Studies on Kombucha Fermentation from Longan Seeds and Longan Peels

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ABSTRACT

Kombucha is a fermented tea beverage produced through the action of a symbiotic of microorganisms known as SCOBY (Symbiotic Culture of Bacteria and Yeast), which consists of yeast and acetic acid-producing bacteria. The objective of this special project are to produce kombucha using longan seed extract and longan peel extract as alternatives to tea infusion, and to investigate the antioxidant activities of both kombucha products in order to develop a health-oriented alternative beverage. The initial substances were prepared by soaking 10 g of finely ground longan seeds or longan peels in 900 mL of water, followed by the addition of 100 g of sucrose. The mixture was boiled at 100 °C for 10 minutes and then allowed to cool. Subsequently, 100 mL (10% v/v) of commercial SCOBY starter (liquid) and a SCOBY pellicle were added. Fermentation was carried out at room temperature (25–30 °C) for 27 days. Samples were collected during fermentation to determine pH, reducing sugar content, total sugar content, total acidity, and total phenolic content. The results showed that at 27 days of fermentation, the pH values of kombucha produced from longan seeds and longan peels decreased from 2.59 and 2.65 to 1.97 and 2.06, respectively. Kombucha produced from longan seeds exhibited a maximum total acidity of 0.68% (w/v), whereas kombucha produced from longan peels showed a maximum total acidity of 0.58% (w/v). Reducing sugar content in longan seed kombucha increased from 7.95 mg/mL at the beginning of fermentation to 74.68 mg/mL, while that of longan peel kombucha increased from 9.14 mg/mL to 63.33 mg/mL. Meanwhile, total sugar content remained relatively high, with values of 122.96 and 104.55 mg/mL, respectively. The total phenolic content of kombucha produced from longan seeds and longan peels at 27 days of fermentation was 3.47 and 6.46 mg GAE/mL, respectively.The results of the experiment show that longan seeds and longan peels can be used as raw materials in the kombucha fermentation.

INTRODUCTION



Figure 1: Kombucha
(www.drinkcoffee.com)



Figure 2: Longan
www.inwiangvalley.com

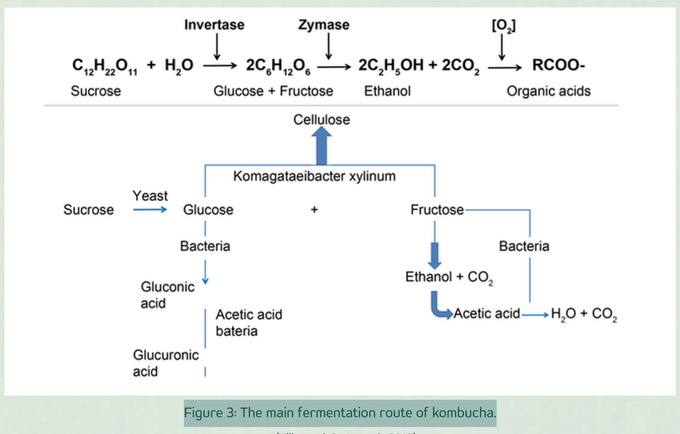


Figure 3: The main fermentation route of kombucha.
(Villarreal-Soto et al., 2018)

Kombucha is a fermented tea beverage produced through the action of a symbiotic of microorganisms known as SCOBY (Symbiotic Culture of Bacteria and Yeast), which consists of yeast and acetic acid-producing bacteria. It usually has a sweet and sour taste and provides health benefits, including probiotics and various organic acids that help balance the digestive system and boost immunity. Longan *(Dimocarpus longan* Lour.*)* a member of the Sapindaceae family, is a tropical and subtropical fruit of paramount economic importance in Thailand. In the food processing industry, only the pulp is typically utilized, leaving the seeds and peels as significant agricultural by-products. These components contain numerous essential bioactive compounds. This study focuses on the fermentation of Kombucha derived from longan seeds and peels, examining changes in sugar content, total acidity, and total phenolic content over a duration of 27 days. Kombucha fermentation begins with yeast secreting invertase to hydrolyze sucrose into glucose and fructose. These sugars are then converted into ethanol and CO_2 by the yeast's zymase complex. Subsequently, acetic acid bacteria (AAB) oxidize the ethanol into acetic acid. Furthermore, bacteria also convert glucose into gluconic acid and synthesize the cellulose pellicle (SCOBY) on the liquid surface.

OBJECTIVES

- To study the fermentation process of Kombucha using longan seeds and peels instead of tea leaves.
- To study and analyze the amount of important substances and bioactive compounds.

METHODOLOGY

Law Material



Washed the longan seeds and peels with distilled water to remove impurities.

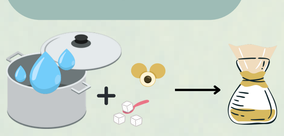


Dehydrated at 140°C for 5 minutes.



Milled into a fine powder and stored in sealed bags.

Tea Preparation



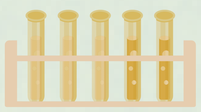
- 10 g of longan seed or peel powder were boiled in water for 10 minutes.
- The mixture was filtered to remove the solid residues.
- 100 g of sucrose were added to the extract.

Fermentation Process



- The extract was inoculated with 100 mL of Kombucha starter and a SCOBY.
- The fermentation was carried out at room temperature for 27 days.

Data collection



Samples of 20 mL were collected on days 0, 3, 7, 11, 15, 19, 23, and 27 for analysis.

Product



The final product was filtered through cheesecloth.



The liquid was subsequently bottled and sealed.

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- Division of Biochemistry and Biochemical Innovation, Department of Chemistry, Faculty of Science, Chiang Mai University

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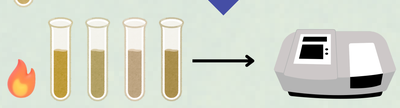
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PROPERTIES ANALYSIS

Determination of Reducing Sugar Content by DNS method



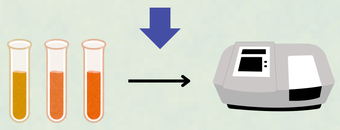
3 mL sample was mixed with 2 mL of DNS reagent.



The mixture was boiled for 5 minutes, then cooled to room temperature and measured at 540 nm.

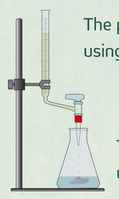
Determination of Total Sugar Content by Phenol-Sulfuric acid method

Mixed 250 µL sample with 250 µL 5% Phenol and 1250 µL 96% Sulfuric acid.



The solution was incubated at room temperature for 30 minutes and measured at 490 nm.

Determination of Total Acidity and pH by titration



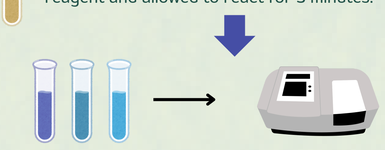
The pH value of the samples was monitored using a digital pH meter.

Titrated 5 mL of the sample with 0.1 M NaOH using phenolphthalein indicator.

Determination of Total Phenolic Content (TPC by Folin-Ciocalteu method



2 mL sample was mixed with 5 mL of 10% Folin-Ciocalteu reagent and allowed to react for 3 minutes.



Following the initial reaction, 2 mL of 7.5% Na_2CO_3 was added.
The mixture was incubated in the dark for 30 minutes and measured at 765 nm.

RESULT AND DISCUSSION

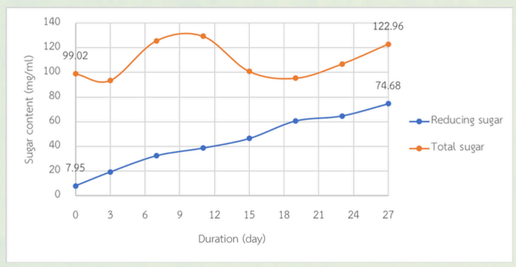


Figure 4: The amount of sugar content in longan seeds Kombucha

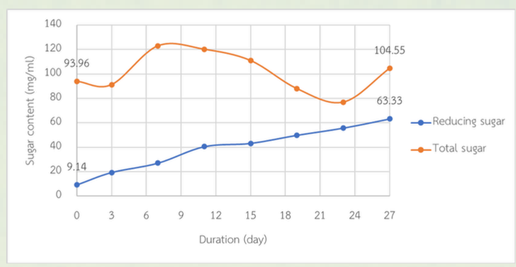


Figure 5: The amount of sugar content in longan peels Kombucha



Figure 6: The pH value and the amount of total acid and non-reducing sugar in longan seeds Kombucha

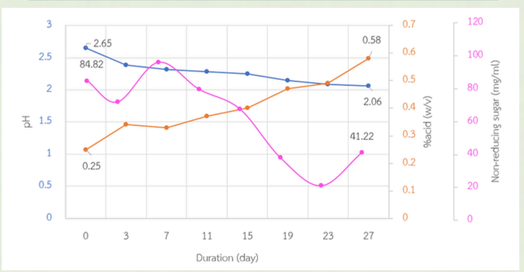


Figure 7: The pH value and the amount of total acid and non-reducing sugar in longan peels Kombucha

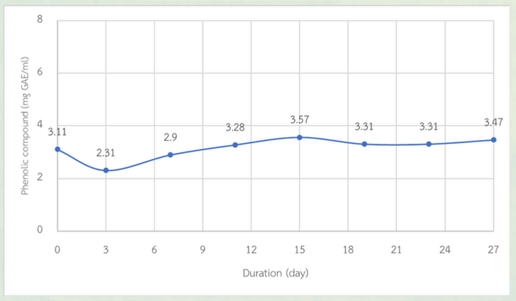


Figure 8: The amount of phenolic compound in longan seeds Kombucha



Figure 9: The amount of phenolic compound in longan peels Kombucha

The calculation of non-reducing sugar (sucrose) : non-reducing sugar (sucrose) = total sugar - reducing sugar (mg/mL)

In longan seeds Kombucha, the amount of non-reducing sugar gradually decreased while the total acid increased. This is because microbes grew and changed the sucrose into organic acid. Additionally, the phenolic compounds increased slightly from the first day because more substances were released.

For longan peels Kombucha, the relationship between non-reducing sugar and total acid followed the same trend as the longan seeds Kombucha variety. However, the amount of phenolic compounds in the longan peels Kombucha was clearly higher.

CONCLUSION

Regarding the Longan seeds Kombucha, the non-reducing sugar reached 48.24 mg/mL on day 27. The pH level measured 2.59 at the beginning and 1.97 at the end of the period, while the total acidity was 0.26% (w/v) initially and reached 0.68% (w/v) finally. The final phenolic compound content on day 27 was recorded at 3.47 mg GAE/mL.

For the Longan peels Kombucha, the non-reducing sugar was 41.22 mg/mL on day 27. The pH level started at 2.65 and concluded at 2.06, with the total acidity measured at 0.25% (w/v) initially and 0.58% (w/v) at the end of fermentation. On day 27, the phenolic compound content reached 6.46 mg GAE/mL.