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A study on alcohol content obtained from different varieties of sugarcane wine

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Abstract

Sugarcane juice which contains high quantity of sugar was used as raw material and an attempt was made to prepare sugarcane wine. Varying concentrations of baker's yeast (*Saccharomyces cerevisiae*)⁽¹⁾ was used to determine the optimum concentration of yeast for the production of good quality sugarcane wine. The total acidity, pH, total sugars and brix tests for the juice were determined. The fermentation was carried out at 22°C after the juice was inoculated with a suspension of yeast. The samples were then subjected to sensory analysis to determine the most preferred wine. It was found out that wine made by addition with citric acid was significantly preferred.

Keywords: Sugarcane Wine; Alcohol estimation; Yeast wine; Citric acid in wine; Wine quantification

1. Introduction

Sugarcane juice contains high concentration of sugar in the form of sucrose (18-23 brix) which can be readily used by yeast during fermentation process. The sucrose in the juice is converted to alcohol during the fermentation⁽²⁾ period. The alcohol content varies depending upon the concentration of yeast inoculated and the sugar content present in the juice. Flavors of the wine depend on period of fermentation and optimum storage conditions.

Ethanol and glycerol are quantitatively dominating alcohols, followed by higher alcohols that contribute more to the intensity of the odor of the wine, and they are important precursors for the formation of esters. The alcohol acetate are found in the highest concentration and have been considered to be important contributors to wine aroma because they are major volatile compounds with fruity odors

Wine is an alcoholic beverage produced by the fermentation of the juice of fruits especially grapes, although other fruits such as plum, banana, elderberry or black currant can be used to obtain products named "wine". Sugarcane juice has high readily fermentable sugars that provide a suitable substrate for fermentation of juice into wine.

2. Material and methods

2.1. Experimental design

Baker's yeast (*Saccharomyces cerevisiae*) is tested for its ability to ferment sugarcane juice (*Saccharum officinarum*) at varying concentrations to determine the most acceptable sugarcane wine. In order to do this regular studies of total acidity, pH, electrical conductivity, alcohol content, carotenoids, anthocyanins, flavonoids, phenolics antioxidant activity, Fermentation studies were carried out and the sugarcane juice was inoculated with different treatments. The extracted sugarcane juice is divided into batches.

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The first batch was inoculating⁽³⁾ sugarcane juice with particular concentration of yeast .the ph of the sugarcane juice must be controlled. Then it was but after incubating for 5 days, there cause an addition of concentrated syrup. The second treatment was mixing of different fruit flavours along with sugarcane juice followed by the addition of concentrated syrup after the incubation of 5 days. The wines were allowed to mature and they were analyzed to determine the most acceptable and preferred wine amongst them.

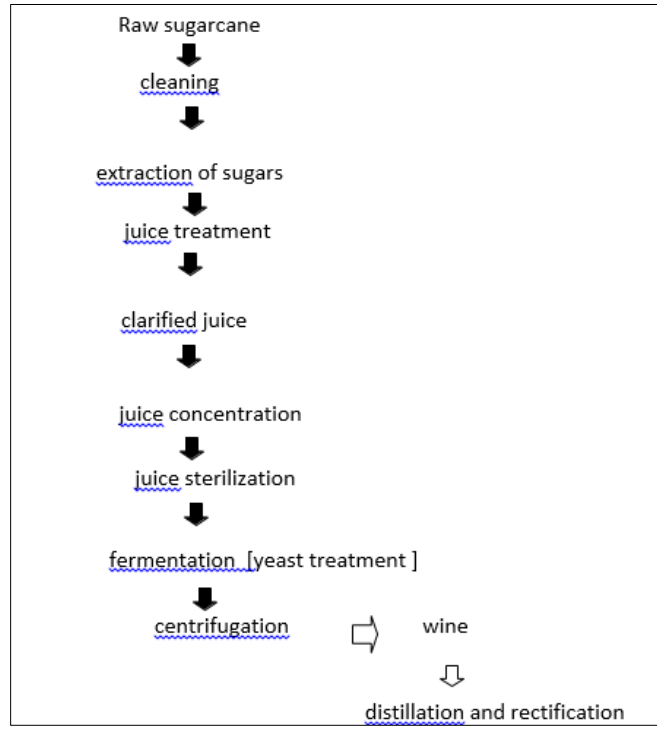


Figure 1 Flow chart of Wine preparation

3. Results and discussion

3.1. Extraction of sugarcane juice

The harvested sugarcane was scrubbed and washed to remove maximum dirt from the skin. Juice was extracted by passing the sugarcane through a sugarcane juice extractor. The juice was filtered using muslin cloth to remove any fibres, bagasse and other dust particles. Antioxidant was added to the juice to reduce enzymatic browning.⁽⁴⁾

3.1.1. Analysis of extracted juice

- pH determination
- Total acidity-titratable acidity
- Sugar content- brix

3.2. Heat treatment of juice

The extracted juice is divided into batches and the selected batches are heated at 85°C for 5 minutes. This is done to sterilize the juice. The sterilized juice is cooled before yeast inoculation.

3.3. Inoculation of yeast

The selected concentration of yeast was activated in warm sugarcane juice and inoculated in the sugarcane juice and allowed to ferment⁽⁵⁾ at 20°C-22°C. After completion of fermentation, the wines were filtered or racked to remove residual yeast and stored at refrigeration condition for maturation.

3.4. Analysis of wine and determination of overall acceptance

- Titratable Acidity
- pH determination
- Alcohol content
- Fixed Acidity

3.5. Alcohol estimation

Alcohol content in the win sample can be determined by distillation of the wine and using a hydrometer to determine alcohol content from the distillate and percentage alcohol is determined using sike's tables.

3.6. Procedure for alcohol estimation

250 ml of sugarcane wine is taken in the distillation unit consisting of round bottom flasks, vaporization line and condenser along with conical flasks to collect the distillate. Distillation is done till the temperature of the liquid reaches just below 100 degree Celsius. The distillate is take and made up to 250 ml using distilled water. The temperature of the distillate is noted after its made up. Hydrometer⁽⁶⁾ is wiped clean and dipped I to made upon distillate and reading is noted Calculation is done by taking corrected readings from sike"s tables and alcohol content is determined by using the formula:

$$\text{Alcohol content} = \frac{(100 - \text{corrected reading}) * 2.5 * 1000}{250}$$

4. Observation

The fermented wines after 15 days of incubation were subjected to distillation and the pure ethanol was obtained. After the first 5 days of incubation again the addition of concentrated syrup to the wine causes an additional increase in alcohol percentage⁽⁷⁾ of the wine. The alcohol percentage of the different sugarcane wines without the addition of concentrated syrup is given below:

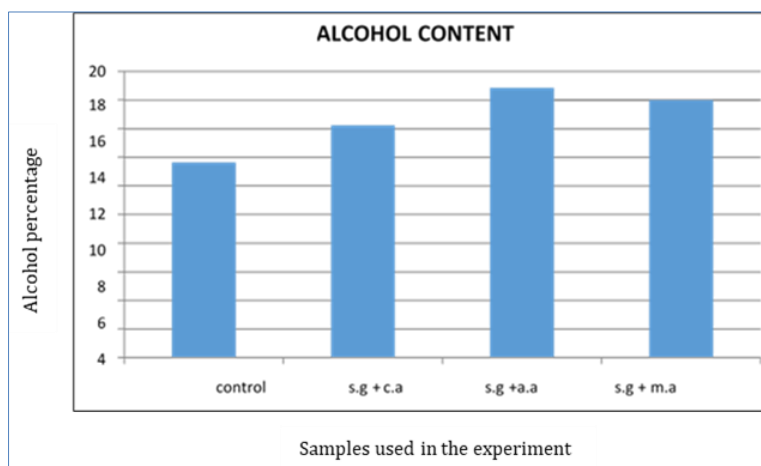


Figure 2 Graph representing alcohol content in various samples

Table 1 Table representing alcohol percentage in each variety of Wine

wine variety	alcohol percentage
control (sugarcane juice)	13.65%
sugarcane + citric acid	16.25%
sugarcane + ascorbic acid	18.85%
sugarcane+ malic acid	18%

Likewise the alcohol percentage of the wines followed by the addition of Concentrated syrup of sugarcane juice is given below

Wine variety	Alcohol percentage
control (sugarcane juice)	49.5%
sugarcane + citric acid	50.75%
sugarcane + ascorbic acid	39%
sugarcane+ malic acid	49.5%

Thus the comparative study of the two tables are showing that

The alcohol thus obtained from the distillation was made up to 250 ml with distilled water. Then it is transferred in to a glass beaker and hydrometer is slowly immersed in to the sample. Thus the reading obtained was checked in the table and corresponding percentage under proof at the particular temperature was noted and the reading was recorded.

5. Conclusion

The analysis of 7 variations of sugarcane wine was done and it is determined that the wine made by addition of pineapple and with inoculation of yeast suspension yielded good quality wine. But the alcohol content is found to be more for the wine that contains more amount of ascorbic acid. All varieties of wines have approximately same amount of Titrable acidity. The maturation period of the wine indicates its quality. It is also inferred that the addition of Concentrated syrup causes almost 4 times increase in alcohol percentage

A new low alcoholic drinks, was brewed from fresh sugarcane juice using yeast. The results showed that alcoholic fermentation period and the alcohol content of fermented cane juice ranged from 9 to 20 days and 2.8–4.8%, respectively. With respect to sensory evaluation, the alcoholic drink obtained by using wine yeast was found suitable with yellow- brown colour, clear and brighter appearance, full wine and cane aromas and flavor. Its soft, mild, mellow and slightly sweet taste made it possible to be used as a beverage in dines. The results of this study concerning the use of sugarcane juice as one of raw materials could be promising for industrial fermentations of low alcoholic drinks production, and also provides a new approach to process sugarcane by-products.

This indicated that the elaboration of wine-like beverages is a good alternative use for sugarcane juice. The sugarcane juice contains total soluble solids (TSS) 20.2 Brix at 26 °C and pH 3.95 during fermentation was observed to be the best and it produces wine of alcohol (9.4%), TSS (7.70 Brix), 0.2 % Titrable acidity (TA) with good flavor, Color and overall acceptability. After 6 months of storage the alcohol and Titrable acidity was increased while the other parameters decreased. Therefore storage improves the quality of wine. Thus, this could be one of the post harvest management method for value addition while reducing the post harvest loss.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest between both authors of the paper.

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