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COLOUR BASED QUALITY DETERIORATION OF TENDER COCONUT WATER

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Coconut water, as a tropical fruit juice, is highly valued and consumed in tropical area since it is tasty and has desirable nutritional and therapeutic properties. Coconut (Cocos nucifera L.) fruit is filled with the sweet clear liquid "coconut water" when the coconut is about 5 to 6 months old. But after harvesting the water content reduce rapidly, which contributes to the post harvest loss of tender coconut water. Therefore, there is a need for processing to preserve the water for longer time. Once it's exposed to air, it loses most of its sensory and nutritional characteristics and deteriorates, where microbes and enzymes are the key reason for spoilage. In this study color based change in quality of tender coconut water has been carried out in a specific pH range, using HunterLab colourflex and maximum change was found at pH 7 whereas at pH 4 it was found minimum.

Keywords: Tender coconut water, Color, Deterioration, Polyphenol oxidase

INTRODUCTION

The shelf life limitation can be explained in terms of enzymes presence, belonging to oxidase family (tyrosinase and peroxidase), that in contact with atmospheric oxygen, right after opening fruit, gives a start to reactions that affect and modify its typical properties like nutritive value, taste and color (Galeazzi *et al.*, 1981; Weemaes *et al.*, 1998). Tyrosinase and peroxides are widely detected in many fruits and vegetables and are closely linked to enzymatic color changes followed by loss of sensorial properties (Vámos-Vigyázó *et al.*, 1981; López-Serrano, 1995; Campos *et al.*, 1996; Yemenicioglu *et al.*, 1997; Weemaes *et al.*, 1998; and Palou *et al.*, 1999). According to some food technologists, tyrosinase (Polyphenol oxidase) is indirectly responsible for fruit and vegetables enzymatic browning (Vámos-Vigyázó *et al.*, 1981; Siddiq *et al.*, 1992; and Weemaes *et al.*, 1998), such as in sunflower seeds (Singh *et al.*, 1999) and in avocados (Palou *et al.*, 1999).

Polyphenol oxidase catalyzes two types of oxidative reactions: hydroxylation of monophenols to do-diphenols, and the oxidation of this last one colorless compound to highly colored o-Quinones. (Galeazzi *et al.*, 1981) determined tyrosinase presence in bananas (Musa cavendishii) proceeding to its purification based on gel filtration chromatography using Sephadex G-100 column and characterization by polyacrylamide gel electrophoresis. The presence of this enzyme was detected in many fruits, among others, apples, peaches, grapes, pears and plums (Siddiq *et al.*, 1992). Peroxide is a group of enzymes that catalyze oxidation reactions of H_2O_2 to water while oxidizing a variety of substrates.

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MATERIALS AND METHODS

The tender coconuts were cut with a sharp sanitized stainless steel knife and all the coconut water collected was mixed thoroughly in a sterilized container inside laminar air flow. The above tender coconut water sample collected was taken for further analysis.

Effect of Storage on Color of Tender Coconut Water

Tender coconut water was stored for 48 hours, in ambient condition and change in color was measured by using Hunter Lab color flex.

Determination of Effect pH for Enzymes Responsible for Browning

Six sets of raw, tender coconut water, 30 ml each was taken into tubes and their pH were adjusted as pH 3, 4, 5, 6, 7 by using 1 M citric acid and 1M NaOH, according to requirement. Above set up was incubated at 37 ^{0}C±2, overnight. Then, color development was measured using Hunter Lab (Colourflex-EZ) color flex and effect of pH on enzymatic browning was found out.

RESULTS AND DISCUSSION

Table 1 represents color based data to show enzyme based color change upon storage. Storage of tender coconut water for 48 hours, results in decrease in lightness (L*) from 35.23 to 26.30, increase in redness (a*) from -0.64 to 2.81 and slight increase in yellowness (b*) from 2.17 to 2.81. The data for L* and a* was found extremely significant with t value L* = 10.375, P value L*<0.0005 and t value a* = 35.56, P value a*< 0.0001 respectively, whereas changes in b* was not significant with t = 1.224 and P< 0.281. The extremely significant change in a* value from -0.64 to 2.81 reveals a change in color from green to red and with other color configuration of L* and *b** the resulting color exert a light pink color. This phenomenon can be termed as pinking of tender coconut water and no literature was available earlier on this phenomenon. This pinking is might be due to the action of enzymes on phenolic compounds present in tender coconut water. Further research is required to establish the complete theory of pinking of tender coconut water, which can be very useful in development of enzyme based natural color.

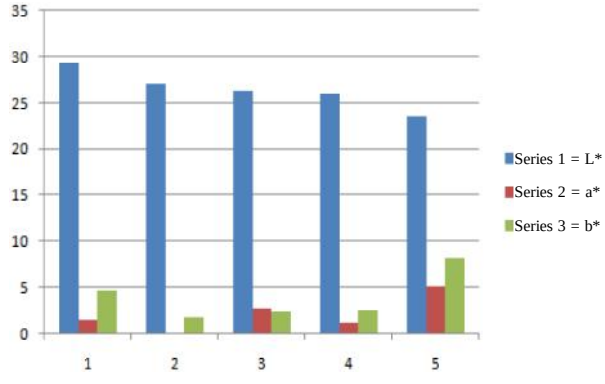
The effect of pH on color development was assessed and the result is represented in Figure 1. Among five different pH ranges, TCW with pH 4 was surprising by means of being clear and colorless. Whereas in TCW with pH 3 and pH 5 developed pink color and towards higher pH (pH 6, pH 7) pinkness was dominated by yellowness and pH 7 showed maximum browning in above pH range tested. In all range pH L*, a*, b* values were found extremely significant at P<0.0001.

Table 1: Effect on Colour Upon Storage[1]

	L*	a*	b*
Mean	35.23±1.483	-0.64±0.1	2.173±0.06
48 hr Stored	26.3±0.15	2.81±0.135	2.83±0.927

Note: [1] t = 10.37 (L*), p <0.0005 (L*), t = 35.56 (a*), p< 0.0001 (a*), t = 1.224 (b*), p< 0.281 (b*).

Figure 1: Effect of pH on Enzymatic Colour Change of Tender Coconut Water



The most important information towards scientific community can be recommended from the result of this study is at acidic pH range except pH4, coconut water imparts a beautiful pink color, when it gets oxidized in the presence of oxygen under ambient condition. More research on this color formed due to enzymatic reaction may lead to the development of a new food grade color, which can be used in acidic beverages for sensory appeal.

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