

Analysis of Alcohol Contents in Kombucha and Its Relevance to Halal Standards for Muslims

Salsabila Luqyana Rachmat^{1*}, Aulia Irhamni Fajri² and Jatu Nur Indah Pratiwi³




¹ IPB University, Jl. Raya Pajajaran, Bogor, 16128, Indonesia

² IPB University, Jl. Raya Pajajaran, Bogor, 16128, Indonesia

*e-mail: salsabilaluqyana@apps.ipb.ac.id, auliairhamni@apps.ipb.ac.id, indahpertiwi032@gmail.com

Abstract: Kombucha has gained the world's popularity due to its unique characteristics. It came from the fermentation process by SCOBY (symbiotic culture of bacteria and yeast), which results in the production of acidic flavor, ethanol, and other alcohol compounds. Although marketed as a non-alcoholic drink, kombucha can contain alcohol levels that exceed Islamic dietary laws, raising concerns for Muslim consumers. This research is focused to analyse the alcohol percentage and discuss the relation between kombucha and halal. It also explores the understanding of consuming kombucha to Muslims. Gas chromatography headspace method will be used to analyse the amount of alcohol. The result shows there is 2.6% alcohol contained in the kombucha, exceeding the limits permitted in Islam. But after 14 days, the alcohol decreased to allowed range. Due to the initially high alcohol content, kombucha should not be labelled as a halal beverage immediately after production without further processing or aging. We need to work for a few days to make the alcohol an allowed limit to make it safe for the Muslims. These findings suggest that freshly made kombucha cannot be immediately considered halal and highlight the importance of proper processing and halal certification to ensure safety for Muslim consumers.

Key words: Kombucha tea, alcohol, halal kombucha, gas chromatography

	Salsabila Luqyana Rachmat Student in Department of Food Quality Assurance Supervisor, Vocational Studies at IPB University		Aulia Irhamni Fajri Lecturer in Department of Food Quality Assurance Supervisor, Vocational Studies at IPB University
	Jatu Nur Indah Pratiwi Owner of Pawon Bunda Tiwi		

Background :

Kombucha is a fermented tea beverage that has recently gained popularity due to its health benefits. Kombucha is produced by the fermentation of green or black tea (*Camellia sinensis*) sweetened with sucrose by a microbial consortium of bacteria and yeasts (symbiotic culture of bacteria and yeast) (Alves *et al.* 2024). The culture mainly consists of acetic acid bacteria, lactic acid bacteria, and yeast. During fermentation, yeast breaks down sucrose into glucose and fructose, which are then converted into ethanol. Acetic acid bacteria (AAB) then oxidize the ethanol into acetic acid, lowering the pH and giving kombucha its sour flavor (Wang B *et al.* 2022). The interaction between yeast and bacteria also contributes to fruity and vinegary notes, giving kombucha its distinctive flavor.

Despite fermentation, kombucha is generally considered a non-alcoholic or low-alcoholic beverage. Although kombucha offers health benefits such as antioxidants, its alcohol content must be

clearly identified. Products must contain $<0.5\%$ and $<1.1\%$ alcohol by volume in the United States and Canada respectively to be classified as non-alcoholic products (Chan M *et al.* 2020). In Indonesia, the Indonesian Ulema Council (MUI) stipulates that fermented drinks are considered halal if their alcohol content remains below 0.5%. Alcohol consumption is restricted due to its negative effects on health and religious beliefs. Considering the popularity of this tea, it may pose a risk for Muslim consumers who are concerned about halal compliance.

For the Muslim community, halal certification is a primary concern. “Halal” refers to what is permissible under Islamic dietary laws. According to the Holy Quran, beverages classified as *khamr* (intoxicants) are prohibited (haram). Khamr refers to drinks made from fruits or grains that become intoxicating through fermentation (Adiansyah R 2023). Kombucha contains ethanol, a type of alcohol that is commonly found in fermented products. The presence of ethanol in kombucha may render it intoxicating, which is prohibited in Islam.

Kombucha products are typically sold as non-alcoholic beverages, making it accessible for Muslim consumers. However, it does not accurately convey their alcohol contents could also pose risks to otherwise none-at-risk individuals who are unaware (Chan M *et al.* 2020). Apart from being contrary to Islamic law, unknown alcohol content can also pose a risk of exposure to alcohol which may risk consumers’ health.

Given the rising popularity of kombucha, it is essential to thoroughly check its alcohol content to ensure it meets with halal standards, especially for Muslim consumers. This effort also aims to inform choices within the Muslim community. The ambiguity of kombucha’s contents forms the basis for the author to analyse the alcohol content and its implications for halal certificates.

Methodology :

The alcohol content of kombucha was determined by gas chromatography headspace method to validate the amount of alcohol in the beverages. The results then compared with the halal limit quantification that is allowed for beverages. Kombucha samples were acquired from Pawon Bunda Tiwi in Ciawi, West Java, Indonesia. The reagents used included distilled water, ethanol, and 1-propanol.

Gas chromatograph equipped with a flame ionization detector (FID) was used for the analysis of ethanol content in kombucha. Supporting equipment included apparatus, condenser, analytical balance, centrifuge, vortex mixer, conical tubes (50 mL polypropylene), volumetric flasks (10 and 100 mL), graduated cylinders, syringe filters (25 mm diameter), syringes (3 mL), syringe temperature, and GC operating conditions.

Make single 200 μ L injections of each ethanol external calibration curve standard working solution. Determine and record the ratio of the peak response of ethanol to the peak response of 1-propanol in each standard working solution. Use simple linear regression to calculate the slope, y-intercept, and r^2 value for the slope obtained from plotting the concentration of ethanol in the working solution and the ratio of the ethanol peak to the 1-propanol peak in each standard (Liu Y & Chan M 2019).

Headspace gas was automatically injected into the GC system. Transfer 20 mL kombucha to a 50 mL centrifuge tube. Centrifuge the sample at 5000 rpm for 5 minutes. Transfer 6 mL supernatant to a 10 mL volumetric flask. Add 100 μ L 1-propanol internal standard solution to the volumetric flask. Fill the volumetric flask to the mark with water. Transfer the entire contents of the flask to a 20 mL headspace vial. Cap the vial and swirl to mix. Inject 200 μ L test solution. Determine and record the ratio of the peak response of ethanol to the peak response of 1-propanol in each test solution (Liu Y & Chan M 2019).

Ethanol concentration was calculated based on the peak area relative to the calibration curve. Results were compared with halal alcohol content beverage thresholds by the Indonesian Ulama Council (MUI) and international standards.