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INVESTIGATING THE HALAL STATUS OF ANIMAL BONES AND ETHANOL IN CONVENTIONAL FOOD PRODUCTS: A PRELIMINARY STUDY

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ABSTRACT

The halal food industry is on a significant trajectory and this trend is expected to continue escalating imminently. However, the halal and thayyib food supply chain issues involving manufacturing, distribution and consumption have not been solved and are causing concern among the Muslim community in Brunei Darussalam. One issue includes the sugar decolorising process by using bone char and/or activated carbon, which include animal bones as a raw material. Ethanol is another issue that is present in conventional and fermented products like beverages, sauces and additives. Brunei has a high importation rate of food products from Muslim-minority countries, resulting in numerous products with unknown halal status, as well as produces local fermented food products widely sold in the market. The current study provides a mini review of the involvement of animal bones and ethanol in food-related products. Moreover, the study presents a compilation of related fatwas on animal bones and ethanol issued by Brunei and neighbouring countries namely Malaysia, Indonesia and Singapore to investigate the halal status of the implicated products. Brunei imposes a strict stance on these issues, whereby any involvement of pigs, dogs and permissible animals that are not slaughtered based on Shariah principles will deem the food-related products haram, as well as industrial ethanol is considered haram so no trace of such type is allowed (0.00%) in food and beverages. In conclusion, halalan thayyiban issues may be overcome in further studies by involving a collaboration of authorities in addressing scientific findings supported with Shariah principles.

Keywords: *Animal bones, Ethanol, Fermented Products, Halal, Sugar*

1. INTRODUCTION

The halal industry is escalating both regionally and worldwide, owing to the accelerated expansion of the Muslim population which currently has reached over two billion followers (World Population Review, 2024). The halal food market solely has impacted the world with having a value at US$2.4 trillion in 2023 and is expected to reach US$4.6 trillion by 2030 at a compound annual growth rate of 9.33% (Halal World Institute, 2024). The 'halal' approach that can be defined as permissible or allowed, is regularly interlinked with the 'thayyib' approach which means clean, good or pure. Henceforth, the halalan thayyiban concept has led to the escalation of halal industry that increases the demand in halal food products both for Muslims and non-Muslims, with regards to being a religious necessity, and hygiene and safety concerns, respectively. The improvement in technology and innovation related with halal food ingredients and products has allowed the enhancement of the economic force from non-Muslim countries such as Brazil, India and United States of America in becoming the largest halal food exporters globally (Statista, 2023). Despite the surge in halal industry, however issues regarding the integrity of halalan thayyiban on certain food products are on the rise which involve the procurement, manufacturing, packaging, labelling, distribution, logistics, marketing and consumption (Khan et. al., 2018). The halal credential is certainly fundamental for food products which are imported from overseas or manufactured by non-Muslims.

One of the issues in the halal industry involves the process in the manufacturing of refined sugar from sugar cane. At first glance, the terms 'sugar cane' may not raise any concern as it is a type of plant and all plant-based food are generally halal (Jameel, 2023). Nevertheless, it has come to light that the process of decolourisation in sugar refining may involve the use of bone char and/or activated carbon. Bone char is manufactured from selected categories of animal bones that have been scorched, generally sourced from cattle, bovine or pig (Piccirillo, 2023). Whereas, activated carbon is a carbonaceous material that can be originated from coconut shells, hard woods, fruit seeds, coals and animal bones (Nwanko et. al., 2018). Both bone char and activated carbon are traditionally the most frequent adsorbents used to eliminate soluble impurities in sugar cane processing.

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Another main issue affecting the halalan thayyiban integrity is the ethanol content in food products. Ethanol is a type of alcohol that is generally associated with intoxication and predominantly found in liquors such as beer, wine, soju and whiskey. These alcoholic beverages are considered haram and absolutely forbidden in Islam (Hanni & Aghwan, 2020). Nevertheless, ethanol can also be found in conventional and fermented food products such as soy sauce, *kimchi* and *tapai* (ul Haque & Mueedin, 2021; Park et. al., 2016). The amount of this ethanol is usually very little, ranging from 0.1% to 5% and it is produced naturally and not intentionally. The naturally produced ethanol found in organic-containing food products is unpreventable and their consumption is generally allowed for Muslims on a condition that the ethanol concentration does not exceed the threshold capacity for intoxication (Pauzi et. al., 2019).

As a Muslim-majority nation, Brunei Darussalam has endeavoured several initiatives to boost its halal economy, including the implementation of 'bruneihalalfood' brand for promoting Brunei halal food products globally and the achievement in collaborative agreements between Taiwan and other halal industry players (Sulaiman et. al., 2023). However, the nation still imports food products more than it exports them. Thus, the prevalence of imported goods is massive, leading to a high number of products with unknown halal status. Notably, Brunei relies heavily on the importation of refined sugar from Thailand (Royal Thai Embassy, 2020). However, little is known about the materials used in the sugar processing. Thailand is a massive sugar supplier with a few producers that still utilise bone chars and activated carbons for its decolourisation (Asia Sugar Mills, 2013; Farminex, 2017). This contributes to a spark of concern among Muslim consumers due to the possible involvement of animal bones which may render the halal status of the sugar doubtful especially when the origins come from pigs and animals that have not been slaughtered according to the Shariah law. In addition to imported products, Brunei also produces a variety of traditional food made by local individuals or companies, whereby many of the selections are fermented such as *tapai*, *tempoyak* and *binjai*. Currently, the shops and supermarkets in the nation sell many local and imported conventional food products with intriguing ethanol content and warrant further analysis. Therefore, the objective of the present study is to: 1) review the involvement of animal bones and ethanol in food products, and 2) analyse fatwas to investigate the halal status of food-related products which are implicated directly and indirectly with animals' bones and ethanol.

2. METHODOLOGY

This study applies a qualitative synthesis method to acquire more comprehensive, transparent and reproducible findings regarding animal bones and ethanol issues in food products. To address this well-defined issue, a systematic literature review (SLR) is used to identify, choose, and evaluate relevant material (Dewey & Drahota, 2016). A standardised data extraction form is used to ensure all relevant information obtained from each study, allowing to examine and compare results. The collected data are combined into a coherent whole and accompanied by an analysis that conveys a deeper understanding of the body of evidence. Therefore, this preliminary study includes review and analysis data of existing relevant literatures mainly from fourteen journal articles, two books and sixteen relevant websites. Accurate and current facts discussed by past and contemporary Islamic scholars, as well as available fatwas issued by Brunei Darussalam and neighbouring countries such as Malaysia, Indonesia and Singapore as pioneers in Islamic matters in the Southeast Asian region are discussed and used to investigate the halal status of food products. Table 1 provides the overall total of selected literatures that have been examined, assessed, and analysed on this subject.

Table 1 The Number of Literatures Selected for The Review of Stated Topic

Topic	Literature	Number
Animal bones and ethanol issues in food products	Journal articles	14
	Books	2
	Relevant websites	16
	Overall Total	32

3. RESULTS AND DISCUSSION

3.1 *Animal Bones and Their Halal Status in Food-Related Products*

The first part of this section is emphasising on the topic of animal bones, and their involvement and halal rulings in food-related products.

3.1.1 *The Involvement of Animal Bones in Refined Sugar Processing*

Refined sugar is predominantly sourced from sugar cane and beet sugar. While beet sugar processing does not involve animal products, sugar cane however requires bone char and/or activated carbon in the decolourisation step to produce its white appearance. This issue also similarly applies to brown sugar as it is classified as white sugar that has been mixed with supplementary colouring and flavouring (PETA, 2024).

Bone chars are one of the oldest materials for adsorption in the sugar industry. Bone chars can be produced with the conversion of organic carbon into an inorganic graphitic form in an inert atmosphere at a range of temperature from 300 until 1000 °C. Different from plant-based biochar's, chars derived from animal bones are comprised of higher levels of calcium phosphate, hydroxyapatite, a varying level of collagen, and only a lower level of carbon (Piccirillo, 2023). The application of bone chars in the industry is preferred due to their high surface area and porosity to eliminate anionic impurities, including sulphates, magnesium ions and calcium ions. Nevertheless, their decolourisation efficiency is limited and requires a substantial inventory, making them an expensive method for sugar whitening. Overtime, bone chars reportedly degrade with pores obstructed that warrant regular replacement (Azevedo, 2017). Currently, the utilisation of bone chars in sugar refining processes is reducing with the emerging of modern replacements such as activated carbon, ion-exchange resin and membrane filtration (Vu et. al., 2020). Nonetheless, bone chars are still being used in a small number of factories worldwide including Brazil, the United States and Thailand (Asia Sugar Mills, 2013; Brazilian Sugar Exporters, 2023; Icenhower, 2023), and such occurrence needs an enhanced awareness among relevant authorities especially in a densely populated Muslim nation.

Activated carbon, also known as activated charcoal, is another frequently used material in the sugar refinery. It is a black, tasteless, odourless and non-graphitic adsorbent that can appear in a granular, powdered and pellet form. Activated carbon is highly porous and has a large surface area, allowing it to possess an excellent adsorption ability (Nwanko et. al., 2018). Agricultural by-products are the common raw materials used to manufacture activated carbon and the type of material chosen is dependent on the price, adsorption capacity and stability. Animal bones particularly are usually preferred due to its abundance and affordable price. Animal bones are subjected to carbonisation in a muffle furnace in the absence of air at around 500 to 700 °C for 4 to 6 hours, to produce activated carbon (Mohd Salleh et. al., 2020). Activated carbon has a high capacity for decolourisation and is excellent at eliminating flavonoids and phenolic colourants. Additionally, it permits the elimination of unpleasant-smelling compounds found in sugar liquor. Furthermore, activated carbon is beneficial as its energy demand is decreased by half during sugar decolourisation process when compared to using bone char (Azevedo, 2017). Overall, animal bones are still widely used as part of the manufacturing processes in the sugar industry and hence an analysis of the rulings on the usage of animal bones is required to solve the halal status of the sugar.

3.1.2 *Analysis of fatwas on the issues of animal bones in food-related industries*

While the fatwas on the utilisation of animal bones in refined sugar processing specifically may not be available, the present study provides any relevant fatwas regarding the issues of animal bones being practiced in many industries. Apart from sugar industry, the application of animal bones can be found in water filtration system and bone China (Mohd Salleh et. al., 2017). Table 2 shows the summary of fatwas on the usage of animal bones in food-related industries published by Brunei Darussalam, Malaysia, Indonesia and Singapore.

Available fatwas on the involvement of animal bones are mainly being emphasised in the bone China production by Brunei, Malaysia and Singapore, whereas only Indonesia has stated specifically the rulings of animal bones in refined sugar processing. Nevertheless, Brunei, Malaysia and Indonesia agreed on the permissibility of bone product if it is sourced from halal animals and that animals have been slaughtered according to Shariah law (Brunei Darussalam State Mufti's Office, 2007; Majlis Ulama Indonesia, 2018a; Jawatankuasa Fatwa Majlis Kebangsaan Bagi Hal Ehwal Ugama Islam Malaysia, 2012). The three countries also consider haram on bone product if it is based on haram animals (pigs and dogs) and permissible animals that have not been slaughtered according to Shariah law. In contrast, only Singapore agreed on the permissibility of bone product regardless of the origin, with a reason that the properties of the bones have changed and mixed with other substances like clay (Islamic Religious Council of Singapore, 2020).

Table 2. The summary of fatwas on the ruling of animal bones in food-related industries.

No.	Fatwa Institution	Ruling
1	Brunei Darussalam State Mufti's Office *State Mufti's Office (2007), Issues on Halal Products: Using* ***Bone China*** *Crockery, pp 272-276.*	**Permissible:** if the bone ash is obtained from permissible animals and have been slaughtered according to Shariah principles. **Haram:** if the bone ash is obtained from pigs and dogs. **Haram:** if the bone ash is obtained from permissible animals but have not been slaughtered according to Shariah principles, thus it is considered as carrion. **Syubhah:** if the origin of the bone ash is unknown and dubious.

2	**The Fatwa Committee of The National Council for Islamic Religious Affairs in Malaysia (Jawatankuasa Fatwa Majlis Kebangsaan Bagi Hal Ehwal Ugama Islam Malaysia)** ***Deliberation No. 99 of the Fatwa Committee of The National Council for Islamic Religious Affairs Malaysia (2012), The Usage of Equipment and Accessories Made from Animal Bone Ashes (Bone China).***	**Permissible: if the bone ash is obtained from halal animals and have been slaughtered according to Shariah principles.** **Haram: if the bone ash is obtained from pigs.** **Haram: if the bone ash is obtained from permissible animals but have not been slaughtered according to Shariah principles.**
3	Indonesian Ulama Council (Majelis Ulama Indonesia, MUI) *Official website of MUI published on 12 September 2018, Halal Haram on* ***Refined Sugar****.*	**Halal:** if the activated carbon is derived from bones of halal animals and have been slaughtered according to Shariah principles. **Haram:** if the activated carbon is derived from bones of haram animals. **Haram:** if the activated carbon is derived from bones of animals that have not been slaughtered according to Shariah principles.
4	Islamic Religious Council of Singapore (Majlis Ugama Islam Singapura, MUIS) *Official website of MUIS, Frequently Asked Questions on Religious Queries: Eating & Drinking No. 14, Can I Use Any Tableware Made Of "****Bone China****"?*	**Permissible:** since the characteristics of the bones have altered, and combined with different substances, then the tableware is not impure and can be used to serve food.

In addition, according to the Halal Food Standard (Piawai Brunei Darussalam, PBD 24:2007), food is considered halal if the ingredient or product is from permissible animals and have been slaughtered based on Shariah principles, excluding pigs, dogs and animals that have not been slaughtered according to Shariah law (Islamic Religious Council of Brunei, 2007). This includes the food supply chain from manufacturing, processing, handling, delivery and distribution. Although no specific mentioning of animal bones was found, the statement is consistent and supported by the Brunei's Government Mufti Fatwa (2006). The ruling can be supported based on the Quran,

"He has forbidden to you dead animals, blood, the flesh of swine, and that which has been dedicated to other than Allah. But whoever is forced (by necessity), neither desiring (it) or transgressing (its limit), there is no sin upon him. Indeed, Allah is Forgiving and Merciful," (Al-Baqarah (2): 173).

Further analysis of the imported sugar may be required to be performed based on scientific findings, for example to test on the presence of animal DNA particularly porcine. Moreover, confirmation may be attained by a site visit to the manufacturing factory of the imported sugar. Lastly, interviews with relevant authorities such as officers from Ministry of Religious Affairs and Brunei Darussalam Food Authority may be conducted to achieve the final status of the sugar.

3.2 *Ethanol And Its Halal Status in Food and Beverages*

The second part of this section is focusing on the different types of ethanol and their application in food and beverages. This sub-section also compares the different halal rulings imposed on ethanol found in edibles.

3.2.1 *Ethanol And Its Presence in Food and Beverages*

Scientifically, the definition of alcohol refers to any chemical compound that contains a hydroxyl group (-OH) attached to a carbon atom. Ethanol is a type of alcohol which is comprised of two carbon atoms, linked with five hydrogen atoms and a hydroxyl group. In principle, there are two categories of ethanol, namely naturally produced ethanol and industrial ethanol (Pauzi et. al., 2019).

The first category of ethanol occurs via fermentation procedure of yeast or bacteria in a natural manner, which synthesises ethanol and carbon dioxide from sugar. The natural production of ethanol means the unintentional presence of ethanol. Such ethanol can happen in fruits and legumes, as well as fermented food for examples tapai, tempoyak, vinegars, soy sauce, kimchi and kombucha (ul Haque & Mueedin, 2021; Park et. al., 2016; Pauzi et. al., 2019).

The second category of ethanol is predominantly synthesised industrially. It can be produced intentionally either by fermentation, or synthetically via the conversion of organic compounds such as ethylene, ethane, acetic acid, acetaldehyde and many more (Alzeer & Hadeed, 2016). Industrial ethanol offers a wide range of applications, which is often found as disinfectant and cleaning materials, food additives, a carrier for medicines, personal hygiene products and in perfume industries (Alzeer & Hadeed, 2016; Pauzi et. al., 2019). In this paper, industrial ethanol is particularly discussed on its use as a solvent or stabiliser in food additives and other food products.

3.2.2 *Analysis Of Fatwas on The Issues of Ethanol in Food and Beverages*

In general, intoxicants of mainly alcoholic beverages, which are widely known as *khamr*, are unanimously deemed as *najis* or filth and therefore, their consumption is haram and prohibited by all Muslim scholars (Hanni & Aghwan, 2020). Nevertheless, there are various viewpoints with reference to food and beverages containing naturally produced and industrial ethanol between Brunei, Malaysia, Indonesia and Singapore (Table 3).

Table 3. The summary of fatwas on the ruling of ethanol content in food and beverages.

No.	Fatwa Institution	Ruling
1	Brunei Darussalam State Mufti's Office *i) State Mufti's Office (2007), Issues on Halal Products: The Hukm on Consuming Tapai, pp 14-21.* *ii) Government Mufti Fatwa (2019), Synthetic Alcohol as Solvents. Fatwa Series (10/2019).*	**Halal and permissible:** if the naturally produced ethanol does not reach intoxication level. **Haram:** only 0.00% of industrial ethanol is allowed in food and beverages.
2	The Fatwa Committee of The National Council for Islamic Religious Affairs in Malaysia (Jawatankuasa Fatwa Majlis Kebangsaan Bagi Hal Ehwal Ugama Islam Malaysia) *Deliberation of the Fatwa Committee of The National Council for Islamic Religious Affairs Malaysia (2011), Alcohol in Food, Beverages, Fragrances and Medicines.*	**Halal and permissible:** if the naturally produced ethanol limits at 1%. **Halal and permissible:** if the industrial ethanol level in the final product limits at 0.5%.
3	MUI *Fatwa of MUI No. 10 Year 2018 on Food and Beverage Products Containing Alcohol/Ethanol.*	**Halal and permissible:** the industrial ethanol level in the food product has no limit, provided it is medically harmless. Whereas its level in the beverage product should be less than 0.5%, provided it is medically harmless.
4	MUIS *Official website of MUIS (n.d), Office of The Mufti, Fatwa, Natural Ethanol in Halal Food Flavouring.*	**Halal and permissible:** if the industrial ethanol level in the flavouring limits at 0.5%, and the level in the final product limits at 0.1%.

Fatwas regarding the involvement of ethanol in food and beverages, particularly on the industrial type have been issued by Brunei, Malaysia, Indonesia and Singapore. However, all four nations remarkably stated discrepancies on resolving the limit of ethanol content in the products.

Malaysia, Indonesia and Singapore have considered the permissibility of industrial ethanol in edibles with certain conditions, nevertheless Brunei has deemed industrial ethanol in food as haram and forbidden on any circumstances (Brunei Darussalam Government Mufti Fatwa, 2019; Majelis Ulama Indonesia, 2018b; Islamic Religious Council of Singapore, n.d., Jawatankuasa Fatwa Majlis Kebangsaan Bagi Hal Ehwal Ugama Islam, 2011). On the other hand, naturally produced ethanol is considered as halal and permissible by Brunei and Malaysia on specific limits but no statement on this ethanol has been issued in the latest fatwa by Indonesia and Singapore.

The discrepancies on the limit of ethanol content in food have raised an issue especially when food products are subjected for importation and exportation. This is because one country has a different halal certifying body from other regions which have different authorities to issue its halal stance. For example, a laboratory analysis performed by the Ministry of Health of Brunei Darussalam based on random sampling of imported products had found 0.1% of alcohol in a soft drink named Orange Crush, a product from Malaysia (Brunei Darussalam State Mufti's Office, 2007). It was assumed that the alcohol was industrially produced, which was most likely acting as a stabiliser. Therefore, the soft drink was deemed haram for consumption according to Brunei's fatwa (Brunei Darussalam Government Mufti Fatwa (2019)), contradicting to the ruling issued by Malaysia which stated that the product may be considered halal and permissible if the alcohol level limits at 0.5% (Jawatankuasa Fatwa Majlis Kebangsaan Bagi Hal Ehwal Ugama Islam, 2011).

Furthermore, PBD 24:2007 stated that one of the requirements of halal food (and beverages) is that they must not contain any ingredient or product that is *najis* or filthy (Islamic Religious Council of Brunei, 2007). Industrial ethanol is considered as *najis* for consumption according to Brunei's law regardless of any content level (Brunei Darussalam State Mufti's Office, 2007). Hence, it is important to maintain the permissibility of food sold in the nation by regular inspection of all edibles, ensuring that no added ethanol in found by performing laboratory analysis of the local and imported food products. Such ruling can be justified according to the verse:

"O you have believed, indeed, intoxicants, gambling, (sacrificing on) stone alters (to other than Allah) and divining arrows are but defilement from the work of Satan, so avoid it that you may be successful," (Al-Maidah (5):90).

Moreover, the fatwa of Brunei depended on the justification according to the Hadith of Prophet Muhammad (Peace Be Upon Him), which translated as,

"*Everything that intoxicates when taken in large amounts is haram in small amounts*," (Sunan Abu Dawud, Hadith 3673).

4. CONCLUSION

Issues on the halalan thayyiban aspect of conventional food products are still rising. This warrants an increase in awareness among Muslims regarding their daily food and beverage consumption, whereby there are still some inconspicuous matters that can affect the halal status of these products. In view of the similarities found between various nations' fatwas, this occurrence is the reflection of consistent connections and justifications clarified according to the primary sources of Quran and Hadith. Whereas there are accounts of dissimilarities of fatwas between differing countries which may result from acceptance of the community and necessity of the residents. Overall, the halalan thayyiban issues may be overcome by involving a collaboration of authorities in addressing scientific findings in support with Shariah principles.

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6. REFERENCES

Alzeer, J., & Abou Hadeed, K. (2016). Ethanol and its Halal status in food industries. *Trends in Food Science & Technology*, *58*, 14–20. https://doi.org/10.1016/j.tifs.2016.10.018

Asia Sugar Mills. (2013). *Refined Sugar Production.* https://www.asiasugarmills.com/refinedsugar.html

Azevedo, J. L. A. (2017). *Sugar decolorization - strategies and solutions*. https://estudogeral.uc.pt/retrieve/161221/Sugar%20Decoloration%20strategies%20and%20solutions.pdf

Brazilian Sugar Exporters. (2023). *Wholesale Crystal White Sugar Exporters Manufacturers.* https://www.braziliansugarexporters.com/crystal-white-sugar

Brunei Darussalam State Mufti Office. (2007). *Issues on Halal Products* (State Mufti Office, Ed.; 1st ed.). Fatwa of The State Mufti.

Dewey, A. & Drahota, A. (2016) Introduction to systematic reviews: online learning module *Cochrane Training* https://training.cochrane.org/interactivelearning/module-1-introduction-conducting-systematic-reviews

Farminex. (2017). *Thailand Sugar Production.* http://www.thailandwhitesugar.com/thailand-sugar-production/

Halal World Institute. (2024, March 2). *Halal Food Market, Size, Global Forecast 2024: A $4,569.69 Billion Industry by 2030 - Key Trends, Share, Growth, Insight, Impact of Inflation, Company Analysis*. https://halalworldinstitute.org/en/news/institute-news/item/119-halal-food-market,-size,-global-forecast-2024-a-$4,569-69-billion-industry-by-2030-key-trends,-share,-growth,-insight,-impact-of-inflation,-company-analysis.html

Hanni, S. N., & Aghwan, Z. A. (2020). Halal Status of Edible Products Based on Alcohol Content. *Ar Raiq*, *3*(1), 1–33.

Icenhower, K. (2023). *The Char House: Long Considered Sugar Land's Most Iconic Building*.https://slheritage.org/2023/01/17/the-char-house-long-considered-sugar-lands-most-iconic-building/

Islamic Relgious Council of Singapore. (2020). *FAQs*. Religious Queries: Eating & Drinking. https://eservices.muis.gov.sg/ifaq/apps/fcd_faqmain.aspx#FAQ_159881

Islamic Religious Council of Brunei. (2007). Halal Food / Makanan Halal. *Brunei Darussalam Standard / Piawai Brunei Darussalam (PBD 24:2007), 1*.

Islamic Religious Council of Singapore. (n.d.). *Natural Ethanol In Halal Food Flavouring*. Office of The Mufti. Retrieved June 30, 2024, from https://www.muis.gov.sg/officeofthemufti/Fatwa/English-Ethanol

Jabatan Mufti Kerajaan Brunei Darussalam. (2006). The Usage Of Bone China Tableware. In *Fatwa Mufti Kerajaan* (Vol. 07/2006). https://www.mufti.gov.bn/Terbitan/Fatwa%20Mufti%20Kerajaan%202006.aspx

Jameel, S. (2023). Climate change, food systems and the Islamic perspective on alternative proteins. *Trends in Food Science & Technology*, *138*, 480–490. https://doi.org/10.1016/j.tifs.2023.06.028

Jawatankuasa Fatwa Majlis Kebangsaan Bagi Hal Ehwal Ugama Islam Malaysia. (2011). *Alkohol Dalam Makanan, Minuman, Pewangi Dan Ubat-Ubatan*. E-Sumber Maklumat Fatwa. http://e-smaf.islam.gov.my/e-smaf/index.php/main/mainv1/fatwa/pr/10281

Jawatankuasa Fatwa Majlis Kebangsaan Bagi Hal Ehwal Ugama Islam Malaysia. (2012). *Hukum Penggunaan Peralatan Dan Perhiasan Berasaskan Abu Tulang Haiwan (Bone China)*. E-Sumber Maklumat Fatwa. http://e-smaf.islam.gov.my/e-smaf/index.php/main/mainv1/fatwa/pr/10297

Khan, M. I., Haleem, A., & Khan, S. (2018). Defining Halal Supply Chain Management. *Supply Chain Forum: An International Journal*, *19*(2), 122–131. https://doi.org/10.1080/16258312.2018.1476776

Majelis Ulama Indonesia. (2018a). *Halal Haram Gula Rafinasi*. LLPOM MUI. https://halalmui.org/halal-haram-gula-rafinasi/

Majelis Ulama Indonesia. (2018b). Fatwa of MUI No. 10 Year 2018 on Food and Beverage Products Containing Alcohol/Ethanol. In *Himpunan Fatwa MUI Sejak 1975*. https://halalmui.org/wp-content/uploads/2022/10/Fatwa-Reference-1.pdf

Mohd Salleh, M. M., Deuraseh, N., Subri, I. M., Rahman, S. A., Mustafa, S., Jamaludin, M. A., & Safian, Y. H. M. (2017). The Use of Ceramic Product Derived from Non-Ḥalal Animal Bone: Is it Permissible from the Perspective of Islamic Law? *International Journal of Asian Social Science*, *7*(3), 192–198. https://doi.org/10.18488/journal.1/2017.7.3/1.3.192.198

Mohd Salleh, M. M., Mohd Subri, I., Deuraseh, N., Ab. Rahman, S., Mustafa, S. M., & Jamaludin, M. A. (2020). Analisis Penggunaan Tulang Haiwan Dalam Produk Penapis Air Dari Perspektif Halal: Kajian Di Hijrah Water Sdn. Bhd. *Ulum Islamiyyah*, *30*, 43–60. https://doi.org/10.33102/uij.vol30no.120

Nwankwo, I. H., Nwaiwu, N. E., & Nwabanne, J. T. (2018). Production And Characterization Of Activated Carbon From Animal Bone. *American Journal of Engineering Research*, *7*(7), 335–341.

Park, S., Kim, J.-C., Lee, H. S., Jeong, S.-W., & Shim, Y.-S. (2016). Determination of five alcohol compounds in fermented Korean foods via simple liquid extraction with dimethyl-sulfoxide followed by gas chromatography-mass spectrometry for Halal food certification. *LWT*, *74*, 563–570. https://doi.org/10.1016/j.lwt.2016.08.030

Pauzi, N., Man, S., Nawawi, M. S. A. M., & Abu-Hussin, M. F. (2019). Ethanol standard in halal dietary product among Southeast Asian halal governing bodies. *Trends in Food Science & Technology*, *86*, 375–380. https://doi.org/10.1016/j.tifs.2019.02.042

PETA. (2024). *Are animal ingredients included in white sugar?* https://www.peta.org/about-peta/faq/are-animal-ingredients-included-in-white-sugar/

Piccirillo, C. (2023). Preparation, characterisation and applications of bone char, a food waste-derived sustainable material: A review. *Journal of Environmental Management*, *339*, 117896. https://doi.org/10.1016/j.jenvman.2023.117896

Royal Thai Embassy. (2020). *Thailand-Brunei Relations*. https://bsb.thaiembassy.org/en/page/cate-4715-thailand-brunei-relations?menu=5d830eec15e39c31b4002658

Statista. (2003). *Leading exporters of halal foods to Organisation of Islamic Cooperation countries in 2021 (in billion U.S. dollars)*. Statista. https://www.statista.com/statistics/785151/top-exporters-of-halal-food-global/

Sulaiman, N. S., Abdullah, R., & Hashim, N. (2023). Halal Industry Development in Brunei Darussalam: Realities and Challenges. *KnE Social Sciences*. https://doi.org/10.18502/kss.v8i18.14308

ul-Haque, Dr. S. N. S. M., & Mueedin, N. (2021). Fermentation of Tapai and Alcohol Content Released From Tapai. *IOP Conference Series: Materials Science and Engineering*, *1053*(1), 012050. https://doi.org/10.1088/1757-899X/1053/1/012050

Vu, T., LeBlanc, J., & Chou, C. C. (2020). Clarification of sugarcane juice by ultrafiltration membrane: Toward the direct production of refined cane sugar. *Journal of Food Engineering*, *264*, 109682. https://doi.org/10.1016/j.jfoodeng.2019.07.029

World Population Review. (2024). *Muslim Population by Country 2024*. https://worldpopulationreview.com/country-rankings/muslim-population-by-country