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Influence of Seasonal Changes on Physicochemical, Nutritional, and Sensory Characteristics of Coconut Sap (Neera)

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ABSTRACT

Coconut sap (neera), a naturally sweet, watery liquid that flows from the cut inflorescence (flower bud) of the coconut palm tree (*Cocos nucifera*), is praised for its economic value. However, in Malaysia, there is limited research on the properties affected by seasonal factors. Hence, the objectives of this study were to determine the physicochemical properties, nutritional content, and sensory attributes of the coconut sap samples collected during wet (NW) and dry (ND) seasons. The results revealed that NW had significantly higher moisture content (86.2 ± 1.41%), while ND contained significantly higher crude protein (0.32 ± 0.01%) and carbohydrate content (13.51 ± 0.02%). Meanwhile, the ND had a darker colour (37.21 ± 0.72), and NW had a higher TSS value (14.68 ± 1.05). The vitamin analysis indicated vitamin C levels of ND (15.40 mg/100 g) were significantly higher than the NW. The sensory evaluation showed NW samples were preferred mainly in terms of colour, sweetness, and aftertaste.

Keywords: Coconut sap, nutritional content, proximate composition, physicochemical properties, sensory attributes, vitamins

INTRODUCTION

Cocos nucifera L. known as the coconut palm, is widely cultivated in tropical regions and belongs to the Arecaceae family. The coconut sap, locally known as neera, typically distinguished by its oyster-white color. In Malaysia, coconut sap holds significant economic value and cultural significance, both as a non-fermented and fermented beverage, vinegar, and palm

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sugar, providing year-round income for farmers (Ghosh et al., 2018). It is rich in natural sugars, essential vitamins, and minerals, and has a low glycemic index (GI) (Asghar et al., 2020). It is considered a healthier alternative option, with a lower GI value as compared to palm and sugarcane sugars (Saputro et al., 2017).

Problem Statement

In Malaysia, research has primarily focused on neera from Negeri Sembilan, West Peninsular Malaysia (Asghar et al., 2020), while comprehensive scientific data from other factors, such as location, season, and tapping times, all of which influence the composition and quality of coconut sap, remain scarce. Most research offering some valuable insights has come from Indonesia (Somawiharja et al., 2018) and India (Ghosh et al., 2018).

Research Questions

Nutritional value may increase during the dry season (May to September) due to tree stress and reduced moisture, while the wet season (November to March) could cause changes in nutrient composition due to higher hydration levels and altered physiological conditions. These inconsistencies may affect consumer preferences.

MATERIALS AND METHODS

Sample Collection

Fresh coconut sap was sourced by a local estate farmer, ABEADI Group Sdn. Bhd. from Besut, Terengganu, Malaysia, during the Southwest Monsoon (dry season) from May to September, and the Northeast Monsoon (wet season) from November to March.

Proximate, Physicochemical, and Nutritional Analyses

Coconut sap was subjected to analysis, including colour determination, pH value, and total soluble solids (TSS). Proximate and mineral compositions analyses were conducted using the AOAC Method (AOAC, 2011). Vitamin analysis was carried out according to Asghar et al. (2020) with slight modifications using a Shimadzu liquid chromatograph LC-10vp fitted with a UV-VIS detector (SPD-10A) set at 260 nm.

Sensory Analysis

This sensory analysis utilised a 9-point hedonic scale involving 50 untrained panelists, who evaluated the samples based on the attributes: color, aroma, consistency, sweetness, aftertaste, and overall acceptance (Kemp et al., 2009).

RESULTS AND DISCUSSION

The results showed that the NW sap contained higher moisture (86.2 ± 1.41%) than ND. In contrast, the ND sample contained a significantly higher crude protein (0.32 ± 0.01%), ash (0.33 ± 0.05%), food energy (55.59 ± 5.01 kCal), TSS value (14.68 ± 1.05%), and vitamin C (15.40 mg/100 g), as compared to NW sample (Table 1). Meanwhile, the sensory evaluation revealed that NW sample was more favored, particularly for its colour, sweetness, and

Table 1
Proximate composition, food energy, vitamins, and physicochemical properties of coconut sap collected during different seasons

Composition	Sample	
	ND	NW
Proximate Composition		
Moisture (%)	85.81 ± 0.73[b]	86.2 ± 1.41[a]
Ash (%)	0.33 ± 0.05[a]	0.29 ± 0.17[a]
Fat (%)	0.03 ± 0.01[a]	0.02 ± 0.01[a]
Crude Protein (%)	0.32 ± 0.01[b]	0.21 ± 0.10[a]
Carbohydrate (%)	13.51 ± 0.02[a]	13.28 ± 1.29[a]
Food Energy (kCal)	55.59 ± 5.01[b]	54.14± 3.01[b]
Mineral (mg/100g)		
Potassium	804.10[a]	844.20[a]
Sodium	116.90[a]	144.60[b]
Phosphorus	88.52[a]	67.24[b]
Ferum	1.68[a]	1.31[a]
Zinc	0.35[a]	0.29[a]
Calcium	0.61[a]	0.76[b]
Magnesium	0.47[a]	0.57[b]
Mangan	0.08[a]	0.08[a]
Cuprum	0.08[a]	0.08[a]
Vitamin (mg/100g)		
C	15.40[a]	13.10[b]
B1	<0.10[a]	<0.10[a]
B2	<0.10[a]	<0.10[a]
Physicochemical		
pH	6.13 ± 0.43[Aa]	6.13 ± 0.52[Aa]
TSS (˚Brix)	14.14 ± 3.23[Aa]	14.68 ± 1.05[Aa]
Colour		
Lightness (L)*	37.21 ± 0.72[Ba]	16.48 ± 0.88[Aa]
*Redness (*a)*	0.59 ± 0.35[Aa]	2.82 ± 0.43[Ba]
*Yellowness (*b)*	0.69 ± 0.55[Aa]	3.35 ± 0.28[Ba]

aftertaste (Table 2). Thus, the findings indicated that seasonal variation had influenced the nutritional profile of coconut sap (neera), with the dry season exhibiting higher nutrient levels, possibly due to physiological stress and reduced moisture. In contrast, the wet season showed nutrient dilution, possibly due to the increased water uptake (Sri et al., 2025). These differences had also affected nutritional quality, sensory traits, and consumer acceptability.

Table 2
Sensory attributes of neera collected at different seasons

Attributes	Sample	
	ND	NW
Colour	5.72^{Bb}	5.54^{Aa}
Aroma	3.96^{Aa}	5.90^{Aa}
Consistency	5.30^{Aa}	5.98^{Ba}
Sweetness	4.86^{Aa}	5.94^{Ba}
Aftertaste	3.68^{Aa}	5.26^{Aa}
Overall Acceptance	4.12^{Aa}	5.58^{Aab}

CONCLUSION

In conclusion, the findings highlight the health-promoting potential of coconut sap, with its nutritional quality being influenced by seasonal factors.

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REFERENCES

AOAC. (2011). *Official methods of analysis of AOAC international.* AOAC International.

Asghar, M. T., Yusof, Y. A., Mokhtar, M. N., Ya'acob, M. E., Ghazali, M. H., Chang, L. S., & Manaf, Y. N. (2020). Coconut (*Cocos nucifera* L.) sap as a potential source of sugar: Antioxidant and nutritional properties. *Food Science & Nutrition 8*(4), 1777-1787. https://doi.org/10.1002/fsn3.1191

Ghosh, D. K., Bandyopadhyay, A., Das, S., Hebbar, K. B., & Biswas, B. (2018). Coconut sap (Neera)-untapped opportunity of spinoff gains in West Bengal, India. *International Journal of Current Microbiology and Applied Sciences 7*(9), 2319-7706. https://doi.org/10.20546/ijcmas.2018.709.229

Kemp, S. E., Hollowood, T., & Hort, J. (2009). *Sensory evaluation: A practical handbook.* John Wiley & Sons. https://doi.org/10.1002/9781118688076

Saputro, A. D., Walle, D. V. D., Aidoo R. P., Mensah M. A., Delbaere C., Clercq N. D., Durme J. V., & Dewettinck, K. (2017). Quality attributes of dark chocolates formulated with palm sap-based sugar as

nutritious and natural alternative sweetener. *European Food Research and Technology 243*(2), 177-191. https://doi.org/10.1007/s00217-016-2734-9

Somawiharja, Y., Wonohadidjojo, D., Kartikawati, M., Suniati, F., & Purnomo, H. (2018). Indigenous technology of tapping, collecting and processing of coconut (*Cocos nucifera*) sap and its quality in Blitar Regency, East Java, Indonesia. *Food Research 2*(4), 398-403.