Data Article

Data on microbial and physicochemical assessment of mixed fruit wine produced from physically damaged fruits

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A B S T R A C T

The data described in this article was obtained in an experiment designed for the production of mixed fruit wine using physically damaged fruits in the process of fermentation. Three fruits (watermelon, pineapple and orange) were used in the wine production process. The fermentation process involved two stages: aerobic and anaerobic fermentation. The paper presents the data on microbial and physicochemical analyses carried out to monitor the fermentation and clarification processes.

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The data presented here represents the total viable plate counts and total coliform counts from the aerobic and anaerobic fermentation process of damaged fruit (watermelon, pineapple and orange).

### Table 1
Changes in temperature (°C) during the fermentation process.

| Days | Replicate 1 | Replicate 2 |
|------|-------------|-------------|
| 0    | –           | 33          |
| 1    | 28          | 29          |
| 2    | 30          | 29          |
| 3    | 29          | 29          |
| 4    | 27          | 28          |
| 5    | 28          | 29          |
| 6    | 28          | 28          |
| 7    | 28          | 28          |
| 14   | 27          | 29          |
| 21   | 27          | 28          |
| 28   | 27          | 28          |
| 42   | 27          | 27          |
| 56   | 27          | 27          |
| 63   | 27          | 27          |
| 64   | 27          | 27          |

**Remark:** Day 28- first week of clarification, Day 42-third week of clarification, Day 56-fifth week of clarification, Day 63-Sixth week of clarification, Day 64- Bottling of wine.
using pour plate method. Also, the measurements of the different physicochemical properties throughout the fermentation and clarification processes were presented. Fermentation ended on the 21th day of the experiment and clarification of the wine ran through six weeks. Analysis where carried out once every two weeks. During aerobic and anaerobic fermentations, changes in temperature, pH, titratable Acidity (TTA), specific gravity, alcohol content, reducing sugar and total viable plate and coliform counts were monitored and presented in Tables 1, 2, 3, 4, 5, 6, and 7.

2. Experimental design, materials and methods

Highly acceptable wines can be made from practically all fruits. Wine can be fermented with yeast that occurs naturally in fruits and even damaged fruits. Details on the history of wine making using fruits, fermentation process, must preparation; the effect of yeast in wine production, aging,
clarification, packaging/bottling, quality assessment and evaluation of wines of different fruits can be found in [1–13]. Related analysis can be explored, see [14–18] for details.

2.1. Must preparation

Physically damaged fruits were obtained from selected markets in Ota, Ogun State Nigeria. Different treatment measures were carried out on the fruits, which are; rinsing with sterile distilled water, hot water and chemical treatments. The fruits were weighed, washed, peeled, sliced, rewashed, seeds removed for the case of oranges and then reweighed. The fruits were blended with a sterile blender using counter top blender into puree, and then filtered and mixed with sterile distilled water (1:1 w/v).
2.2. Fermentation

Two fermentors were used in this experiment; the first is a primary fermentor which is for the aerobic fermentation and the secondary fermentation which is for the anaerobic fermentation.

In the primary fermentor, the mixed fruit wine were mixed with known amount of sugar and yeast nutrient, pectinase, potassium metabisulphite and the prepared starter culture were mixed and stirred every 12 hours with daily analysis of temperature, pH, specific gravity, alcohol content and reducing sugar. The primary fermentation lasted for 7 days.

The mixed fruit wine was then transferred to the secondary fermentor aseptically with physiological analysis on a weekly basis of temperature, pH, specific gravity, alcohol content and reducing sugar. The whole fermentation period lasted for 21 days and after which bentonite clay was added to aid clarification of the wine. This process lasted for six weeks. The microbial analysis was by standard microbiological methods, a 6 fold serial dilution was performed. Aliquot of the sample was inoculated

| Days | Replicate 1 | Replicate 2 |
|------|-------------|-------------|
| 0    | 24.060      | 24.072      |
| 1    | 20.084      | 20.082      |
| 2    | 14.504      | 14.501      |
| 3    | 8.621       | 8.620       |
| 4    | 6.431       | 6.429       |
| 5    | 2.740       | 2.742       |
| 6    | 1.635       | 1.634       |
| 7    | 1.600       | 1.601       |
| 14   | 1.480       | 1.480       |
| 21   | 1.311       | 1.312       |
| 28   | 1.310       | 1.311       |
| 42   | 1.308       | 1.308       |
| 56   | 1.304       | 1.303       |
| 63   | 1.301       | 1.300       |
| 64   | 1.300       | 1.300       |

**Remark:** Day 28- first week of clarification, Day 42-third week of clarification, Day 56-fifth week of clarification, Day 63-Sixth week of clarification, Day 64-Bottling of wine.

| Days | TVC           | TCC           |
|------|---------------|---------------|
| 0    | –             | –             |
| 1    | $6.0 \times 10^4$ | 0             |
| 2    | $8.5 \times 10^5$ | 0             |
| 3    | $1.6 \times 10^5$ | 0             |
| 4    | $1.95 \times 10^5$ | 0             |
| 5    | $5.5 \times 10^4$ | 0             |
| 6    | $2.5 \times 10^5$ | 0             |
| 7    | $1.6 \times 10^4$ | 0             |
| 14   | $4.0 \times 10^3$ | 0             |
| 21   | $2.0 \times 10^3$ | 0             |
| 63   | $1.0 \times 10^3$ | 0             |
| 64   | 0             | 0             |

**Remark:** Day 28- first week of clarification, Day 42-third week of clarification, Day 56-fifth week of clarification, Day 63-Sixth week of clarification, Day 64-Bottling of wine, TVC-Total viable counts; TCC-Total coliform counts.
into a Nutrient agar (NA) for total viable count (TVC) and MacConkey agar for coliform count using the pour plate method. Cultures were allowed to grow for 18–24 hours after which the resulting colonies were enumerated using a colony counter. Colony counts were converted to colony forming units using the formula below;

\[
\text{Colony forming unit} = \frac{\text{No of Colonies}}{\text{volume plated}} \times \text{dilution factor cfu/ml}
\]

The microbial counts presented as the total viable count (TVC) and total coliform counts (TCC) is shown in Table 7.

In the determination of titratable acidity 6grams of the sample was weighed into 100 ml beaker and 50ml of distilled water was added to the sample. This was titrated with 0.1 M NaOH solution to give a faint pink colour. 1 ml of 1% aqueous alcoholic phenolphthalein indicator solution was added. The calculation of the titratable acidity was done using the formula below;

\[
\text{Titratable acidity} (\%) = \frac{\text{Mls of NaOH used} \times 0.1\text{N NaOH} \times \text{multiequivalent factor (0.064)}}{\text{Grams of sample}} \times 100
\]

Specific gravity was determined by using a 25 ml specific gravity bottle which was cleaned with distilled water, dried in an oven at 50°C and allowed to cool in dessicator. The weight of the dry bottle was recorded as \(W_1\). The bottle was then filled with distilled water and the weight was recorded as \(W_2\). The bottle was emptied and filled with the wine sample and weight was recorded as \(W_3\). The specific gravity of the sample was calculated thus;

\[
\text{Specific Gravity} = \frac{W_3 - W_1}{W_2 - W_1}
\]

The alcohol content was calculated using the data from the specific gravity;

\[
\text{Alcohol content by volume} (\%) = (\text{Original gravity} - \text{Final gravity}) \times 131.25
\]

In the estimation of reducing sugar in wine samples, One ml of 3, 5-Dinitrosalicylic acid (DNS) was added to 1 ml of supernatant of sample, in a test tube and the mixture heated in boiling water for 10 minutes. The test tube was cooled rapidly in tap water and the volume adjusted to 12 ml with distilled water. A blank containing 1 ml of distilled water and 1 ml of DNS was prepared. The optical density of the sample was read against the blank in the spectrophotometer or 540 nm absorbance. The concentration of reducing sugar in the supernatant was estimated from the glucose standard curve.

\[
\text{Reducing sugar} (\text{g/L}) = \frac{\text{Absorbance of Test}}{\text{Absorbance of standard}} \times 100
\]

Table 8
Paired sample statistics of changes in temperature (°C).

|          | Mean    | N  | Std. Deviation | Std. Error Mean |
|----------|---------|----|----------------|-----------------|
| Replicate 1 | 25.8000 | 15 | 7.19325        | 1.85729         |
| Replicate 2 | 28.4000 | 15 | 1.50238        | 0.38791         |

Table 9
Paired sample correlation of changes in temperature (°C).

|                      | N  | Correlation | Significance |
|----------------------|----|-------------|--------------|
| Replicate 1 & Replicate 2 | 15 | -0.798      | 0.000        |
### Table 10
Paired samples test of changes in temperature (°C).

| Statistic                        | Value      |
|----------------------------------|------------|
| mean (paired difference)         | -2.600000  |
| Standard deviation (paired difference) | 8.441395   |
| $t$                              | -1.192902  |
| Degrees of freedom               | 14         |
| Significance (2 tailed)           | 0.252733   |

### Table 11
Paired sample statistics of changes in pH.

|                  | Mean   | N  | Std. Deviation | Std. Error Mean |
|------------------|--------|----|----------------|-----------------|
| Replicate 1      | 4.4060 | 15 | 0.47634        | 0.12299         |
| Replicate 2      | 4.4027 | 15 | 0.47227        | 0.12194         |

### Table 12
Paired sample correlation of changes in pH.

|                  | N     | Correlation | Significance |
|------------------|-------|-------------|--------------|
| Replicate 1 & Replicate 2 | 15    | 0.998       | 0.000        |

### Table 13
Paired sample test of changes in pH.

| Statistic                        | Value      |
|----------------------------------|------------|
| mean (paired difference)         | 0.003333   |
| Standard deviation (paired difference) | 0.029681   |
| $t$                              | 0.434959   |
| Degrees of freedom               | 14         |
| Significance (2 tailed)           | 0.670222   |

### Table 14
Paired sample statistics of changes in titratable acidity (%).

|                  | Mean   | N  | Std. Deviation | Std. Error Mean |
|------------------|--------|----|----------------|-----------------|
| Replicate 1      | 0.8353 | 15 | 0.28760        | 0.07426         |
| Replicate 2      | 0.8273 | 15 | 0.28927        | 0.07469         |

### Table 15
Paired sample correlation of changes in titratable acidity (%).

|                  | N   | Correlation | Significance |
|------------------|-----|-------------|--------------|
| Replicate 1 & Replicate 2 | 15  | 0.999       | 0.000        |
2.3. Statistical tests

Paired sample t-tests are conducted to determine the significant difference in the means of the replicates. Null hypothesis implies that there is no significant mean difference and the alternative hypothesis implies otherwise. Small sample sizes necessitated the use of t-test. Three distinct tables are obtained for each parameter which is paired sample statistics, paired sample correlations and paired sample test. These are shown in Tables 8–19. Paired sample tests of changes in alcohol content (%) and sugar reduction were not considered because the values of the replicates are almost the same.

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