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Analysis of Organic Acids in Coconut Brown Sugar

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Abstract – The present of organic acid could be a significant contribution to the taste of brown sugar. An HPLC technique has been developed to analysis of organic acids in brown sugar from both sugar palm and coconut. A reversed column (YMC Triart C_{18}) has been used with a UV detector at 210 nm. The phosphoric mobile phase with 0.7 mL per min was run as isocratic eluent. Three organic acids have been identified including ascorbic acid, lactic acid and pyroglutamic acid and several more uv absorbed compounds need to be further identified. Ascorbic acid and lactic acid are present in significant amount of 1.374 and 0.78 g/100 mg of sugar samples, respectively, compared to pyroglutamic acid that is 0.256 g/100 g. The present of organic acids in coconut brown sugar are relatively different in concentration and less in the number of organic acids compared to that from brown sugar of sugar palm.

1. INTRODUCTION

Brown sugar is one of the important food ingredients in Indonesian cuisine. The reason for that is the taste of this food ingredient is very specific and until now is no alternative replacement. The taste of brown sugar is dictated by the chemical composition of the food. In Indonesian standard for brown sugar there is no specific criteria yet for the taste except stated as "normal for specific brown sugar taste" [1].

Brown sugar traditionally produced from sugar palm (aren), coconut and palmyra saps. Aren brown sugar is the most important brown sugar in Indonesia followed by coconut brown sugar and in small extends is from palmyra brown sugar.

Organic acids are naturally present in food as biological metabolism products or added as food ingredient or formed during food processing by microorganism. Organic acids have important roles in determining the taste of food. The present of organic acid in brown sugar from sugar palm has been reported recently by Kurniawan [2], but there is no information about the organic acid in brown sugar from coconut. The taste of those two brown sugars is different. So it is important to study of the organic acids in coconut brown sugar.

2. METHODS

2.1 Materials

Coconut brown sugars were purchased from a village in Bali from two different farmers. The standard organic acids, carbonate phosphate and phosphoric acid were purchased from Sigma, while the ascorbic acid was used a commercial C vitamin.

2.2 Procedures

The samples preparation and chromatographic analysis were performed followed the methods described in Limo [3] and Kurniawan [2]. Briefly the samples were ground, dried and weighed for about 5 gram and then dissolved in 100 mL of phosphoric buffer used as mobile phase. A sample aliquot of 2 mL was filtered through a Whatman Syringe Filter 0.2 µm before injected into the HPLC system.

The HPLC system of Schimadzu LC 20 equipped with a reversed phase column (YMC Triart C_{18}) and UV detector set at 210 nm. The mobile phase made from potassium dihydrogen phosphate and phosphoric acid at 50 mM and pH 2.8 [4]. The mobile phase was run at isocratic mode. Organic acid determination follows the retention time of standard organic acid, respectively. The concentration of organic acid was determined follows the standard curve for each organic acid [3].

3. RESULTS AND DISCUSSION

The chromatogram of the samples can be seen in Figure 1. And the chromatogram of standard organic acids is shown in Figure 2. Based on these chromatograms, it is found that coconut brown sugar contains four organic acids including ascorbic acid, lactic acid, pyroglutamic acid and fumaric acid. The concentration of each organic acid is shown in Table 1. Ascorbic acid is the main organic acid in coconut brown sugar follow by lactic acid and pyroglutamic acid. Fumaric acid is present in very small amount.

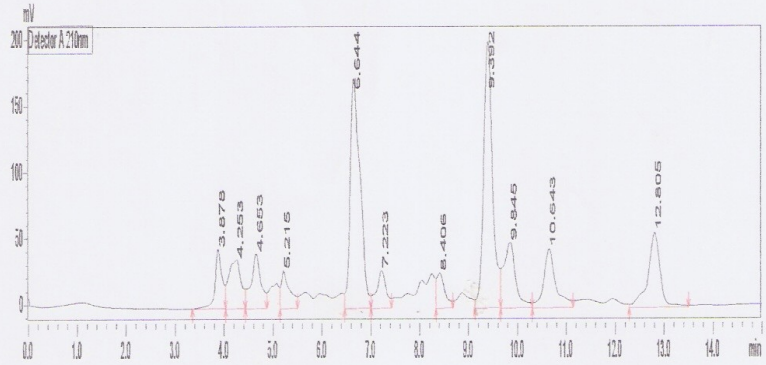

Figure 1 Chromatogram of coconut brown sugar

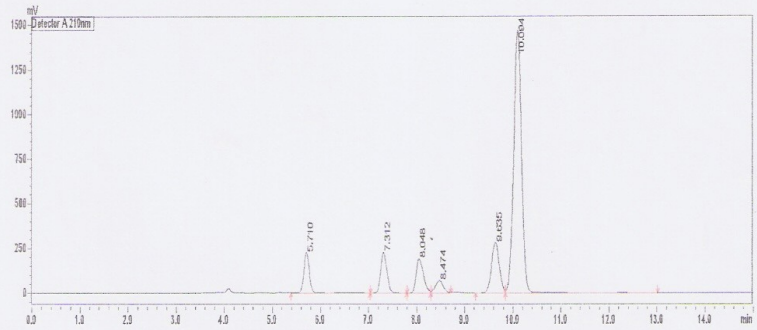

Figure 2 Chromatogram of organic acid standard. Retention time of Maleic (5.11 min), Ascorbic (6.65 min; did not showed), Lactic (7.32 min), Acetic (8.05 min), Citric (8.47 min), Pyroglutamic (9.64 min) and Fumaric Acid (10.09 min).

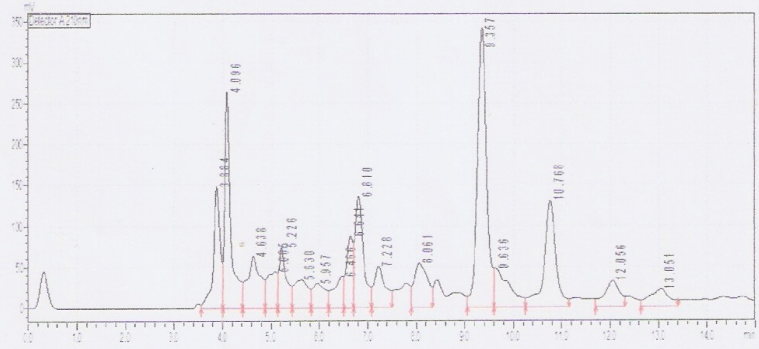

Figure 3 Chromatogram of aren brown sugar [2]

Comparing the chromatograms of coconut brown sugar to aren brown sugar (Figure 2 and 3; [2]) shows that the numbers of organic acids in coconut brown sugar are less than those in aren brown sugar. There are also several other organic acids present in these sugar that not recognized yet using the present organic acid standards as shown from the

present of several significant peaks in chromatogram. Aren brown sugar contains six organic acids (Figure 3, [2]) while in coconut brown sugar is only containing four organic acids.

The concentration of organic acids in both sugars is also different (Table 1). Aren brown sugar contains very high lactic acid while in the coconut brown sugar there is no lactic acid. Because of the present of lactic acid in brown sugar is from fermentation after harvesting [2,5], than it can be concluded that the juice treatment after harvested of coconut juice is better than that of aren juice.

The ascorbic acid content in coconut brown sugar is relatively very high (double the concentration in aren brown sugar). There is no information yet the source of this organic acid either from the coconut juice or from contaminated fermentation.

Table 1 The concentration of organic acids in coconut and aren brown sugar (g/100g)

Organic Acids	Coconut Brown Sugar	Aren Brown Sugar [2]
Malic Acid	-	0.986
Ascorbic Acid	1.37	0.686
Lactic Acid	0.78	3.67
Acetic Acid	-	1.96
Pyroglutamic Acid	0.25	0.457
Fumaric Acid	0.00070	-
Total	**2.40**	**7.76**

4. CONCLUSIONS

Coconut brown sugar contain four organic acids including ascorbic acid (1.37 %), lactic acid (0.78 %), pyroglutamic acid (0,25 %) and fumaric acid (0.00070%). The concentration of ascorbic acid is relatively very high compared to that from aren brown sugar, while the lactic acid is lower than that from aren brown sugar. The number of organic acids in coconut brown sugar is relatively less than that from aren brown sugar.

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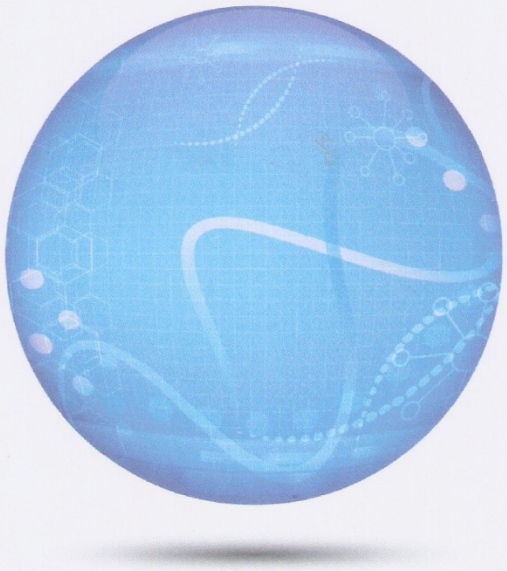

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