

Preparation of an edible fruit based alcoholic beverage and fortification with specific household nectar

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Abstract:

Fruit based fermented alcoholic beverages are made from a variety of fruits as the base material, also sometimes referred to as fruit wine. In a broader sense, fruit wine can be made from virtually any plant matter that can be fermented. Most fruits have the potential to produce wine; however only few fruits other than grapes have the balanced quantities of sugar, acid, tannin, nutritive salts for yeast feeding and water to naturally produce a stable and drinkable wine.

Aim: In our current study, the alcoholic beverage has been produced by using tamarind (*Tamarindus indica*) as substrate and fermentation was carried out by inoculating suitable yeast culture.

Method: The Fermented beverage was tested for different parameters after which it was fortified using honey; to increase its nutritional qualities and palatability. The organoleptic acceptability of this fortified beverage was assessed by using a group of panelist on the basis of five point hedonic scale.

Result: The experiment revealed that drink number 9 is the most acceptable one among the panelists.

Conclusion: Further tests can be done for scale up and enhancing the characteristics of this beverage.

Keywords: Alcoholic beverage, Fermentation, Fortification, Fruit wine, Honey, Nectar.

INTRODUCTION

Alcoholic beverages forms one of the largest group of industrially manufactured product that is globally recognized. The pattern of alcohol consumption also depends on various factors such as region, temperature, climate, age, socio-economic background etc. [1]. Such beverages comes in various forms being prepared from various substrates that can be conventional like grapes, cereals or some other plant parts or unconventional like fruits, seeds or flower [2,3]. With increase in consumption worldwide, especially wine, they are now shifting towards more sustainable processes and adapting them in order to meet the demand as well as minimize the impact on environment due to industrialization [4].

Tropical country like India is one the largest producers of fruit wine since it produces so many varieties of fruits that are not only providing variations in taste but also nutritionally enriched [5].

Though the term fortified wine is typically used for wines that is blended with brandy and honey wine or mead is produced by fermenting aqueous solution of honey, our current study experimented on the production and honey fortification of fruit based tamarind wine and two step sensory evaluation to determine the most acceptable ratio of in terms of perception of the panelists. These novel fortified wines are not only tasty but also enhances the overall nutritional quality of the wine.

MATERIALS AND METHODS

The alcoholic beverage from tamarind is usually prepared using a traditional method. This method is also used by homemakers to make beverages out of tamarind at home. This home process can be modified in lab scale and used for preparation of the beverage.

Preparation of starter culture

For the preparation of starter culture, tamarind stock was prepared using 0.06 kg tamarind and mixing it with 100 ml

of water. It was mixed thoroughly using mild hand pressure to make it a pasty slurry and kept it for some time. The slurry was then filtered using cheesecloth and the brownish filtrate is mixed with more water to keep the total volume 100 ml. The total soluble solid and pH was adjusted to 15 and 4.1 respectively. The stock was then pasteurized at 60° C for 30 minutes and Yeast was added to this substrate at the rate of 0.02% w/w which was allowed to grow for 48 hours at 30° C in aerobic condition [6].

Preparation of substrate

1 kg of tamarind stock was taken and mixed with 1.5 liter of water and the extract was filtered using cheesecloth. The total soluble solid was adjusted at 18-20 ° Brix [7, 8]. The pH of around 4-4.5 [6] was maintained in the broth. The juice was then pasteurized at 95° C for 10 minutes [9] and cooled to prepare the final substrate.

Fermentation process

The substrate was then filled into ¾ th of the container and the starter culture was added at the ratio of Starter: Substrate= 1:9 by volume and mixed thoroughly. The container was then sealed in all sides keeping a small open air passage. It was left in this aerobic condition at 30° C [8] for 2-3 days for the yeast to grow and produce enough cell that may perform fermentation later. After this, the passage was closed and fermentation was allowed to take place for 3-4 weeks at the same temperature. When fermentation was over, the bubbling stopped and the wine was ready for racking and bottling.

Measurement of characteristics of the beverage

Different quality tests like color, appearance, taste, pH, titrable acidity, reducing sugar and alcohol content of the beverage prepared was performed using standard protocol. Measurement of color, appearance and taste was done manually by visual inspection or tasting. The pH of the raw sample was measured by using pH paper and verified by digital pH meter. The measurement of titrable acidity was done by standard acidimetry- alkalimetry method using

phenolphthalein as the indicator [10]. Tartaric acid was the standard with respect to which measurement has been taken. The reducing sugar content was measured using DNS method [11]. The alcohol content was measured by using dichromate method (University of Canterbury).

Fortification with honey and sensory evaluation

Honey was added to the prepared fermented beverage as the fortifying agent to increase the palatability and nutritional quality of the beverage. Fortification was done using different concentrations of honey.

A sensory evaluation was performed in two rounds; the first round consisted of 15 panelists and second round of 10 panelist. It was evaluated in 5 point hedonic scale [9] to evaluate palatability and acceptability by consumers. The color, taste, flavor, appearance and overall acceptability of the prepared beverage was taken into consideration here. The maximum number 5 represents “Most liked” and 1 represents the “least or not liked”. The first round included common people who were not experts but have general awareness about alcoholic beverages whereas the second round consisted of expert panelists in terms of sensory tests and sample differentiation as shown in (Figure 1).



Figure1: Labelling and sensory evaluation test using fortified tamarind wine



Figure 2: Freshly inoculated tamarind substrate ready for fermentation

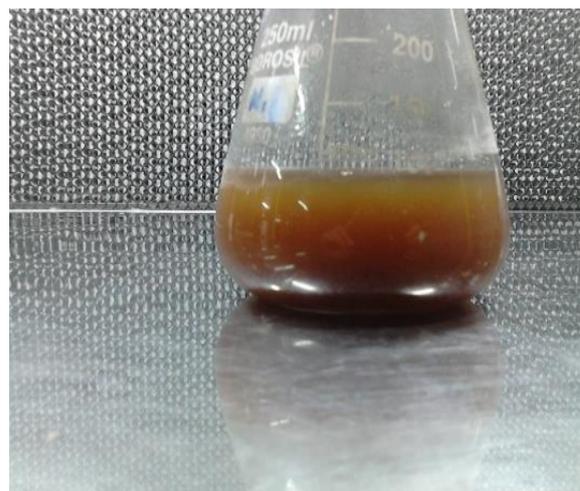


Figure 3: The fermented and clarified tamarind wine.

RESULTS AND DISCUSSION

Starter, substrate preparation and fermentation

The alcoholic beverage using tamarind was prepared by using certain modifications on the traditional method. Tamarind bears fruit only once a year. So, it is best to make large batches of tamarind stock. To make the stock, the shell of the fruit is peeled off and for each kilo of pulp 5 kilo of rock salt is added. Then it is packed and put in a cold dry storage.

After enough juice was extracted from the tamarind pulp, it was subjected to filtration by muslin cloth or cheesecloth in order to avoid any suspended impurities. This stock was inoculated using yeast that was previously activated. Wine Starter must be made two to three days prior to wine production.

Evaluation of different characteristics of the fermented beverage

Before fermentation started, the color of the substrate was very dark brown having tarty taste and is highly opaque in appearance as shown in (Figure 2). After fermentation was completed, the clarified fermented beverage was found to be yellowish brown in color, heavy and opaque in appearance and having a mix of sour and mild alcoholic taste as shown in (Figure 3).

The pH of the raw sample was measured by using pH paper and verified using digital pH meter. The pH paper gives a range of pH in and around 3-3.5; whereas the digital pH meter gives an exact reading of 3.19. Usually, major fruit wines throughout the world have a pH range of 3-3.5. The lower pH value eliminates the undesirable growth of other microorganisms keeping the shelf life of wine longer.

The measurement of titratable acidity by acidimetry-alkalimetry method gives initial and final readings based on which calculations are done using phenolphthalein as the indicator. Tartaric acid was the standard with respect to which measurement has been taken. The value for titratable acidity was found to be 1.0163 % w/v.

The reducing sugar content measured using DNS method gives an approximate reducing sugar content of 1.7025 mg/ml as obtained from the standard curve. The lesser value of reducing sugar is an indication of the sugar utilized by the yeast to perform fermentation.

Table 1: Result of the first round of sensory evaluation with different ratios of tamarind wine and honey

Panelist number	Sample 1 Wine : Honey 10:1	Sample 2 Wine : Honey 10:2	Sample 3 Wine : Honey 10:3	Sample 4 Wine : Honey 10:4	Sample 5 Wine : Honey 10:5
1	2.2	3.3	3.9	4.3	3.8
2	3.8	3.2	3.2	3.6	3.8
3	3.6	4	4.3	4.4	4
4	3.3	3.8	3.4	3.22	3.2
5	3	3	3.4	3.7	3.4
6	4	4.4	4.6	4	3.8
7	3.4	2.8	2.8	3.2	2.7
8	3.4	3.3	3.5	4	3.6
9	3.4	4	4	4.4	4.1
10	4	4.2	4.2	4	3.4
11	3.6	4	4	4.3	4
12	3.2	3.2	3.2	4.3	4
13	2.4	2.9	2.9	3.2	3
14	3.4	3.6	3.6	4.4	4.2
15	3.1	3	3.3	4	3.6
Average	3.319	3.51	3.62	3.934	3.64

Table 2: Result of the second round of sensory evaluation with different ratios of tamarind wine and honey

Panelist number	S1 (100:31)	S2 (100:32)	S3 (100:33)	S4 (100:34)	S5 (100:35)	S6 (100:36)	S7 (100:37)	S8 (100:38)	S9 (100:39)	S10 (100:40)
1	4	4	4	4	4	4	4	4	4	4
2	2.2	2.2	2.2	2.6	2.6	2.6	3	3	3	3
3	3.6	3.4	3	3.2	3	3.4	3.2	2.2	3.6	3
4	3.2	3	2.4	3.4	2.6	3.4	3.2	2.2	3.6	3
5	3	3.4	4	3.6	4.2	3.2	3.8	4	4.4	3.4
6	3.4	3.8	3.8	4	3.8	4.6	4.4	3.8	3.6	4.2
7	3	2.8	2.8	3	3	3	3	3	3.4	3
8	2.8	2.3	2.9	3.8	2.8	2.6	2.7	1.8	2.6	2.2
9	2.8	3.2	3.8	4.2	4.2	4	4.2	4	4.4	4
10	3	3	3	3	3	3.2	3.8	3.6	3.4	3.2
Average	3.1	3.11	3.19	3.48	3.32	3.4	3.53	3.16	3.6	3.3

The alcohol content measured using dichromate method reveals an alcohol content of 4.89 % v/v. Akoma et al. in 2002, did cold and hot water extraction of tamarind pulp and after 14 days of fermentation using yeast, the titratable acidity was found to be 0.6 % at pH value 3.5 and 0.9% at pH value 3-3.1. He also found alcohol content of around 4% v/v with cold water extraction methodology [6].

Sensory Evaluation of the fortified wine

After the first round of sensory evaluation with 15 panelists, the results can be tabulated in (Table 1). The average value for all panelists suggests that sample 4 has been chosen as the best by maximum number of panelists which is having an average ratio value of 3.93.

A second round of sensory tests was performed in continuation of the first round of tests. All the panelists clearly opted for sample number 9 (Table 2) which contains about 39 ml of honey fortified in it. The average ratio value for it was 3.6 which was almost in conformation with the result of the first round of sensory evaluation.

Sensory evaluation also revealed that it was accepted by most panelists and consumers because of the blend of sour and sweet taste. Here addition of honey has not only enhanced the flavor of the tamarind wine but also helped to increase the nutritional and anti-inflammatory properties. Alcoholic beverages with alcohol content close to the

prepared tamarind wine are commercially available in the form of light beer, Chicha (homemade beverage from corn), breezers, palm wine, Shandy (beer + citrus soda or ginger ale) etc.

Although honey consist of natural sugar which are not having severe harmful effects like any refined sugar that are consumed on a daily basis, still care must be taken in consuming honey fortified products in case of people who are in strict no sugar diet or are suffering from diabetic alignments.

CONCLUSION

The current study based on the traditional method of preparation of tamarind wine was undertaken to study different aspects of this delicious alcoholic beverage. The idea was to add value to this product so that it gets an edge as a functional formulation in the market. Addition of honey has not only enhanced its flavor qualities but also increased its nutritional aspects as well. Since the beverage tastes good as confirmed by the two sets of sensory tests performed and the alcohol content also compares to some of the available commercial products in the market, it can be pursued as a potential product. Thorough toxicological tests and scale up of the process is only necessary to achieve this goal.

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