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Wine Preparation from Different Fruit Substrates

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Abstract

The present study involves the production of wine by using different fruit substrates, especially beet root and betel leaves. Two sets of wine were prepared, one with betel leaf and other one without betel leaf. Different parameters like acidity, pH, sugar content and alcoholic content were checked in both sets of wine and compared with each other.

Keywords: *Saccharomyces cerevisae,* Betel Leaf, Beet Root

Introduction

Wine is an alcoholic drink that is prepared from grape juice typically. It can be made from other fruits, depending upon their acid content.Apples and berries are used for wine production [1]. We can add some more flavors to wine by using various flowers, herbs, etc. Betel leaf can also be used as ingredient in wine making as it consist of pepper and kava having many medicinal properties. Betel leaf has antimicrobial and antihistaminic activity[2-3]. It has antidiabetic activity also[4]. The essential oil isolated from betel leaf can be used as an antiseptic[5]. We can also use beetroot to make wine as it will add color to wine and has abundant nitarte. β-sitosterol is present in root of this plant[6]. Wine is produced by fermentation of raw material with the help of yeast such as *Saccharomyces cerevisiae*[7]. Different strains of yeast can be used depending upon type of wine. During wine making process the yeast utilizes raw material and alcohol production takes place[8]. If raw material contain more starch, then it resembles beer more than wine. Bitter and sweet oranges can also be used to prepare wine. Wine has wide range of applications e.g. Red wine protects us from heart attack[9].

Material and Methods

For the preparation of wine various parameters such as sugar content, acidity, pH and alcoholic content were measured. For the determination of all these parameters various laboratory tests were done.

Materials used for wine making: Set 1: Without betel leaf, Set 2: With betel leaf.

Procedure: All these fruits were properly checked and washed. After the washing of fruits they were properly dried. Grapes were destemmed and crushed in the grinder. Apples and gingers were crushed without removing the peels. Beetroot was peeled off and grinded. Beetroot was used to impart colour to the wine. Betel leaves were crushed and juice was added. Oranges were peeled off and the juice of all fruits was filtered through muslin cloth. All these fruit juices were added in a given ratio. All the parameters such as sugar, and pH were checked before the inoculation. The sugar content is measured in BRIX. Sugar syrup was added to the wine to set sugar level of 25˚ BRIX in refractometer ((Erma, Japan). The measured pH was 2.5. *Saccharomyces cerevisae* was added in the juice and kept for incubation at 25ºC for 10 to 12 days[7].

Table-1
Showing fruits ratio

Fruit	Quantity
Grapes	160 ml
Apples	60 ml
Oranges	60 ml
Ginger	60 ml
Beetroot	60 ml

Table-2
Showing fruit ratio

Fruit	Quantity
Grapes	160 ml
Apples	60 ml
Oranges	60 ml
Ginger	60 ml
Beetroot	60 ml
Betel leaf	4 to 5 leaves

Sensory Evaluation: The sensory parameters of wine like taste, colour, aroma, appearance and flavor are evaluated by using an evaluation system[10]. The results are depicted in table-3.

Estimation of sugar content: The estimation of sugar content in wine was done by DNS method (Dinitrosalicylic)[11]. Table 4 and table 5 shows the comparison of sugar content of both the wines.

Determination of pH: A crude approximation of a wine's pH can be measured using pH Meter (Sigma digital pH meter). The pH of wine was adjusted by adding concentrated hydrochloric

acid and it was maintained between 2-3 intiaiily. (table -6, table-7 and figure-1, figure-2)

Determination of acidity: The acid content in wine is of great significance for the preservation and sensory characteristics of wine. Titration acidity is commonly within the range 4.0-8.0 g/dm. The determination of acidity was done by the titration method[12]. Table-8, table-9 and figure-3, figure-4 shows difference in acidity of both the wine.

Determination of alcoholic content: Specific gravity of wine was calculated by using a hydrometer [1].The alcohol content of the wine was determined by using Triple scale Hydrometer for wine. The results of both of the wines are compared in table-10, table- 11 and figure -5, figure-6.

Results and Discussion

Sensory parameters: The wine was analyzed according to taste, colour, aroma, appearance and odour. These sensory parameters of both the wines were analyzed separately.

Table-3
Showing different sensory parameters of wine

Sensory parameters	Sample 1 (without betel leaf)	Sample 2 (with betel leaf)
Appearance	Clear	Clear
Colour	Light reddish	Light reddish
Taste	Dry	Pungent
Odour	Vinous	Pleasant

Physiochemical parameters: The physiochemical parameters include the estimation of sugar content, pH, acidity content and the alcoholic content.

Estimation of sugar content in wine samples: The DNS method was applied for the estimation of sugar content on the basis of standard graph in both the wines[11].

Table-4
Showing sugar concentrations in wine samples

Sample	Sugar concentration (µg/ml)
Without betel leaf	120
With betel leaf	160

Sugar level in Brix: The sugar content was measured in degree Brix at different intervals. Initially the sugar content was set at 25^{0}Brix by adding sugar syrup . The sugar content in wine without betel leaves was reduced from 25^0 to 10^0 Brix and the sugar in wine with betel leaf reduced from 25^0 to 12 ^{0}Brix .The sugar content reduced during fermentation as the sugar gets converted into alcohol and carbon dioxide. T he sugar content was measured by the refractometer and reducing sugar contents were measured by DNS method[11].

Table- 5
Showing sugar level in wine samples

Wine sample	Sugar level (day 1)	Sugar level (day 6)	Final sugar level after fermentation
Without betel leaf (1)	25˚brix	14˚brix	10˚brix
With betel leaf (2)	25˚brix	15˚brix	12˚brix

pH: It is necessary to check pH of wine as pH influences many properties of wine like colour, oxidation etc.

Table-6
Showing change in pH in wine sample without betel leaf

Sample	pH						
	Day 1	Day 2	Day 4	Day 6	Day 8	Day 10	Day 12
Without betel leaf	4.5	4.2	3.5	3.2	3.0	3.0	3.0

The pH in wine sample without betel leaf reduced initially but after few days of fermentation it remained constant.

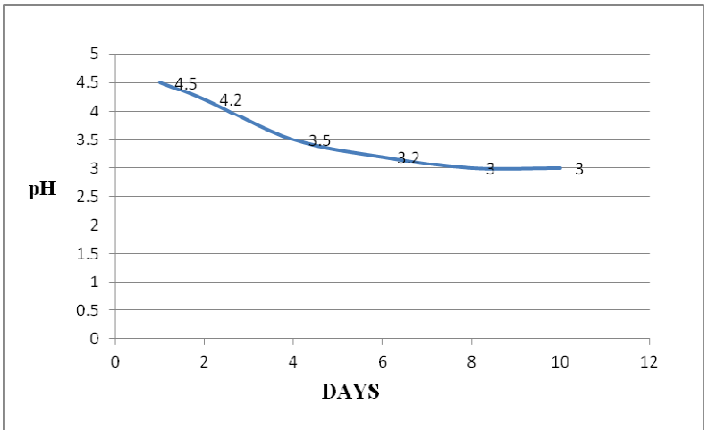

Figure -1
Showing change in pH in wine sample without betel leaf

Table -7
Showing change in pH with change in fermentation days in betel leaf wine

Sample	pH						
	Day 1	Day 2	Day 4	Day 6	Day 8	Day 10	Day 12
Betel leaf	5	4.5	4.2	4.0	3.2	3.2	3.2

The observed changes in the pH of the wines could be due to production of acids with period of fermentation. The pH of wine with betel leaf reduced from 5 to 3.2. The pH of the juice was checked initially before fermentation on day 1.

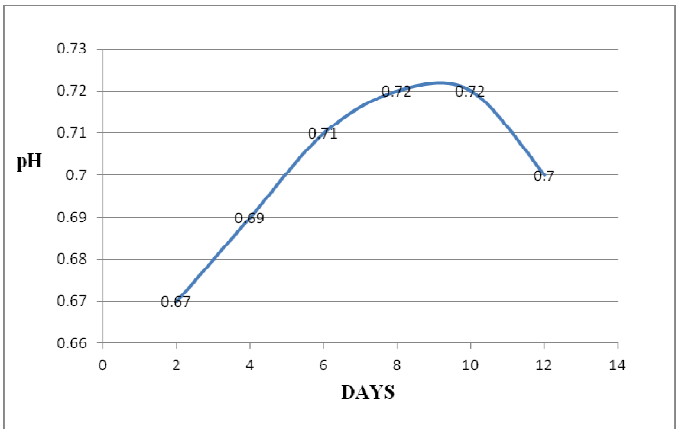

Figure-2
Showing change in pH in wine sample with betel wine

Acidity: The acidity allows wine to maintain its freshness. The acidity of wine prepared from fruits was measured by the titration method[12]. The wine without betel leaves showed more acidity than the wine containing betel leaves betel leaves.

Table-8
Showing percentage of acidity in wine sample without betel leaf

Sample	Acidity%					
	Day 2	Day 4	Day 6	Day 8	Day 10	Day 12
Without betel leaf	0.67	0.75	0.71	0.72	0.74	0.75

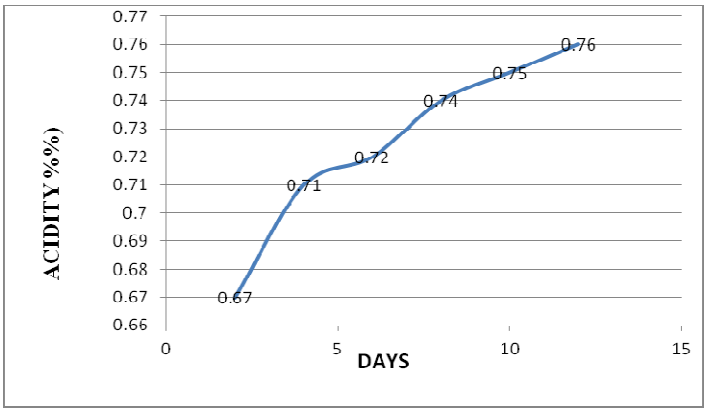

Figure-3
Showing acidity percent in wine sample without betel leaf

Table-9
Showing acidity percentage in wine sample with betel leaf

Sample	Acidity%					
	Day 2	Day 4	Day 6	Day 8	Day 10	Day 12
Betel leaf wine	0.50	0.55	0.65	0.70	0.72	0.85

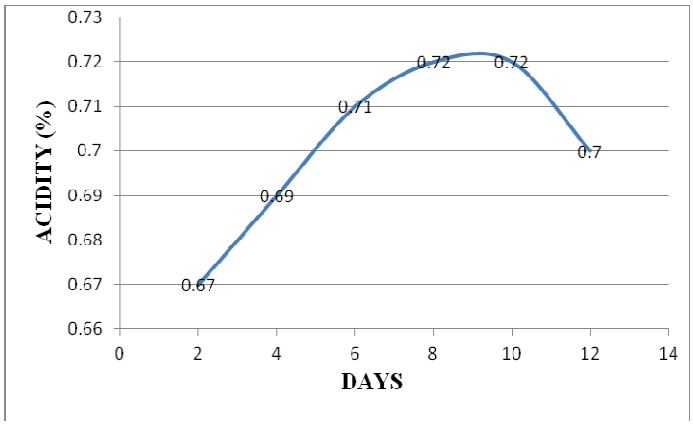

Figure-4
Showing acidity percent in wine sample betel leaf

The acidity in wine containing betel leaves showed increase in the acidity percent. The acidity of the wine can be maintained by adding acids such as citric and malic acids which are generally lost during fermentation.

Alcoholic content: The alcohol content in this wine sample without betel leaves started increasing from day 4 to day 12. The final alcohol content in this without betel wine increased from 4% to 14% till 12 day of fermentation. The alcohol content depends on the amount of sugar present in the. The alcohol level increase with increase in fermentation and the sugar level decreases which leads to the increase in alcohol content. The alcoholic content in wine should be between 8 and 14%[14].

Table-10
Showing alcoholic content in wine without betel leaf

Sample	Alcohol content(v/v)					
	Day 2	Day 4	Day 6	Day 8	Day 10	Day 12
Without betel leaf	5	6	9.8	10.2	11	14

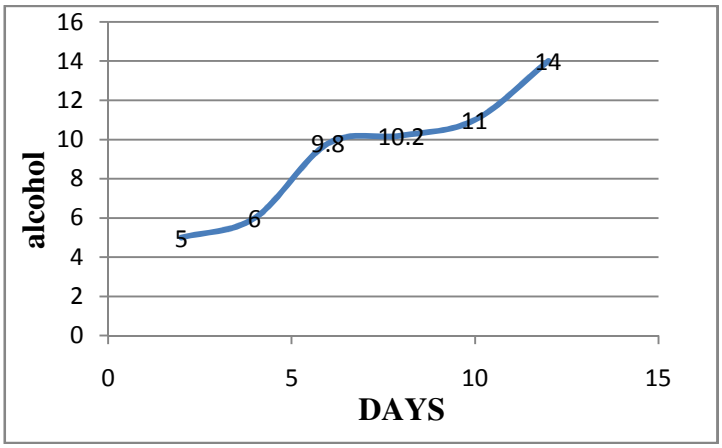

Figure-5
Showing alcoholic content in wine without betel leaf

Table-11
Showing alcoholic content in wine sample with betel leaf

Sample	Alcohol content(v/v)					
	Day 2	Day 4	Day 6	Day 8	Day 10	Day 12
Betel leaf	6	6.2	7	10	10	12

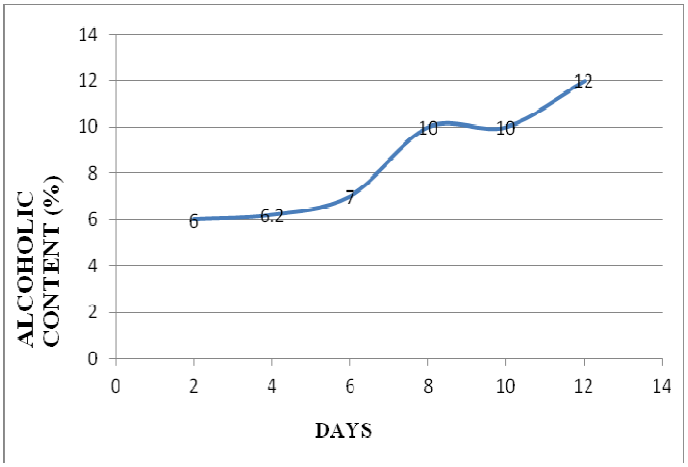

Figure-6
Showing alcoholic content in wine sample with betel leaf

From the above results it has been concluded that both the wines showed differences in sugar content, pH, acidity and alcoholic content. Both the wines were different in taste and odour but the appearance of both of them was similar.

Conclusion

Two sets of wine were prepared, one was with betel leaves and another was without betel leaves. The differences in results of sensory parameters, pH, alcoholic content, acidity, sugar level etc. were compared with each other.

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