

Mimics in conversion of Cocoti sap to wine analysis by Physico-chemical changes



Microbiology

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ABSTRACT

Cocos nucifera wine is the fermented sap of cocoti trees. When sap undergoes fermentation large number of physical and chemical changes takes place in it. It influences on quality. The quality of cocoti wine is an important issue for public health. In the present study, we discuss about the changes in nature of cocoti wine. The pH turns alkaline to acidic nature, turbidity, hardness increases the fermentation reaction. Nutrients and proteins are utilized in the process of fermentation and they convert into some organic acids. Acidity and alcohol content are measuring factors of fermented wine which will be explained how the environmental factors are affected.

Introduction:

Cocoti wine is one of the major palm wines. Palm wine is an alcoholic beverage created from the fermented sap of various palm trees. It can be collected (or tapped) from the palm trees [1, 2]. Cocoti wine is the most common seasonal drinking in rural areas. At the time of collection, it is tasty and sweet in nature and it's containing so many microorganisms. Cocoti wine is like a fermentation broth it consists of high nutrients. The microorganisms need to grow and produce the various chemical compounds like organic acids. Then it turns into acidic nature. The sap is clear and it is converted by the fermenting action of microorganisms, it is a milky whitish appearance and effervescent, which is called wine. [4, 8, 9] There is no sterilisation before consumption; it contains so many pathogenic bacteria and fungi.

Microorganisms contaminate the sap and convert the sap into wine by a fermentation process. The present study explains what happened when cocoti sap is converted into wine. The people who are consumed sap it is helpful to their health. But in case of wine it causes some health problems because of physical and chemical changes occurred in wine. Consumption of wine is an emerging problem in public safety and social awareness [3]. Fermentation begins immediately after collection, as a result of natural yeasts in the air and convert as wine within two hours, the alcohol content reaches approximately 4%. Continued fermentation for up to 24 hours results in a more alcoholic, acidic, and sour white drink. This wine also distilled in to whisky-like drinks with higher alcohol content (up to 40%). Fresh cocoti wine is very sweet and refreshing because of the presence of sucrose, but within 24 hours the concentration of sucrose falls to less than 50% of the initial amounts. Fermentation time is depending on the nature of the carbohydrate source available and the carbon/nitrogen ratio [10, 11]. Fermentation virtually ends when the pH falls to 4.0; this whole process lasts about 48 hours (5), acidosis may initially causes stomach upset in affected people. Unbolted cocoti wine has lower alcohol content (around 3%) than bottled cocoti wine (around 4%) (6). In general, cocoti wine, which has an alcohol content of 3–6%, is also widely consumed (7).

Material and methods:

Cocos nucifera (cocoti) sap was collected in a sterilised bottle. Preservation and transportation of the sample to the laboratory were as per standard methods. The samples were undergoing for analysis of Physico-chemical factors.

Physical factors: Colour, Odour, taste, pH and turbidity.

Chemical factors: acidity and alcohol.

Colour:

Four test tubes were taken. One tube was filled with cocoti wine and another filled with cocoti sap. Remaining tubes filled with standard solutions like potassium chloroplatinate and cobaltous chloride and observed the colour parallel to the eye with

white background.

Odour:

Take one litre wide mouth bottle and cleaned it with hydrochloric acid pour it out and find the smell it. Then rinsed with distilled water two times washed out and find the smell it. The sample rinsed and observed the odour.

Taste:

After tasting salt and sugar solutions and distilled water, finally recorded our samples taste for the result.

pH:

pH was analysed by using pH analyser (MBI pH METER MODEL 3D)

Turbidity:

Turbidity indicates the growth of microorganisms in the samples. Distilled water is taken into a cuvette and inserted it in the holder and calibrate by using zero knob to set zero. By taking standard solutions to set the calorimeter finally and introduced the samples and analyse the turbidity of sap and wine.

Acidity:

5 ml of wine / sap sample was taken into clean conical flask and homogenise by gentle shaking. To this, added 2 drops of phenolphthalein indicator and it was titrated against 0.1N NaOH. A clean burette was taken and filled with NaOH and initial volume was recorded by drop wise release of NaOH burette to wine/ sap sample at complete neutralisation. Turning of a pink colour development was recorded. Likewise, three concurrent values were recorded by taking same wine/ sap sample. By taking standard neutralisation of 0.1N NaOH (100 ml) can neutralise 9 gms of lactic acid. The amounts of lactic acid present in the given wine/ sap was evaluated. To calculate acidity, we can use the following formula. The concentration of acetic acid in the media was determined by titration following the protocol described by Accolas *et al.*, [12].

$$\% \text{ total acidity} = \frac{\text{ml of alkali} \times \text{Normality of alkali} \times 9}{\text{Weight of sampling}}$$

Alcohol:

Different concentrations of standard alcohol samples were prepared like 0.1, 0.3, 0.5, 0.7, 0.9 in test tubes. These test tubes were made up to 1 ml with distilled water, again these test tubes filled with 1% 1 ml of $K_2Cr_2O_7$ and 5 ml of conc. H_2SO_4 . Blank also prepared along with the samples. After incubation period recorded the readings. A standard curve was plotted by taking O.D values on Y-axis and concentration of alcohol on X-axis.

Results and Discussion:

After fermentation, cocoti wine presented different recordings compared to sap. With regard to colour, cocoti sap is in white and cocoti wine is in milky white because in fermentation process microorganisms evolved CO_2 gas with white bubbles.

In case of Odour, cocoti sap evolves sweet smell but wine gives sour smell with foam which indicates formation of carbon dioxide.

Taste of the cocoti sap is better than the wine taste. Wine was sour/tangy due to the acidic level. When fermentation time increases taste of wine was also differed.

The turbidity of cocoti sap was slightly transparent solution, but in the case of wine it is different. Turbidity indicating the growth rate of microorganisms (or) fermentation rate was enhanced due to higher fermentation processing. Old cell debris is settled down on bottom of the container. Cells within a culture scattering the light make it harder to see cloudy. It should be above 2 NTU (Nautical units).

Table-1: pH difference in between cocoti sap and wine.

| S.No | Time intervals in minutes | pH meter readings | |
|------|---------------------------|-------------------|------|
| | | Sap | Wine |
| 1 | 30 | 6.8 | 4.2 |
| 2 | 60 | 6.3 | 4.1 |
| 3 | 90 | 6.1 | 3.8 |
| 4 | 120 | 5.7 | 3.5 |
| 5 | 150 | 5.1 | 3.3 |
| 6 | 180 | 4.5 | 3.1 |

The pH falls sharply with in the first 3 hours in both sap and wine. The fall is from near neutral of pH 6.8 to pH 4.5. After standing for 24 hours, the pH stabilizes around 3.0 in wine.

Fig-(1) pH difference in-between cocoti sap and wine

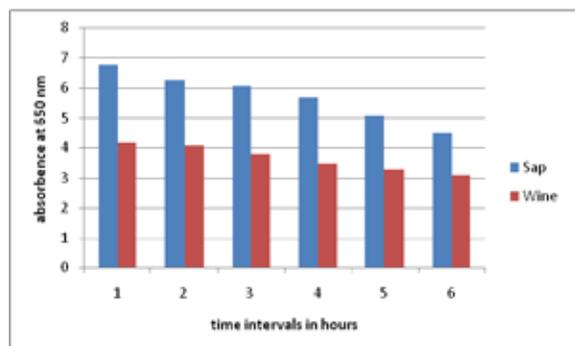


Table-(2) Total acidity levels of cocoti sap and wine.

| S.NO | SAMPLE VOLUME | BURETTE READINGS | |
|------|---------------|------------------|------|
| | | Sap | wine |
| 1 | 5 ml | 3.0 | 4.7 |
| 2 | 5 ml | 2.7 | 4.1 |
| 3 | 5 ml | 2.4 | 4.7 |
| 4 | 5 ml | 2.1 | 4.4 |
| 5 | 5 ml | 2.2 | 4.6 |

| | | | |
|---|------|-----|-----|
| 6 | 5 ml | 2.4 | 4.5 |
| 7 | 5 ml | 2.1 | 4.4 |

For calculating total acidity, titration method was employed in seven samples. The average total amount of acidity in cocoti sap and wine was 2.59g/100ml and 4.75g/100ml respectively.

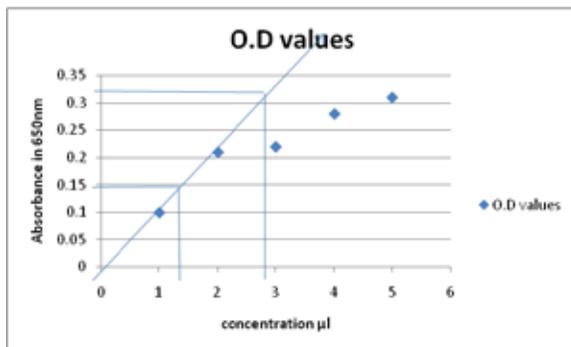
There is a sharp rise in titratable acidity of cocoti sap after 4 hours. This is probably due to the *Acetobacter* species. Conversion of alcohol to acetic acid may have occurred. The causation of active fermentation creates aerobic conditions which favours this organism.

Table-(3) Total alcohol content in cocoti sap and wine.

| S. No | Sample volume in ml | D.Water in ml | Concentration μ /ml | $K_2Cr_2O_7$ solution in ml | H_2SO_4 solution in ml | O.D values |
|-------|---------------------|---------------|-------------------------|-----------------------------|--------------------------|------------|
| 1 | 0.1 | 0.9 | 100 | 1 | 5 | 0.10 |
| 2 | 0.2 | 0.8 | 200 | 1 | 5 | 0.21 |
| 3 | 0.3 | 0.7 | 300 | 1 | 5 | 0.22 |
| 4 | 0.4 | 0.6 | 400 | 1 | 5 | 0.28 |
| 5 | 0.5 | 0.5 | 500 | 1 | 5 | 0.31 |
| 6 | Blank | 0.0 | 000 | 1 | 5 | 0.00 |
| 7 | Cocoti sap(0.5) | 0.5 | ---- | 1 | 5 | 0.18 |
| 8 | cocoti wine(0.5) | 0.5 | ---- | 1 | 5 | 0.32 |

Microorganisms convert the sap sugars into alcohol and acids. Alcohol percentage majorly depends on temperature and pH. Cocoti sap alcohol concentration is 180 μ / ml and wine alcohol content is 310 μ / ml.

Fig-(2) Alcohol concentrations of palm sap and palm wine



Conclusion

When contaminated food is consumed it acts as a vehicle for the pathogens to enter our body, causes “food poisoning”. Bacteria multiply and produce chemical toxins in our gastrointestinal tract ultimately effecting normal physiological functions like digestion, respiration etc. From our study it is imperative that the beneficial effects of Cocoti sap will be compromised if consumed after 4 hours of storage. These findings are of encouraging and a base line research of my further work to analyse how the proteome is altered from sap to wine.

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