Proceeding International Conference on Religion, Science and Education (2025) **4**, 1185-1191

Economic and health prospects and challenges of kombucha in Indonesia

William Ben Gunawan[1,*], Alexander Ivan Gunawan[2]
[1]PPM School of Management, Jakarta, 10340, Indonesia
[2]Department of Psychology, Faculty of Social and Political Sciences, Malang, 65145, Indonesia.

Corresponding author*
wbwilliambenwb@gmail.com

Abstract: Economic growth always involves various aspects of the economy, one of which is the food and beverage industry. Kombucha, a globally consumed fermented beverage, has gained remarkable popularity among health-conscious individuals due to its slightly sweet and sour taste. Moreover, the process of crafting kombucha is relatively simple and practical, making kombucha a potentially lucrative product for businesses. Not only does kombucha offer health advantages and commercial viability, but it also holds promise for innovation in industry and the creative economy, opening the doors for the creation of various derivative products. However, the application of kombucha in Indonesia faces several challenges. This review seeks to examine the prospects and challenges of kombucha products in Indonesia both in terms of economy and health. A comprehensive review of national and international literature has been performed, presenting the idea of economic and health prospects and challenges of kombucha in Indonesia. Based on the contents, we propose that the application of kombucha in Indonesia is likely to bring more benefits (both health and economic) than its adverse health effects. The trend of kombucha beverage products in Indonesia is still constrained by several regulatory restrictions and halal aspects. Kombucha has advantages both in terms of affordable production costs and by-products of the kombucha fermentation process that can be applied in various industries as well as various health benefits of kombucha. Health claims on kombucha products will be better if accompanied by halal certification so that these benefits can be felt by the Indonesian people at large. Related to this, the author supports efforts to study and research kombucha products in more depth to provide excellence and benefits to the people of Indonesia. Various local foods, herbs, and resources in Indonesia can be used as the main ingredients of kombucha, so it becomes very interesting to explore.

Keywords: Kombucha, Economy, Health, Prospect, Challenge.

Introduction

Economic growth always covers various aspects of business, one of which is the food and beverage industry. One of the beverage products favored by the public is a drink with health benefits. Yogurt is a fermented milk product that has been known and consumed by the people of Indonesia with an increasing demand trend (Achmadin et al., 2021). Innovations in plant-based beverage products are also often developed, with various antioxidants and phenolic compounds that contribute to the health effects of these products (Gunawan et al., 2021; Gunawan & Basoeki, 2022). Kombucha, a tea-based fermented product, is less well-known than other health drink products.

Kombucha is a slightly sweet and sour non-alcoholic fermented beverage that is consumed around the world and has gained significant popularity among an increasingly health-conscious public (Chakravorty et al., 2016). Kombucha consists of various natural compounds such as sugar, ethanol, and organic acids, and a complex microbial community composed of bacteria and yeast (symbiotic culture of bacteria and yeast; SCOBY) (Vargas et al., 2021). These ingredients contribute to the various health benefits of kombucha. The process of making kombucha drinks is also relatively easy and practical. The materials and costs required to make kombucha are very simple, making kombucha a potential business product. Kombucha products have the

Copyright: © 2025 by the authors. This article is an open access article distributed under a CC BY license.
ISSN 2829-3355 | EISSN 2828-8467

potential to become innovative products in the realm of industry and creative economy, both from the health benefits, business power offered, and various derivative products that can be produced from the process of making kombucha. Furthermore, challenges related to kombucha, especially regulations related to the halal aspects of kombucha, are all going to be reviewed in this article.

Methods

This research employs a qualitative methodology with a literary approach, involving a comprehensive literature review based on relevant keywords aligned with the study's focus. According to Snyder (2019), a literature review is a research method that aims to gather, filter, and evaluate various expert summaries within texts. Conducting a literature review is essential for understanding new phenomena that are not yet comprehended (Popenoe et al., 2021). Literature reviews are foundational for many research types as their findings help track the evolution of knowledge, inspire policy-making, spark idea development, and guide research in specific fields. The insights gained can serve as a reference for future development and research. The research process involves the following steps: 1) Identifying keywords based on the research focus; 2) Searching for relevant literature on Google Scholar, then refining, analyzing, and drawing conclusions in alignment with the research focus.

Creative Economy Industry And Sustainability Development Goals

The economy is all human efforts to meet the needs of life. The economy consists of the process of production, distribution, and consumption of goods and services that meet the needs of society. The economy is one aspect of national life related to efforts to improve the standard of living of the community as individuals and groups and improve the way of life of the community that is adjusted to the needs. The economies that are currently the focus of world governments are the creative economy and the green economy. The green economy is an economic model that focuses on improving people's lives through the use of natural resources, low carbon emissions, biodiversity conservation, and pollution reduction while the creative economy is defined as economic activities that expect inputs and outputs in the form of ideas (Gunay et al., 2022). A creative economy is an effort to develop and explore the creativity of economic actors who run their businesses and companies. The power of the creative economy focuses more on the excellence of human resources, works of art, architecture, books, technological innovations, and animation that arise from the creative ideas of human thinking that eventually lead to creative industries (Humaniora, 2017).

Based on the Rencana Pembangunan Jangka Menengah Nasional (RPJMN) by the Government of the Republic of Indonesia, it is stated that in carrying out economic development, it is necessary to increase value in the creative economy, by conducting mentoring and incubation, developing centers of excellence, innovation facilities and brand strengthening, developing and revitalizing creative spaces, klister or creative cities (Be Creative District), implementing and commercializing intellectual property rights, as well as strengthening supply chains and business scale creativity. Strengthening the creative economy in Indonesia itself focuses on 8 clusters, one of which is the culinary (food and beverage industry) (National Development Planning Agency (Bappenas), 2020). Culinary contains the essence of history, art, and functional creations; and so does kombucha. A more complete elaboration of kombucha is summarized in the following sections.

Kombucha Characteristics And Health Benefits

Kombucha reportedly originated in Manchuria located in northeastern China during the Chinese dynasty "Tsin" around 220 BC. The drink became popular in the country because it was believed to its energy and detoxifying properties (Figure 2a). Kombucha itself comes from the word "Kombu" which is the name of a doctor from Korea who used this drink to treat digestive problems in King Inkyo in Japan (Figure 2b) around 141 AD and the word "Cha" which means tea in Japanese

(Jayabalan et al., 2014). The popularity of kombucha across Europe has fluctuated since World War II. Kombucha first arrived in Russia via commercial sea routes and is increasingly popular among the Kargasok population (Figure 2c) who are known to lead healthy lifestyles and exhibit slow aging with an average lifespan exceeding 100 years. In the 20th century, kombucha expanded to Germany and Italy (Figure 2d) to France and North Africa in the 1950s (Figure 2e). Today, kombucha has been reported as the fastest-growing product in the functional beverage market and one of the most popular low-alcohol fermented beverages in the world, given its nutritional potential and good function for health (Jayabalan et al., 2016).

Kombucha is a drink made from fermented tea and sugar with a symbiotic culture of bacteria and yeast (SCOBY). SCOBY is a microorganism biofilm with a shape resembling a mushroom cap consisting of various acetic acids bacteria such as Acetobacter xylinum, Acetobacter aceti, Acetobacter pasteurianus, and Gluconobacter oxydans; yeasts namely Saccharomyces sp., Zygosaccharomyces kombuchaensis, Torulopsis sp., Pichia spp., Brettanomyces sp., and Zygosaccharomyces bailii, as well as several lactic acid bacteria (Watawana et al., 2015). Fermentation can occur due to the activity of yeast which will convert the available carbon source into ethanol and bacteria which will convert ethanol into organic acids. The fermentation process will produce γ-aminobutyric acid, lactic acid, acetic acid, carbonic acid, and glucuronic acid (Li et al., 2022; Tran et al., 2020), vitamin C, various B vitamins, and polyphenols and can increase the antioxidant activity of kombucha significantly after 7 days of fermentation (Chakravorty et al., 2016). In addition, there was also an increase in D-saccharic acid-1,4-lactone (DSL) which is a component derivative of D-glucaric acid and has detoxifying and antioxidant properties after 8 days of fermentation (Bhattacharya et al., 2013). This is due to the presence of lactic acid bacteria that have a positive effect on DSL production in symbiosis with Gluconobacter (Yang et al., 2010). However, it should be considered that the longer the fermentation process, the more acid will be produced. As a result, if fermentation is not stopped immediately, kombucha will become dangerous for consumption because it can irritate the stomach. In addition, ethanol levels will be higher in line with the longer fermentation time (Sulistiawaty & Solihat, 2022), although it is suppressed by the activity of acetic acid bacteria.

Kombucha is a symbiotic drink mixed between probiotics and prebiotics that work synergistically and have various health benefits. Kombucha drink has the effect of increasing microbial resistance (probiotics) when passing through the upper digestive tract, supporting the growth of good bacteria in the large intestine, and improving the balance of intestinal microbial flora, therefore attenuating intestinal dysbiosis (Gomaa, 2020). Probiotics are live microorganisms that when consumed in sufficient quantities can have health benefits for the host (Gibson et al., 2017). In addition, kombucha is a unique drink that is claimed to have various health properties contributed by antioxidant activity, phenolic compounds, and flavonoids (Massoud et al., 2022). Kombucha beverage development innovation continues to be carried out by exploring raw materials combined with tea as an infused drink. These efforts are made to provide a distinctive taste and add nutritional value, health benefits, and consumer acceptance of kombucha. A study has shown that the use of red tea and green tea as the basis for making kombucha makes the beverage product a source of antioxidants rich in flavonoids and anti-inflammatory properties, which can support the immune system (Jakubczyk et al., 2020). Another research showed that sea grape kombucha has good potential and activity as an antiaging functional drink and can improve blood glucose levels and total cholesterol levels in mice given a diet rich in cholesterol and fat (Permatasari et al., 2021). The combination of butterfly pea flower with SCOBY as kombucha has the potential as a therapeutic functional drink to prevent metabolic syndrome which was shown by the presence of antioxidant activity to relieve metabolic disorders and inflammatory events, including diabetic conditions (Hardinsyah et al., 2023; Permatasari et al., 2022). On the other hand, watermelon rind kombucha exhibits in vitro anti-aging and anti-diabetic properties (Gunawan et al.,

2023). Red ginger kombucha with the addition of honey has an antioxidant activity of 84.7% (Pebiningrum & Kusnadi, 2018). Kombucha is also known as a probiotic drink with psychobiotic effects which can affect mental health through the regulation of gut microbiota (gut-brain axis) (Atmaja et al., 2022). These studies describe the utilization of various ingredients as the main component of kombucha with undoubted health benefits.

Figure 1. The History of the Development of Kombucha Product

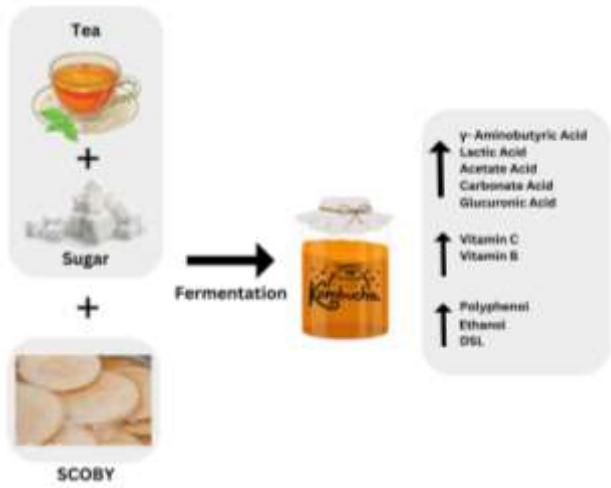

Figure 2. Bioactive Compounds Contained in Kombucha

Economic Properties Of Kombucha Products In Indonesia

Kombucha has a wide range of economic prospects and advantages. A community empowerment effort in Cilegon emphasizes that kombucha production at the household level is relatively easy and offers a potential profit of 243% (Arlofa et al., 2019). Analysis of other business aspects of kombucha products also states that with a conservative selling price, kombucha has a break-even turning point (BEP) with a maximum sales volume of 600 bottles within 1 year (Yusmita et al., 2021). Research on the energy aspects and production costs of kombucha shows that the kombucha production process produces renewable energy by 15.7%, with a net profit from the production of kombucha drinks of 0.38$ per liter and a production cost of 1.03$ per liter (37% profit) (Mohammadshirazi & Bagheri Kalhor, 2016). This emphasizes the attractive profit margins of the kombucha business.

Bacterial cellulose produced in the kombucha fermentation process can be utilized in various industries. The potential of bacterial cellulose has been studied in the sustainable clothing and textile industry, where cellulose can be used as an alternative to leather (Domskiene et al., 2019). Cellulose and biomass from kombucha fermentation have also been successfully utilized in biodegradable food packaging that is superior in terms of cost efficiency, and physicochemical, and bioactive compounds that remain in the coating (Ramírez Tapias et al., 2020). Another study emphasized the cellulose potential of kombucha, namely the ability to protect from ultraviolet light, retain moisture, protect against heavy metal pressure, and various other benefits that can be applied in biomedicine such as coatings or drug carriers and wound dressings (Rajwade et al., 2015). Kombucha biomass has also been utilized in the manufacture of capacitors, batteries, and electrodes (Dai et al., 2017). The economic feasibility analysis shows an estimate of US$ 13.72 million as the total investment, with a payback period of 4.23 years and a return on investment of 23.64% (Behera et al., 2022). This can support policymakers in facilitating the commercialization of kombucha-based cellulose on a field scale.

However, all these prospects also come with challenges related to the halal aspects of kombucha. A study of 6 kombucha products stated that all products had not obtained halal certification (Majidah et al., 2022), while only 1 kombucha product in Indonesia is known to have received halal certification. The author observes that formulation modification and multidisciplinary collaboration are needed to produce kombucha formulations that can be applied as medicine and food, of course, with

aspects that are in accordance with halal regulation. The study by de Miranda et al., (2022) summarized the ethanol content of various kombucha products with a fermentation duration of 12 – 14 days, which is 0.11 – 0.7% (de Miranda et al., 2022). This suggests that the duration of fermentation can be controlled in such a way as to produce targeted ethanol levels. Ethanol levels in kombucha are also maintained quite low due to the activity of acetic acid bacteria that utilize ethanol that has been formed as a substrate for acetic acid formation (De Roos & De Vuyst, 2018). Therefore, kombucha can potentially obtain halal certification, with the hope that it can be widely distributed in Indonesia. The consumption of kombucha widely provides a wide range of health benefits. In addition, the by-products of kombucha production also have beneficial values for business actors in various industrial fields.

Conclusion

The trend of kombucha beverage products in Indonesia is still hindered by several restrictions related to regulations and halal aspects. With various health benefits possessed by kombucha, the kombucha application has various potentials, both economically such as affordable production costs, by-products of the kombucha production process that can be utilized in various industries, and the health benefits of kombucha. Health claims on kombucha products will be better if accompanied by halal certification so that these benefits can be felt by the Indonesian people at large. Related to this, the author supports efforts to study and research kombucha products in more depth to provide excellence and benefits to the people of Indonesia. Various local foods, herbs, and resources in Indonesia can be used as the main ingredients of kombucha, so it becomes very interesting to explore.

References

Achmadin, N. S., Wardani, A. P., Sasmita, F. G., Hasanah, N., & Moentamaria, D. (2021). Studi Kelayakan Industri Yoghurt. Distilat: Jurnal Teknologi Separasi, 7(2), 310–319. https://doi.org/10.33795/distilat.v7i2.229

Arlofa, N., Febriasari, A., Elysabeth, T., Cahyadi, D., & Wajdi, F. (2019). Meningkatkan Pendapatan Usaha Mitra Melalui Teknologi Fermentasi Teh Kmobucha. Jurnal Kuat: Keuangan Umum Dan Akuntansi Terapan, 1(3), 169–175.

Atmaja, P. D. A. P., Haq, A. D., & Wiguna, V. V. (2022). Kombucha: Pendayagunaan Mekanisme Gut-Brain Axis Dalam Pencegahan Depresi. JIMKI: Jurnal Ilmiah Mahasiswa Kedokteran Indonesia, 9(April), 24–33. https://doi.org/10.53366/jimki.v9i3.333

Behera, B., Laavanya, D., & Balasubramanian, P. (2022). Techno-economic feasibility assessment of bacterial cellulose biofilm production during the Kombucha fermentation process. Bioresource Technology, 346(December 2021), 126659. https://doi.org/10.1016/j.biortech.2021.126659

Bhattacharya, S., Gachhui, R., & Sil, P. C. (2013). The prophylactic role of d-saccharic acid-1,4-lactone against hyperglycemia-induced hepatic apoptosis via inhibition of both extrinsic and intrinsic pathways in diabetic rats. Food and Function, 4(2), 283–296. https://doi.org/10.1039/c2fo30145h

Chakravorty, S., Bhattacharya, S., Chatzinotas, A., Chakraborty, W., Bhattacharya, D., & Gachhui, R. (2016). Kombucha tea fermentation: Microbial and biochemical dynamics. International Journal of Food Microbiology, 220, 63–72. https://doi.org/10.1016/j.ijfoodmicro.2015.12.015

Dai, C., Wan, J., Geng, W., Song, S., Ma, F., & Shao, J. (2017). KOH direct treatment of kombucha and in situ activation to prepare hierarchical porous carbon for high-performance supercapacitor electrodes. Journal of Solid State Electrochemistry, 21(10), 2929–2938. https://doi.org/10.1007/s10008-017-3631-2

de Miranda, J. F., Ruiz, L. F., Silva, C. B., Uekane, T. M., Silva, K. A., Gonzalez, A. G. M., Fernandes, F. F., & Lima, A. R. (2022). Kombucha: A review of substrates, regulations, composition, and biological properties. Journal of Food Science, July 2021, 1–25. https://doi.org/10.1111/1750-3841.16029

De Roos, J., & De Vuyst, L. (2018). Acetic acid bacteria in fermented foods and beverages. Current Opinion in Biotechnology, 49, 115–119. https://doi.org/10.1016/j.copbio.2017.08.007

Domskiene, J., Sederaviciute, F., & Simonaityte, J. (2019). Kombucha bacterial cellulose for sustainable fashion. International Journal of Clothing Science and Technology, 31(5), 644–652. https://doi.org/10.1108/IJCST-02-2019-0010

Gibson, G. R., Hutkins, R., Sanders, M. E., Prescott, S. L., Reimer, R. A., Salminen, S. J., Scott, K., Stanton, C., Swanson, K. S., Cani, P. D., Verbeke, K., & Reid, G.

(2017). Expert consensus document: The International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of prebiotics. Nature Reviews Gastroenterology and Hepatology, 14(8), 491–502. https://doi.org/10.1038/nrgastro.2017.75

Gomaa, E. Z. (2020). Human gut microbiota/microbiome in health and diseases: a review. Antonie van Leeuwenhoek, International Journal of General and Molecular Microbiology, 113(12), 2019–2040. https://doi.org/10.1007/s10482-020-01474-7

Gunawan, W. Ben, & Basoeki, L. E. A. S. (2022). Incorporating Watermelon Rind into Jackfruit Seed Drink: A Functional Drink Rich in Antioxidant and Phenolic Compounds. EDUFORTECH, 7(2), 100–107.

Gunawan, W. Ben, Priambodo, A. S., Winarti, D., Nurohma, A., & Wijayanti, L. O. (2021). Proximate and Sensory Analysis of Functional Drink from Jackfruit Seed Extract with Citrulline Fortification As A Potential Antidiabetic. Journal of Food and Health, 1(2), 56–64. https://doi.org/10.53966/jofh.v1i2.6

Gunawan, W. Ben, Wijayanti, M., & Deviani, H. E. (2023). Anti-Ageing and Anti-Diabetic Potential of Watermelon Rind Kombucha: An In Vitro Exploration. Malaysian Journal of Medicine and Health Sciences, 19(S1), 147–148.

Gunay, S., Kurtishi-Kastrati, S., & Krsteska, K. (2022). Regional green economy and community impact on global sustainability. Journal of Enterprising Communities. https://doi.org/10.1108/JEC-03-2022-0040

Hardinsyah, H., Gunawan, W. Ben, Nurkolis, F., Alisaputra, D., Kurniawan, R., Mayulu, N., Taslim, N. A., & Tallei, T. E. (2023). Antiobesity potential of major metabolites from Clitoria ternatea kombucha: Untargeted metabolomic profiling and molecular docking simulations. Current Research in Food Science, 6, 100464. https://doi.org/https://doi.org/10.1016/j.crfs.2023.100464

Humaniora, L. M. (2017). Meningkatkan Ketahanan Ekonomi Nasional Melalui Pengembangan Ekonomi Kreatif. Jurnal Cakrawala: Ejournal.Bsi.Ac.Id, 17(2), 258–265.

Jakubczyk, K., Kałduńska, J., Kochman, J., & Janda, K. (2020). Chemical profile and antioxidant activity of the kombucha beverage derived from white, green, black and red tea. Antioxidants, 9(5). https://doi.org/10.3390/antiox9050447

Jayabalan, R., Malbaša, R. V., Lončar, E. S., Vitas, J. S., & Sathishkumar, M. (2014). A review on kombucha tea-microbiology, composition, fermentation, beneficial effects, toxicity, and tea fungus. Comprehensive Reviews in Food Science and Food Safety, 13(4), 538–550. https://doi.org/10.1111/1541-4337.12073

Jayabalan, R., Malbaša, R. V., & Sathishkumar, M. (2016). Kombucha. Reference Module in Food Science, 1–8. https://doi.org/10.1016/b978-0-08-100596-5.03032-8

Li, R., Xu, Y., Chen, J., Wang, F., Zou, C., & Yin, J. (2022). Enhancing the proportion of gluconic acid with a microbial community reconstruction method to improve the taste quality of Kombucha. LWT, 155, 112937. https://doi.org/10.1016/j.lwt.2021.112937

Majidah, L., Gadizza, C., & Gunawan, S. (2022). Analisis Pengembangan Produk Halal Minuman Kombucha. Halal Research Journal, 2(1), 36–51. https://doi.org/10.12962/j22759970.v2i1.198

Massoud, R., Jafari-Dastjerdeh, R., Naghavi, N., & Khosravi-Darani, K. (2022). All aspects of antioxidant properties of kombucha drink. In Biointerface Research in Applied Chemistry (Vol. 12, Issue 3, pp. 4018–4027). https://doi.org/10.33263/BRIAC123.40184027

Mohammadshirazi, A., & Bagheri Kalhor, E. (2016). Energy and cost analyses of kombucha beverage production. Renewable and Sustainable Energy Reviews, 55, 668–673. https://doi.org/10.1016/j.rser.2015.11.022

National Development Planning Agency (Bappenas). (2020). Presidential Decree No. 18 Year 2020. In National Mid-Term Development Plan 2020-2024.

Pebiningrum, A., & Kusnadi, J. (2018). Minuman Fermentasi Kombucha Jahe Effect of Ginger Varieties (Zingiberofficinale) and Addition of Honey to the Antioxidant Activity of Kombucha Ginger Fermented Drink. Journal of Food and Life Science, 1(2), 33–42.

Permatasari, H. K., Nurkolis, F., Augusta, P. S., Mayulu, N., Kuswari, M., Taslim, N. A., Wewengkang, D. S., Batubara, S. C., & Ben Gunawan, W. (2021). Kombucha tea from seagrapes (Caulerpa racemosa) potential as a functional anti-ageing food: in vitro and in vivo study. Heliyon, 7(9), e07944. https://doi.org/10.1016/j.heliyon.2021.e07944

Permatasari, H. K., Nurkolis, F., Gunawan, W. Ben, Yusuf, V. M., Yusuf, M., Kusuma, R. J., Sabrina, N., Muharram, F. R., Taslim, N. A., Mayulu, N., Batubara, S. C., Samtiya, M., Hardinsyah, H., & Tsopmo, A. (2022). Modulation of gut microbiota and markers of metabolic syndrome in mice on cholesterol and fat enriched diet by butterfly pea flower kombucha. Current Research in Food Science, 5(June), 1251–1265. https://doi.org/10.1016/j.crfs.2022.08.005

Popenoe, R., Langius-Eklöf, A., Stenwall, E., & Jervaeus, A. (2021). A practical guide to data analysis in general literature reviews. Nordic Journal of Nursing Research, 41(4), 175-186. https://doi.org/10.1177/2057158521991949

Rajwade, J. M., Paknikar, K. M., & Kumbhar, J. V. (2015). Applications of bacterial cellulose and its composites in biomedicine. Applied Microbiology and Biotechnology, 99(6), 2491–2511. https://doi.org/10.1007/s00253-015-6426-3

Ramírez Tapias, Y. A., Peltzer, M. A., Delgado, J. F., & Salvay, A. G. (2020). Kombucha Tea By-product as Source of Novel Materials: Formulation and Characterization of Films. Food and Bioprocess Technology, 13(7), 1166–1180. https://doi.org/10.1007/s11947-020-02471-4

Sulistiawaty, L., & Solihat, I. (2022). Kombucha: Fisikokimia dan Studi Kritis Tingkat Kehalalan. WARTA AKAB, 46(1). https://doi.org/10.55075/wa.v46i1.80

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. Journal of Business Research, 104 (C), 333-339. https://doi.org/10.1016/j.jbusres.2019.07.039

Tran, T., Grandvalet, C., Verdier, F., Martin, A., Alexandre, H., & Tourdot-Maréchal, R. (2020). Microbiological and technological parameters impacting the chemical composition and sensory quality of kombucha. Comprehensive Reviews in Food Science and Food Safety, 19(4), 2050–2070. https://doi.org/10.1111/1541-4337.12574

Vargas, B. K., Fabricio, M. F., & Záchia Ayub, M. A. (2021). Health effects and probiotic and prebiotic potential of Kombucha: A bibliometric and systematic review. Food Bioscience, 44(July). https://doi.org/10.1016/j.fbio.2021.101332

Watawana, M. I., Jayawardena, N., Gunawardhana, C. B., & Waisundara, V. Y. (2015). Health, wellness, and safety aspects of the consumption of kombucha. Journal of Chemistry, 2015. https://doi.org/10.1155/2015/591869

Yang, Z., Zhou, F., Ji, B., Li, B., Luo, Y., Yang, L., & Li, T. (2010). Symbiosis between microorganisms from kombucha and kefir: Potential significance to the enhancement of kombucha function. Applied Biochemistry and Biotechnology, 160(2), 446–455. https://doi.org/10.1007/s12010-008-8361-6

Yusmita, L., Berd, I., & Sihaloho, F. (2021). Analisis Pengembangan Usaha Minuman Kombucha Daun Kawa Menggunakan Metode Break Even Point (BEP). Jurnal Ekonomika Dan Bisnis, 1(1), 22–27.

THIS PAGE INTENTIONALLY LEFT BLANK