.82	Good

** Values are mean ± S.D of fifteen determinations*

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