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Physicochemical Properties of Fresh and Stored Coconut Palm Toddy

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Abstract

Coconut toddy is an effervescence beverage tapped from young inflorescence of coconut tree, *Cocos nucifera*. The sap contains various nutrients, though it undergoes natural fermentative changes when it is stored. The physicochemical changes like pH, turbidity, acidity, alcohol content, total sugars, and total soluble solid, reducing sugar and non reducing sugar occurs in toddy on storage were analyzed. The toddy pH changed to 4.21 from 5.5 and the titratable acidity increased from 0.75 to 0.91 on storage. The lowest alcohol content of 0.2% was observed in fresh toddy which further increased to 4.5% on storage. The ash and ascorbic acid content of 0.12% and 5.8 mg/100ml found in fresh toddy increased to 0.38% and 3.5ml/ ml respectively. Whereas the total carbohydrates content of 66 mg/100 ml reduced to 40 mg/100ml after 24 hours storage.

Keywords: *Cocos nucifera*; Toddy; Physicochemical properties; Alcohol content

Introduction

Toddy is a sweetish, heavy, milky white, vigorously effervescent alcoholic beverage consumed as mildly alcoholic beverage similar to beer which is collected from palm tree. During ancient period, people drink palm wine in early morning in empty stomach before breakfast for health benefits. Palm wine has a special place in traditional celebrations and ceremonies such as marriages, burials and settling disputes. Generally, it is a popular drink among lower income people and it is believed to be good for the health, eyesight and also serves as a sedative [1]. It is made from the fermented sap of tropical plants of Palmate family, such as the coconut palm (*Cocos nucifera*), oil palm (*Elaeis guineensis*), date palm, nipa palm, kitul palm and raffia palm (*Raphia hookeri*) [2-4]. The palm wine undergoes lactic, alcoholic and acetic fermentation involving lactic acid bacteria, yeast and acetic acid bacteria as well as *Zymomonas and Leuconostoc.* The types and numbers of organisms encountered vary widely, even from tree to tree [5]. The main ingredient of the fresh palm sap is sucrose, which is about 12-15% by weight. There is very little reducing sugar, although glucose, fructose, maltose and raffinose are present. Most consumers prefer palm wine with whitish, pleasant sugary taste and also exhibit vigorous effervescence. Thus, if the collected palm wine is not consumed within a few hours, it begins to develop an unacceptable flavour which is not usually liked by the consumers. In the present work, the physicochemical changes occurred in stored coconut toddy was compared with fresh toddy properties.

Materials and Methods

Toddy was collected from coconut tree (*Cocos nucifera*) available at IICPT, Thanjavur campus farm. The emerging inflorescence was tied with string and tapped by wooden mallet daily in the morning and evening for ten days. The tip of the inflorescence was sliced about 2 cm from the tip on the 10th day and inserted into the toddy collecting mud pot. The sap oozed out from the inflorescence was collected and stored for 24 hours in a glass container at atmospheric temperature (28 ± 2°C) for analysis. The toddy samples collected fresh and stored for 24 hours were analysed for various parameters such as pH, turbidity, titratable acidity, alcohol, ash content total soluble solids, protein fat and ascorbic acid content by following regular methods [6]. Toddy was collected for five different days from two different coconut trees were analysed and mean value reported.

Result and Discussion

The fresh toddy on storage becomes turbid, more whitish in color, with fermentative odour. The fresh toddy had 5.5 pH which on 24 hours storage reduced to 4.21 pH (Table 1). The palm sap from *Borassus flabellifer* had the pH value of 7.20 and 6.00 pH in fresh and fermented sap respectively as reported by Barh and Mazumdar [7], whereas in the present study, the pH reduces to 4.2 on storage [8], as reported according to which the volatile acidity of the fresh and fermented palm wine were 4.92 and 0.89 gl^{-1} respectively.

In the present study, the titratable acidity of 0.75 gl^{-1} observed in fresh toddy increased to 1.78 gl^{-1} in stored toddy. It might be the reason for reduction in pH and sourness of the 24 hours stored toddy when compared to the fresh one.

The ash, protein and ascorbic acid content of 0.12 g/100 ml, 0.23 g/100 ml and 3.5 mg/100 ml respectively observed in fresh toddy has been increased to 0.38 g/100ml, 0.85 g/100ml and 5.8 mg/100 ml in

S.No	Parameters	Fresh toddy	Stored toddy (24hrs at 28 ± 2°C)
1	pH	5.5 ± 0.03	4.21 ± 0.0.2
2	Turbidity	75.2 NTU	152 NTU
3	Titratable acidity (g l-1)	0.75 ± 0.02	1.78 ± 0.02
4	Alcohol content (V/v)	0.2	4.5
5	Ash	0.12 g/100ml	0.38 g/100ml
6	Total soluble solids (%)	14.1 ±1.4	11.4 ± 0.94
7	Protein	0.23g/100 ml	0.85 g/100ml
8	Fat	0.02 g/100 ml	Nil
9	Ascorbic acid	3.5mg/100 ml	5.8 mg/100ml
10	Yeast plate count	3.2 x 10^{-1} CFU/ml	8.5 x 10^{-3} CFU/ml

*Ranges shown here are the mean values of 10 samples

Table 1: Physico chemical properties of fresh and stored coconut toddy.

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stored toddy. The microorganism like yeast and lactic acid bacteria are observed in the toddy, that are present naturally and in collecting mud pot which were retained during previous collection of toddy serves as an inoculum. The microorganism multiply and also utilizes the total soluble solids and carbohydrates present in the toddy and ferment to make it alcoholic. Meanwhile, the lactic acid bacteria increased the acidity and ascorbic acid content. The alcohol content in fresh toddy was 0.2% V/v and it increased to 4.5% after 24 hours. It was also reported that the alcohol percentage ranged from 2-8% in Palmyra wine [9]. The fermentation causes the increase in alcohol content and it is evident from that the increase in yeast population from 3.2 x 10^{-1} CFU/ml to 8.5 x 10^{-3} CFU/ml on 24 hours storage. The increased protein content might be because of the yeast cells itself. The total soluble solids are utilized by the microorganisms and the content reduced to 11.4% in stored toddy compared to 14.1% observed in the fresh sample. Also, it was reported that 12 to 15% sucrose content was present in fresh palm toddy. The fat content observed was very less and negligible in both fresh and stored toddy.

Conclusion

The physicochemical properties of traditional local drink of coconut toddy showed that fresh toddy contains 14.1% of total soluble solids which on natural fermentation during storage reduced to 11.4%. However, alcohol, protein and ascorbic acid and titratable acidity were increased as the fermentation changed the properties of fresh toddy and hence it has to be consumed within 12 hours of collection itself to avoid acidic or sour taste.

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