

Research Article

Perception of off-odour with pH and colour changes in street vended coconut juice

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Abstract

In this study, the perception of off-odour with pH and colour changes in street vended coconut juice was determined. The coconut juice was exposed and let stand at selling environment (34°C) for 12 hours. Results of the pH value of the coconut juice decreased from its initial value of 5.90 to 3.31. After 12 hours of standing of the coconut juice, whiteness and turbidity of the samples were perceived as per the results indicated from the sensory evaluation and it was confirmed by the results determined by colour analysis with the values significantly increased on the 10th to 12th hour with ΔE mean values from 11.80 to 21.70 respectively. With the manifestation of the physico-chemical changes namely the lowering of pH values, turbidity, and perception of off-odour, the study concludes that the exposure of coconut juice at environmental conditions for prolonged hours causes deterioration.

Keywords: food safety, quality, sensory evaluation, deterioration, *Cocos nucifera*, Philippines.

Introduction

The FAO/WHO Codex Alimentarius Commission [1] defined “street-vended foods” or street foods” as ready-to-eat food and beverages prepared and sold by vendors and hawkers especially in streets around markets and other public places. Consumption of street food has always been a part of the Filipino culture with about one-third of the total food budget per household spent on street food [2]. Street food provides a cheap, tasty and convenient source of nourishment for urban Filipinos on a daily basis. However, more than just being a convenient source of nourishment, it is also a source of employment and income in the country. In fact, street-food vending has become the most visible segment of the urban informal economy in the Philippines. There are about 200,000 street vendors in Metro Manila [2]. Despite providing immediate nourishment to urban Filipinos, there are also health risks associated with consumption of street-vended food and beverages. According to Harmayani [3], some of the problems associated with street-food vending include unhygienic practices of the street vendor resulting in microbial contamination of the food and lack of basic amenities such as potable water.

Coconut (*Cocos nucifera L.*) water, also referred to as coconut juice, is a refreshing natural drink common and mostly consumed in the tropical regions of the world [4, 5]. It is a clear, colourless, sweet, naturally flavoured slightly acidic drink, with reported pH ranging between 4.2 and 6.0 [6]. In some countries it is refrigerated and sold in tetrapaks or fermented and combined with other juices [7, 8]. Studies conducted for over six decades on coconut water showed that it is rich in carbohydrates and minerals with potassium being the most abundant [9]. It is also a rich source of essential amino acids, fatty acids, glucose, fructose, cellulose, sucrose and organic acids [10, 11].

Coconut juice, or *Buko* juice in the Philippines, is a popular street-vended cold beverage commonly sold in plastic disposable cups. It is a mixture of fresh coconut water obtained from mature green coconuts, sugar and ice. Other popular street-vended beverages in the Philippines include the “*iskrambol*” (artificially flavoured drink with crushed ice) and “*sago at gulaman*” (a refreshing drink made from tapioca and jelly with sugar syrup as sweetener). However, despite numerous nutritional benefits, consumption of this street-vended beverage poses a significant public health problem due to inadequate public awareness of hazards associated with certain street food. Recommendations of FAO [1] on street-vended cold beverage included using potable water in preparation of the *buko* juice and keeping it at $<4^{\circ}\text{C}$ and observing proper holding time to avoid growth of pathogens.

When the coconut water is still in the undamaged fruit, it is stable and sterile. However, once it is extracted from the coconut fruit, it becomes unstable [11]. Despite its wide consumption, there is little information on the quality of the street-vended coconut juice. Consumers of this beverage are familiar with the sensory properties but have limited knowledge specifically on the changes that occur in its sensory and physicochemical properties. It is therefore the objective of this study to determine sensory perception of off-odour and monitor pH and colour changes in street-vended coconut juice exposed to actual selling environmental conditions at around 34°C for 12 hours.

Materials and Methods

Collection of coconut juice samples

Freshly prepared coconut or *buko* juice samples were bought in España, Manila, Philippines, let stand and exposed at actual selling environment conditions for 12 hours for further analysis.

Sensory evaluation of coconut juice samples

Fifteen (15) semi-trained panellists composed of a mixture of Food Science and other science major graduate students from the University of Santo Tomas Graduate School, Manila, Philippines were given coconut juice samples in their actual serving cups. The samples were described based on their attributes by writing a vertical line on a 10-cm line scale based on the appearance from 0 (whitish/very turbid) to 10 (clear), intensity of coconut aroma from 0 (no perception) to 10 (strong perception) and off-odour from 0 (sour smell) to 10 (no off-odour). Sensory evaluation of samples was conducted every 4 hours for 12 hours.

pH changes

Fifty (50) ml sample of the coconut juice was placed in a glass beaker and stirred for one minute. The pH of the sample was measured using an Orion pH meter. The electrode of the pH meter was dipped in the glass beaker containing the sample. The pH was monitored every 2 hours for 12 hours.

Colour changes

The colour was determined using a hand held-Minolta Chromameter (Minolta CR-300 Series, Japan) set against the standard white tile plate where L=0 means black, L=100 means whiteness; +a=redness, -a = greenness; +b = yellowness, -b = blueness. The change in colour or ΔE was computed. The colour was monitored every 2 hours for 12 hours.

Data analysis

The means of data were evaluated with One-Way Analysis of Variance (ANOVA) at 95% confidence level using Statist XL. T-test was also used when applicable.

Results and Discussion**pH changes**

The pH changes of coconut juice samples exposed at 34°C was significant except for the 6th hour. As can be seen in Figure 1, the coconut juice sample showed an overall decrease in pH mean values from 5.9 to 3.1 with time respectively. One method for the detection of spoilage would be the decrease in pH of the coconut juice. Also, high temperature stimulates the respiratory rate of the coconut which then leads to rapid quality deterioration of the coconut juice [12].

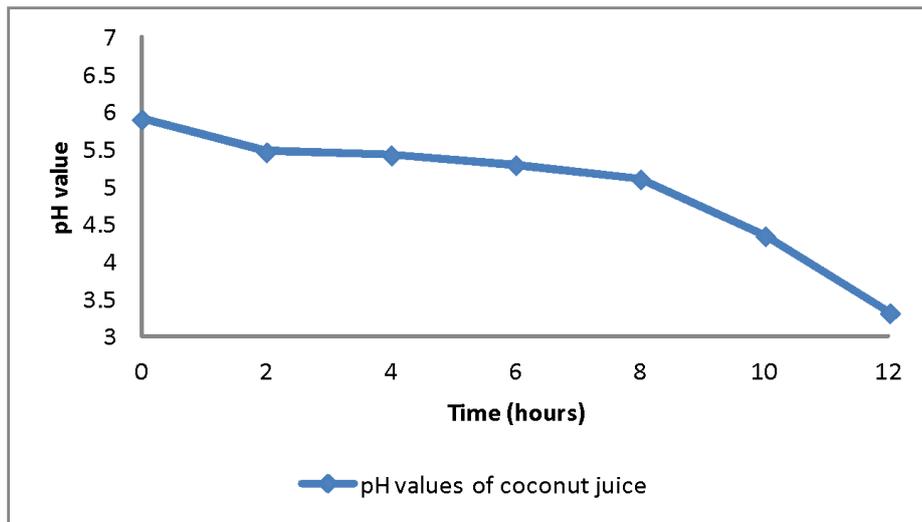


Figure 1. Mean pH values of coconut juice exposed to actual selling environment conditions for 12 hours.

Colour changes

A significant change in colour was obtained on the 10th and 12th hour for the coconut juice samples with ΔE mean values ranging from 11.80 to 21.70. There was also an increase in the L* or lightness mean values from 38 to 59 which means the appearance of the coconut juice is becoming whitish or turbid indicating spoilage of the juice which was also in conformity with findings by FAO [12].

Sensory evaluation

The sensorial analysis resulted in the perception of off-odour in coconut juice samples on the 8th hour. Coconut juice likeness for the overall sensorial properties decreased significantly on the 8th hour. This was caused by the microbes that have begun the process of breaking down food molecules for their own metabolic needs. Sugars and easily digested carbohydrates are used first, and plant pectin is degraded. Then proteins are attacked, producing volatile compounds with the characteristic smell of sulphides [13].

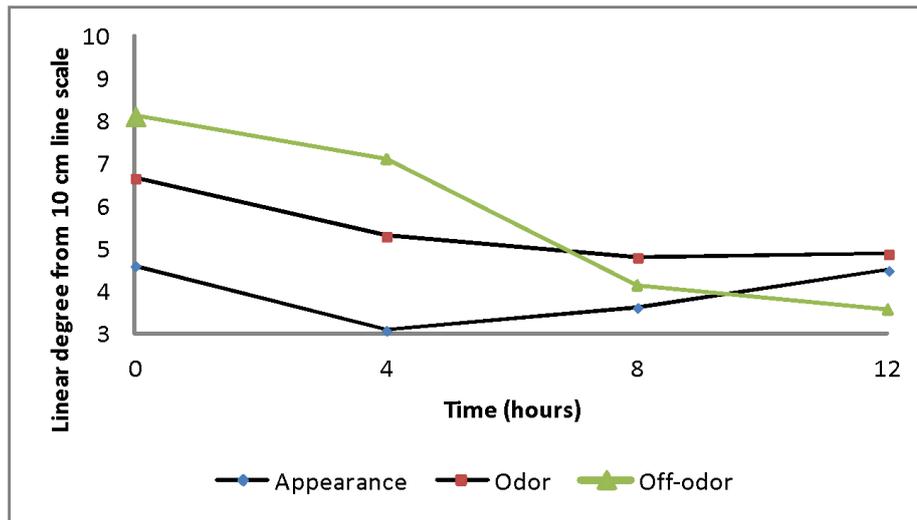


Figure 2. Mean linear values of the sensory evaluation of coconut juice exposed to actual selling environment conditions for 12 hours.

Conclusion

The present study was able to determine sensory perception of off-odour or sour smell in coconut juice on the 8th hour exposed under actual selling environment conditions for 12 hours. Similarly, appearance and manifestation of the off-smell in coconut juice is correlated with the development of a turbid or whitish coloured juice.

This study was able to provide baseline data on the quality assessment of street-vended coconut or *buko* juice in the Philippines. The study proposes that to maintain the quality of street-vended coconut juice, it should be kept at a temperature of 4°C and the acceptable sensory quality is preserved of street-vended coconut juice within 2-4 hours after preparation. Also, future studies should be undertaken on the microbiological aspects of the street vended coconut juice to further substantiate the safety or otherwise of the consumption of street vended beverages.

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