

Physicochemical and microbiological assessment of *Nypa fruticans* sap collected in Sarawak, Malaysia

Jaraee, J., * Awg Adeni, D.S., Bilung, L.M. and Azmin, P.A.

Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, Jalan Dato' Haji Mohd Musa, 94300, Kota Samarahan, Sarawak, Malaysia

Article history:

Received: 1 April 2022

Received in revised form: 2 May 2022

Accepted: 2 August 2022

Available Online: 23 February 2023

Keywords:

Physicochemical assessment, Microbiological assessment, *Nypa fruticans*, Nipa sap, Fermentation, Sarawak

DOI:

[https://doi.org/10.26656/fr.2017.6\(S4\).004](https://doi.org/10.26656/fr.2017.6(S4).004)

Abstract

Nipa sap is a sweet and translucent beverage that originated from nipa palm (*Nypa fruticans*) tree. In Sarawak, nipa sap become raw material for nipa sugar or locally known as *gula apong*. However, nipa sap undergoes natural fermentation that alters the properties of nipa sap including taste, aroma and quality. Fermented nipa sap is whitish colour with an unpleasant aroma and taste, which makes it unacceptable for consumption. Hence, it is no longer suitable to make nipa sugar. This study aimed to determine the physicochemical and microbiological changes of nipa palm sap from fresh to fermented. The nipa sap was allowed to undergo natural fermentation at room temperature for 56 days. Samples were collected every 24 hrs for the first week and once a week in the subsequent week. The selected physicochemical qualities were analysed using high-performance liquid chromatography (HPLC) whereas the microbial content was analysed using spread plating. Fresh nipa sap showed the highest load of sugar (334.2 ± 12 g/L) with sucrose as the main sugar found (231.5 ± 4.3 g/L), followed by fructose (42.1 ± 1.2 g/L), and glucose (29.7 ± 3.2 g/L). Fresh nipa sap also possessed the lowest load of ethanol (0.08 ± 0.03 g/L), lactic acid (1.09 ± 0.06 g/L), and acetic acid (0.05 ± 0.01 g/L) as well as microbial and yeast concentration. Later, ethanol started to accumulate on day 4 (9.80 ± 0.1 g/L) and the highest peak was on day 21 (19.1 ± 2.01 g/L). The microbial concentration changed as well, affecting the quality of nipa sap. As nipa sap plays such an important role in the lifestyle of people in Sarawak, this study provides a better understanding of the microbiology and biochemistry of its fermentation process. Hence, proper planning for handling fresh nipa sap should be considered to ensure the quality of value-added product production.

1. Introduction

Nipa sap or locally known as *air sadap* or *air nira* is a traditional beverage consumed by people in Sarawak. Nipa sap is a refreshing beverage that is rich in sugar, translucent, and fruit-like odour juice obtained from *Nypa frutican* tree (Minh *et al.*, 2014). It is obtained by cutting the mature infructescence and inflorescence nipa palm. Nipa palm (*Nypa fruticans*) is a fast-growing palm that thrives in brackish water environments such as river estuaries and mangrove forests. Nipa palms have been known to yield excellent sugar-sap from their infructescence for more than 50 years (Tamunaidu and Saka, 2011). The shoots of 9-12 years old stems are reported to be the highest yielding, providing up to 1500-1900 mL of sap per stem per season. The stems of 15 years or more were reported to yield lower sap production (Farid *et al.*, 2015). Nipa sap can be utilised

to produce many products such as fresh beverages, syrup, alcohol, molasses, and traditional vinegar. These have become sources of income for the community. In addition, some local communities inherit traditional techniques for generations to utilise nipa palms that remain a part of the community's livelihood.

The natural fermentation of nipa sap involves the breakdown of carbohydrate materials under an anaerobic condition with the help of microbial activities. Since the microorganisms in nipa sap are alive, they metabolise away the pleasant sugary taste of the fresh nipa sap and produce ethanol and various organic acids in a short period (Radi *et al.*, 2013). Hence, the process of fermentation of nipa sap will alter the properties of nipa sap including taste, aroma, contents, and quality. Fermented nipa sap is whitish colour with an unpleasant aroma and sour taste, which makes it unacceptable for

*Corresponding author.

Email: adsahwa@unimas.my