

Production & Comparative Study of Holy Basil Wine, Banana Wine and Date Wine



Microbiology

KEYWORDS : Wine, Holy basil wine, Brix, Titratable acidity, Ethanol content

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ABSTRACT

Wine is one of the functional fermented drinks and has many health benefits. It is a well-liked drink being enjoyed all over the world. Wine is a complex mixture of a large number of compounds [1]. Fruit are the best substrates for wine production. Moreover fruits, herbs can also be used for wine production by keeping in mind the health benefits of herbs. Thus, the present investigation focuses on the production and comparative study of holy basil wine with banana wine and date wine. Consequently, results of different analyses in pure herbal wine (holy basil) in comparison to fruit wines showed that holy basil wine fulfills the requirement criteria needed for as all parameters like brix, titratable acidity and ethanol content were found within normal range for holy basil wine as well as for both the fruit wines.

To conclude it can be said that leaves of holy basil can be used to prepare pure herbal wine. Due its medicinal and therapeutical properties, the holy basil wine can be a good option for fermented beverages. The outcome of the present analysis may expand the utility of holy basil and other herbs for production of herbal wine and can be excellent alternative to fruit wines.

INTRODUCTION:

Wine is an alcoholic beverage made from fermented grapes or other fruits. It is a complex mixture of a large number of compounds including carbohydrates, alcohols, aldehydes, esters, acids, proteins, vitamins and a number of polyhydroxy aromatic compounds which contributes to color and taste [1]. Wines are normally characterized by colour, flavour, alcohol content and aroma; also classified as still, sparkling, fortified, aromatized and sweet wines. There are many scientific researches which evidently authorize the tremendous health benefits of wine. Red wine and white wine has been advised for their immense valuable character which prevents chronic pathologies, involving cancer. The nutritional role of wine include anti-ageing effects, improvement of lung function from antioxidants in white wine, reduction in coronary heart disease, development of healthier blood vessels in elderly people, reduction in ulcer-causing bacteria, destruction of cancer cells by protein and prevention of stroke by keeping the arteries clean by polyphenols in red grape skins, diminishing ovarian tumor risk in women and making the bones stronger [2].

Throughout the last few decades, grapes have been the main source for the production of wine. Along with this, several other fruits have appeared into as a substrate for the making of wine. Most of the wines made from the grapes are still sweet or dry, may be white, rose or red wines (8-14% alcohol). Desert wines (>14 alcohol) are prepared by fortification with herbs or spice mixture and these may be white or red and sweet or dry. Sparkling wines (10-12% alcohol, excess of CO₂) giving effervescence like a carbonated beverage. Alcoholic beverage with characteristic flavour of the particular fruit like banana, apple, pear, plum, apricot, cherry, dates and mango are broadly termed as fruit wines. Furthermore, the seasonal availability and high cost of grapes in the tropical regions has also necessitated the search for alternative fruit sources in tropical countries [3]. Moreover, herbs can also be used for wine production by considering the health profits. Herbal wines include the alcoholic extract of herbs; usually with an ethanol percentage of 12-38 [4]. Herbs were used for their traditional medicinal values, the wine-making process being merely the method of preservation [5].

Tulsi or Holy Basil (*Ocimum tenuiflorum*) also known as *Ocimum sanctum* is an aromatic plant in the family Lamiaceae. Applications of holy basil leaves are known to reduce ring worm affected areas, insect bites, inflammation, acne, additionally, it is medically proven to control diabetes, cold and cough, osteoporosis.

Regular use of this herb strengthens nerve tissue, promotes clarity of mind, increases memory and eases nervous tension [6].

Measures

Brix Refractometer, is an instrument which measures the percentage of sugar in a pure sucrose solution. This instrument uses light refraction to identify a sample, determine its purity and measure the concentration of particular substance (sugar) in that sample. Brix (symbol °B) is the sugar content of an aqueous solution. One degree Brix is 1 gram of sucrose in 100 grams of solution and represents the strength of the solution as percentage by weight (% w/w). The titratable acidity of fruit juice/wine is measured by *Titration method* [7]. Titration is a technique where a solution of known concentration is used to measure the concentration of an unknown solution. Typically, a titrant (known solution) is added from a buret to a known quantity of analyte (unknown solution) until the reaction is complete which is often indicated by a color change. Titratable acidity (TA) is the measure of the amount of acid present in a solution. It is expressed as grams/liter (g/L) and is obtained by multiplying to percent TA by 10.

To measure the ethanol/alcohol content in wine, *distillation column* [8] can be used. Distillation columns are made up of several components including vertical shell, trays/plates, reboiler, condenser and reflux drum etc.

PROCEDURE:

For the preparation of wine, juice was extracted from three sources. Holy basil leaves were put in boiling water and allowed to steep for an hour. Simultaneously, dates were chopped then boiled gently for half an hour. It is then cooled and strained. Banana pulp was sliced and blended with water (1:2, pulp: water) in a blender. The slurry obtained was then filtered through a muslin cloth. The fruit juice thus obtained was analyzed for pH, titratable acidity, total soluble solids (°B), total sugars and reducing sugars after filtration through double muslin cloth. Inoculation of fruit juices was done by using Yeast strain of *Saccharomyces cerevisiae* MTCC 3089 and allowed to ferment. During fermentation of wine, brix, titratable acidity and ethanol content were measured on daily basis. For assessing sugar content in wine, hand refractometer was used, on which two drops of sample was applied and determined. The titratable acidity was determined by taking fruit juice/wine (10 ml) in a conical flask (250 ml) and few drops of phenolphthalein were added to it. It was then titrated against 0.1N NaOH and total acidity (%) in

terms of tartaric acid was calculated by using following formula,

$$\text{Total acidity (\%)} = \frac{\text{Volume of NaOH used} \times 0.0067 \times 100}{\text{Volume of sample taken}}$$

Ethanol content in three different juices/wines was measured by distillation technique. The specific gravity of distillate was determined by dividing the weight of distillate by weight of distilled water.

$$\frac{\text{Weight of distillate @20}^\circ\text{C}}{\text{Weight of distilled water @ 20}^\circ\text{C}} = \text{Specific gravity of distillate}$$

Results

Brix of fermented wine:

The brix of the juices were originally set as 21 which was decreased rapidly during first three days. On the other hand, slow but sure decrease was observed on later days (Table 1). The total soluble solids were recorded least for banana wine followed by date wine while holy basil wine had the highest brix as 4, 5 and 6 respectively.

Titratable acidity:

The titratable acidity has increased over fermentation period (Table 2). The percentage of tartaric acid was 0.87%, 0.39% and 0.26% in banana wine, date wine and holy basil wine respectively at the end towards fermentation. The highest acidic content of wine was found in banana wine. In holy basil wine, the acidic content was the lowest of all the three wines. Whereas, during fermentation, activity by yeast cells naturally produces a small amount of acetic acid also. In the present study, the acetic content of the three wines was 0.70%, 0.75%, 1.11% for holy basil wine, date wine and banana wine.

Ethanol content:

The ethanol or alcohol content (% by volume) of wine was determined by distillation. After the distillation, for all the three wines specific gravity was obtained by using hydrometer. The specific gravity values were then matched for alcohol content from the table. The banana wine counted for the highest alcohol content of 11.68%, followed by date wine which had 7.29% alcohol while holy basil wine had the least alcohol content of 5.51% (table 3).

DISCUSSION

The alcohol percentage produced during fermentation depends upon amount of sugar present in the juice. At the end of fermentation if value of brix is less it means more alcohol production. As in starting of fermentation the brix of different juices was set to 21 but at the end, brix of banana wine was least out of three wines. A total soluble solid of 4.8 was recorded for banana wine produced by Akubor P.I. [9] at the end of fermentation of 14 days and 2.5×10^3 at 0hr to 5.0×10^3 at 168hr [10].

Tartaric acid is the most volatile of the primary acids associated with wine. The normal range should be 1-3% in wine. Tartaric acid of 0.15% was produced in date wine [11] and 0.85% in banana wine [9] whereas highest average value of $1.348 \pm 0.072\%$ was seen among wine produced by 5 different samples of banana wine by Obaedo M.E. [12]. The aim of the present study was to check the acceptability of holy basil as wine which was proved when it also produces sufficient amount of tartaric acid and ethanol content, which was comparable to banana wine and date wine.

Furthermore the ethanol content of three wines was closely related with the results given by Obaedo M.E. from five different bananas samples of which highest alcohol content was 12.5% where as 5% alcohol produced in case of banana wine [9] and 5.5% for date wine [11].

So, current research proves that pure herbal wine can also be

produced as in this study leaves of holy basil were used from which juice was extracted and fermented. The requirement criteria needed by wine (fruit wine) was fulfilled by holy basil wine.

CONCLUSION

To conclude it can be said that leaves of holy basil can be used to prepare pure herbal wine. All the parameters like brix, titratable acidity and ethanol content were found within normal range for holy basil wine as well as for both the fruit wines. Due to its medicinal and therapeutical properties, the holy basil wine can be a good option for fermented beverages. The outcome of this study may expand the utility of holy basil and other herbs for the production of herbal wine and can be a good alternative to fruit wines.

Table 1: Brix of wine samples during fermentation

Days of Fermentation →					
	3	5	7	9	11
Wine Samples ↓					
Holy Basil wine	11	8	7	7	6
Banana wine	7	6	6	5	4
Date Wine	7	6	6	6	5

Table 2: Titratable acidity of wine samples during fermentation

Days of Fermentation →						
	3	5	7	9	11	
Wine Samples ↓						
Holy Basil wine	TA	0.06	0.10	0.16	0.21	0.26
	AA	0.48	0.58	0.66	0.68	0.70
Date wine	TA	0.12	0.17	0.25	0.32	0.39
	AA	0.54	0.62	0.69	0.72	0.75
Banana Wine	TA	0.28	0.35	0.51	0.64	0.87
	AA	0.71	0.78	0.87	0.91	1.11

Note: TA = tartaric acid, AA = acetic acid

Table 3: Ethanol content after completion of fermentation

Wine Samples	Alcohol Content (% by volume)
Holy basil wine	5.51%
Banana Wine	11.68%
Date Wine	7.29%

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