

DIVERSITY IN HALAL FATWAS ON MAGGOT UTILISATION FOR FOOD APPLICATION IN THE HALAL INDUSTRY

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Abstract

This study examines the potential for issuing a halal fatwa on maggots in the halal industry, drawing parallels with fatwa methods applied to similar cases, such as the cochineal insect (karmin). The problem stems from the majority of Islamic scholars prohibiting insect consumption, including maggots, not primarily due to impurity but because they are classified as mayitah animals that die without proper Islamic slaughter. This raises challenges for processed maggot products in halal-certified industries, necessitating a clear fatwa to address permissibility. The objective is to analyze two primary approaches for issuing a halal fatwa on maggots, based on precedents from cochineal fatwas, and assess their applicability to ensure compliance with Islamic principles in the halal industry. Employing a normative legal approach with qualitative methods and literature review, the study reviews Islamic jurisprudence from various schools of thought. Data from fatwa authorities, such as the Indonesian Ulama Council (MUI), Darul Ifta of Egypt, and Jordan, are analyzed descriptively and analytically. Results and discussion highlight two key approaches: the first, rooted in the Maliki school, permits insect consumption if killed beforehand, as adopted by MUI in the cochineal fatwa; the second involves istihalah, the transformation of substances from impure or forbidden to pure or permissible, applied by Hanafi and Maliki scholars in Egyptian and Jordanian fatwas. These methods demonstrate flexibility in addressing processed insects. In conclusion, the approaches used in the cochineal case can be adapted for maggot fatwas, particularly for processed products, promoting consistency in halal certification and supporting the halal industry's growth while upholding Islamic ethics.

Keywords: *Maggot; Fatwa; Istihalah; Jordan; Egypt.*



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INTRODUCTION

In recent years, the sustainability of global food resources has emerged as a critical challenge, driven by accelerating climate change, rapid population growth, urbanization, frequent disasters, and demographic shifts. According to the State of Food Security and Nutrition in the World 2025 (SOFI 2025) jointly published by FAO, IFAD, UNICEF, WFP, and WHO, between 638 and 720 million people equivalent to 7.8-8.8% of the global population faced hunger in 2024. While modest recovery occurred post-COVID-19, progress toward SDG Target 2.1 (Zero Hunger by 2030) remains stalled, primarily due to persistent high food-price inflation that has eroded purchasing power, especially among low-income households. The 11th edition of the Global Food Security Index (GFSI, 2022) further confirms a three-year consecutive deterioration in the global food environment, rendering it highly vulnerable to shocks. These trends underscore an urgent need for innovative, efficient, and environmentally sustainable protein sources that can support both human and animal nutrition without exacerbating resource depletion.

Arif et al. (2020) highlight that urbanization, natural disasters, climate variability, and demographic transitions have compounded these pressures, leading to reduced agricultural productivity and heightened food insecurity. Miftahuddin et al. (2021, p. 468) add that the continuous shrinkage of arable land due to conversion for non-agricultural uses has become a dominant triggering factor, particularly in densely populated developing nations. Consequently, international organizations such as the Food and Agriculture Organization (FAO), Asia-Pacific Economic Cooperation (APEC), and Association of Southeast Asian Nations (ASEAN) have intensified discussions on achieving long-term food security through diversified and resilient supply chains (Suryana, 2014, p. 124).

Food security, as defined by Rehman et al. (2023, p. 81) drawing from Clapp et al. and McCarthy et al., exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. In Indonesia, the world's largest Muslim-majority country with over 270 million people, this challenge is particularly acute. Nasmiati et al. (2014, p. 19) documented the sharp rise in soybean imports (a primary protein source) alongside escalating prices, signaling a structural crisis that persists into 2025-2026. Recent data from the USDA Foreign Agricultural Service (2025) indicate soybean imports reached approximately 2.68 million tons in 2024 (an 18% increase from the prior year), while domestic production remains limited at around 0.36 million tons annually. This heavy reliance on imports exposes the country to global price volatility and supply disruptions, threatening livestock feed security and overall nutritional stability.

The escalating demand for nutritious yet affordable alternative food and feed sources has positioned black soldier fly (BSF) larvae (*Hermetia illucens*), commonly known as maggots, as a promising innovation. Maggots represent the larval stage in the BSF life cycle (Fauzi & Sari, 2018, p. 43). In several Indonesian regions, they are already cultivated as low-cost, high-protein livestock feed. Their nutritional profile, typically 30-53% crude protein on a dry-matter basis (often 40-50%), 12-42% fat, plus calcium, phosphorus, and essential minerals, makes them superior to conventional fishmeal or soybean meal in terms of cost-effectiveness and environmental footprint (Wallady et al., 2021; recent systematic reviews by Su, 2025 and Tariq, 2025). Maggots also contain chitin fibre, which supports digestive health and provides natural antimicrobial properties (Van Huis, 2013). Environmentally, BSF larvae excel as bioconverters: they reduce organic waste volume by 50-78% daily, emit significantly lower ammonia and

greenhouse gases than traditional livestock, and require no additional land or water-intensive inputs when reared on organic waste streams (Wang et al., 2017; Diener et al., 2011; Rehman et al., 2023). Recent studies (2024-2025) confirm that minimal inclusion of BSF larvae in aquafeed yields growth performance comparable to fishmeal-based diets, while converting up to 60% of substrate carbon into valuable biomass (Nyirenda, 2023; Schneider et al., 2025).

In Taiwan, processed BSF maggots are explored as a direct human food source to mitigate climate-induced protein shortages, noted for their palatable texture when properly prepared (Wang et al., 2017, p. 1). In Malaysia's Sabah region, over 60 insect species, including BSF, have historically been consumed by indigenous communities, though consumption has declined among the broader population (Wang et al., 2017, p. 9). Muslim-majority countries, including Indonesia and Malaysia, have increasingly researched BSF applications in both feed and food sectors, explicitly evaluating compliance with halal-thayyib principles amid the global push for sustainable protein (Widodo et al., 2021; Faisal et al., 2022).

Despite these compelling nutritional, economic, and ecological advantages, the legal status of maggots under Islamic law remains a pivotal concern in Indonesia. Muslims constitute the vast majority of the population and are governed by Shariah principles that strictly regulate permissible (halal) and prohibited (haram) consumption. Maggots, as larvae of the BSF, fall under the category of hasharat (small crawling creatures/insects). Classical Islamic jurisprudence reveals divergent opinions: the Maliki school permits hasharat consumption if the creature is alive and intentionally killed (based on Qur'an al-An'am 6:145 and Sahnun's *Al-Mudawwanah*), provided it is not inherently harmful. In contrast, the majority (jumhur) of scholars from the Hanafi, Shafi'i, Hanbali, and Zahiri schools prohibit them, classifying hasharat as khaba'ith (repulsive/impure) under Qur'an al-A'raf 7:157, and as mayitah (carrion) since they die without proper zabiha slaughter (Al-Nawawi, Al-Majmu'; Ibn Qudamah, Al-Mughni).

This scholarly debate is reflected in contemporary Indonesian fatwas. Majelis Ulama Indonesia (MUI) Fatwa No. 24 of 2019 specifically addresses "Larva Lalat Tentara Hitam" (BSF maggots), ruling that consumption is haram as they belong to the hasharat category, while cultivation for beneficial purposes (e.g., animal feed) is mubah (permissible). No explicit fatwa, however, addresses processed maggot products intended for industrial-scale halal supply chains (e.g., defatted meal, protein isolates, or feed additives subjected to thermal/chemical processing). Some preliminary scholarly opinions suggest potential permissibility if maggots are reared on pure substrates and undergo transformation, yet these remain exploratory.

The absence of a dedicated ruling creates legal uncertainty for the rapidly expanding halal industry. Indonesia's halal economy is projected to grow exponentially, with the global market already exceeding USD 2 trillion. Processed insect-derived ingredients could significantly contribute to circular economy models aligned with maqasid al-Shariah (objectives of Islamic law), including preservation of life (hifz al-nafs) and environmental stewardship. Precedents exist in the treatment of cochineal (carmine) dye, another hasharat-derived substance. Egypt's Dar al-Ifta (2019) and Jordan's Dar al-Ifta (2020) permit cochineal after istihalah (complete substance transformation), whereby the insect's original characteristics are chemically altered and rendered pure. Malaysia's JAKIM (2021) and Lajnah Bahtsul Masail NU (Jabar/Jatim, 2019-2020) have issued similar rulings applying istihalah or Maliki leniency for processed forms. The COVID-19 vaccine precedent (porcine trypsin transformed via istihalah under necessity) further illustrates the principle's applicability in contemporary contexts.

This study therefore addresses a critical knowledge gap: the lack of comprehensive analysis and specific fatwa guidance on the halal status of processed BSF maggots despite their proven sustainability benefits and the 2019 MUI ruling's limitation to raw consumption. By employing the *ilhaqi* (analogical) method to cochineal fatwas and evaluating *istihalah* applicability, the research bridges classical *fiqh* with modern bio-innovation needs.

The primary objectives are threefold: (1) to analyse the legal status of maggot consumption and utilization under Islamic jurisprudence across major *madhhabs*; (2) to assess the applicability of *istihalah* and Maliki approaches in deeming processed maggot products halal; and (3) to provide evidence-based recommendations for fatwa institutions (MUI, JAKIM, Dar al-Ifta) and halal certification bodies. The theoretical framework integrates *usul al-fiqh* principles, particularly halal-haram classification, *istihalah*, and *qiyas*, with contemporary fatwa methodology and empirical data on BSF technology. This normative-doctrinal lens ensures rigorous alignment between Shariah objectives and sustainable development imperatives.

By clarifying the potential for a progressive halal fatwa, this study not only resolves jurisprudential ambiguity but also supports Indonesia's ambition to become a global halal hub while contributing to food security and environmental sustainability. The findings will serve as a practical reference for policymakers, industry practitioners, academics, and the wider Muslim community in advancing ethical bio-based innovation.

LITERATURE REVIEW

The legal status of insects (*hasharat*) in Islamic jurisprudence has been extensively debated across classical and contemporary scholarship, reflecting divergent methodological approaches within the four major *madhhabs*. The *jumhur* (majority) scholars from the Hanafi, Shafi'i, Hanbali, and Zahiri schools generally classify insects as haram for consumption. This ruling is primarily grounded in the interpretation of Surah al-A'raf (7:157), which prohibits *khaba'ith* (repulsive or impure substances). Insects are viewed as *mayitah* (carion) because they die without proper Islamic slaughter (*dhabh*), rendering them inherently unsuitable (*khaba'ith*) both physically and spiritually. Prominent jurists such as Imam al-Nawawi in *Al-Majmu' Sharh al-Muhadhdhab* and Ibn Qudamah in *Al-Mughni* reinforce this position, emphasising the principle of precaution (*ihtiyat*) to safeguard human health and spiritual purity. While this approach provides robust textual fidelity (*naql*) and consistency, it has been critiqued for its rigidity in addressing contemporary challenges, such as the urgent need for sustainable protein alternatives amid global food security crises. The majority view prioritises avoidance over contextual adaptation, potentially limiting innovation in bio-based industries.

In contrast, the Maliki school adopts a more flexible and contextual stance. According to Sahnun in *Al-Mudawwanah al-Kubra* (Vol. 3), insects (*hasharat*) that are not inherently harmful and are not found dead may be consumed if they are killed intentionally and do not violate core Shariah principles. This ruling draws from Surah al-An'am (6:145), which permits all things except those explicitly prohibited, and integrates rational consideration (*aql*) alongside textual evidence. Maliki scholars emphasise benefit (*maslahah*) and the absence of harm (*darar*), allowing for practical applications in modern contexts. This methodological difference, *naql*-centric (majority) versus *aql*-integrated (Maliki), highlights a key tension in *fiqh*: textual literalism versus adaptive reasoning. The Maliki position offers significant potential as a bridge between classical jurisprudence and contemporary sustainability needs, yet it remains

underutilised in modern fatwa literature, particularly concerning processed insect products like maggots.

The application of these classical views in modern fatwas is best illustrated through the case of cochineal (*Dactylopius coccus*), the source of carmine dye (E120). Fatwa institutions have diverged markedly in their rulings, revealing both opportunities and inconsistencies in applying *istihalah* (complete substance transformation) and *qiyas* (analogy). The Indonesian Ulama Council (MUI) issued Fatwa No. 33 of 2011, declaring cochineal-derived food and beverage colouring halal provided it is beneficial and non-harmful. MUI explicitly draws on the Maliki school, arguing that processing (drying and extraction) transforms the insect into a pure substance no longer retaining its original *hasharat* characteristics. This aligns with the Institute for the Assessment of Food, Drugs, and Cosmetics of the Indonesian Ulema Council (Lembaga Pengkajian Pangan, Obat-obatan, dan Kosmetika Majelis Ulama Indonesia; hereafter LPPOM MUI) guidelines (2015) and reflects a progressive accommodation of industrial needs. However, Nahdlatul Ulama's Lajnah Bahtsul Masail (LBM) in East and West Java has taken a stricter position. In its 2019-2020 decisions (and reaffirmed in 2023 discussions), LBM NU Jatim ruled carmine haram and najis, classifying it as derived from *mayitah* insects without sufficient *istihalah* to alter its legal status. This divergence between MUI (Maliki-influenced leniency) and LBM NU (majority *jumhur* adherence) underscores interpretive pluralism within Indonesia and highlights the need for harmonisation.

Internationally, Dar al-Ifta of Egypt (2011, 2015, and subsequent clarifications) permits cochineal extract through *istihalah*, particularly when chemical processing changes the substance's properties, aligning with Hanafi and Maliki majority opinions on transformation (e.g., impure matter becoming pure). Egypt's fatwas emphasise that once the original insect form is eliminated, the product loses its *khaba'ith* status. Similarly, Jordan's General Iftaa' Department (aliftaa.jo) rules that carmine (E120) is permissible if its properties have undergone complete transformation and no halal alternatives exist, provided it is not inherently intoxicating or harmful. Malaysia's Department of Islamic Development (JAKIM) and National Fatwa Committee (revised 2012) also permit cochineal in food and cosmetics, citing good manufacturing practices (GMP), hygienic cultivation of herbivorous cochineal insects, and the absence of blood-flowing creatures (thus not strictly *mayitah*). JAKIM's guidelines (MS 2565:2014 and updates) integrate *istihalah* with public interest (*maslahah 'ammah*). These rulings demonstrate a growing global trend toward *istihalah*-based permissibility for processed insect derivatives, yet they remain case-specific to cochineal and lack empirical testing for other insects such as black soldier fly (BSF) maggots.

Parallel to these fiqh developments, scientific literature on black soldier fly (*Hermetia illucens*) maggots has expanded rapidly, underscoring their potential as sustainable protein sources. Wang and Shelomi (2017) provide a comprehensive review, highlighting that BSF larvae contain 30-45% protein and 30-35% fat, with essential amino acids, minerals (calcium, phosphorus), and chitin fibre beneficial for digestion. In Taiwan, processed BSF maggots are explored as human food to address climate-induced food crises, while in South Africa and Malawi, Nyirenda (2023) demonstrates that low inclusion rates (5-10%) in fish feed yield growth performance comparable to conventional fishmeal, reducing reliance on overfished marine resources. Environmentally, Diener et al. (2011) quantify that BSF larvae convert organic waste into biomass with 65-78% daily volume reduction, producing residue suitable as organic fertiliser and emitting significantly lower greenhouse gases and ammonia than traditional livestock. Studies in Indonesia (Fauzi & Sari, 2018; Widyastuti et al., 2021; Asrowi et al., 2024) confirm maggots' efficacy in waste management and poultry/fish feed, with

defatted BSF replacing up to 100% soybean meal without adverse effects (Mangisah et al., 2022). These findings strongly support circular economy models aligned with halal-thayyib principles of sustainability and environmental stewardship.

However, a critical gap persists in the integration of scientific and Shariah perspectives. While nutritional and environmental benefits are well-documented, few studies (e.g., Widodo et al., 2021; Rahman & Alawi, 2020) engage deeply with halal-thayyib requirements or fiqh analysis. Existing fatwa literature focuses predominantly on cochineal, with no dedicated ruling on maggots despite MUI Fatwa No. 24 of 2019 classifying BSF larvae as hasharat (consumption haram, cultivation mubah). Cross-madhab comparisons remain superficial, and the application of istihalah to maggot processing (drying, defatting, grinding on halal substrates) has not been empirically validated. Subjective interpretations of transformation risk inconsistency across institutions.

Overall, the literature reveals an evolution from conservative classical prohibitions toward adaptive modern fatwas via Maliki leniency and istihalah. Yet significant lacunae remain: the absence of a specific maggot fatwa, insufficient empirical testing of istihalah for larval insects, and limited interdisciplinary integration of sustainability science with Islamic legal theory. This study addresses these gaps by conducting a comparative analysis of MUI, LBM NU, Dar al-Ifta Egypt, Dar al-Ifta Jordan, and JAKIM rulings, applying qiyas and ilhaq (extension) from cochineal precedents to BSF maggots, and proposing a harmonised framework for halal industry application. Such an approach advances fiqh al-mu'amalat and supports global halal innovation while upholding Shariah integrity.

METHODOLOGY

This study adopts a qualitative normative legal research design, also known as doctrinal or library-based research. This methodological approach is highly suitable for analysing the potential issuance of a halal fatwa on the utilisation of black soldier fly (*Hermetia illucens*) maggots in the halal industry. Normative legal research focuses on the systematic examination, interpretation, and critical evaluation of existing legal norms, principles, and doctrines derived from primary and secondary Shariah sources without involving empirical data collection from human subjects (Zahrah, 1997; Hallaq, 2009). The research is grounded in the principles of *usul al-fiqh* and employs a comparative fiqh (*fiqh muqaran*) methodology. This enables the researchers to compare classical juristic opinions across the four Sunni madhhabs with modern fatwas (particularly those concerning cochineal/carmine), and subsequently apply qiyas (analogical reasoning), ilhaq (extension of rulings), and the doctrine of istihalah (complete substance transformation) to the case of maggots. The study also integrates *maqasid al-Shariah* considerations, especially the preservation of life (*hifz al-nafs*) and environmental stewardship (*hifz al-bi'ah*), to evaluate the permissibility and benefit of maggot utilisation in the halal economy.

Research Design

The study follows a doctrinal-normative design with an analytical-critical approach. This design is particularly appropriate for investigating emerging halal issues such as alternative protein sources from insects, as it allows for a thorough investigation of textual evidence (*adilla shar'iyyah*) and the derivation of new legal opinions through *ijtihad* and *tarjih*. The research process begins with the identification of the legal problem (*mas'alah*), followed

by the collection of relevant sources, analysis using *usul al-fiqh* tools, and finally the formulation of a potential fatwa framework.

Sources of Data

Data were drawn from two main categories:

Primary sources consist of:

- The Noble Qur'an and authentic Sunnah (Hadith) pertaining to the consumption of animals, hasharat (insects), and the principles of halal and haram.
- Classical fiqh texts representing the major madhhabs, including Sahnun's *Al-Mudawwanah al-Kubra* (Maliki school), al-Nawawi's *Al-Majmu' Sharh al-Muhadhdhab* (Shafi'i), Ibn Qudamah's *Al-Mughni* (Hanbali), and major Hanafi references.
- Official fatwas and guidelines issued by recognised authorities: MUI Fatwa No. 24 of 2019 on hasharat, MUI decisions on cochineal (2012, 2015), Dar al-Ifta al-Misriyyah (Egypt, 2019), Dar al-Ifta al-Urdunniyyah (Jordan, 2020), JAKIM guidelines on animal-derived colourants (2021), and resolutions from Lajnah Bahtsul Masail Nahdlatul Ulama (LBM NU) Jawa Barat and Jawa Timur (2019-2020).

Secondary sources include peer-reviewed journal articles, academic books on Islamic jurisprudence and halal studies, and scientific literature documenting the nutritional and environmental benefits of black soldier fly maggots (retrieved from Scopus, Google Scholar, and official institutional repositories).

Data Collection Procedure

The data collection process involved systematic documentary research. Relevant materials were gathered through comprehensive searches using keywords such as “hasharat”, “black soldier fly maggots”, “istihalah”, “cochineal fatwa”, “carmine halal”, and “insect consumption in Islam”. Sources were retrieved from academic databases, official websites of fatwa institutions, and digital libraries of classical Islamic texts. Only authoritative and credible documents were selected after careful screening based on relevance, scholarly consensus (*ijma'*), and the strength of legal reasoning (*tarjih*).

Data Analysis

The analysis was conducted using qualitative content analysis combined with comparative legal analysis. The process involved four stages: (1) thematic coding to identify core themes (prohibition of hasharat by the *jumhur*, Maliki exception, and *istihalah* application); (2) application of *qiyas* to draw legal analogies between cochineal insects (as *asl*) and black soldier fly maggots (as *far'*); (3) critical evaluation of *istihalah* processes in maggot cultivation and processing (drying, defatting, and extraction); and (4) assessment through the lens of *maqasid al-Shariah*.

To ensure validity and reliability, source triangulation was employed by cross-verifying opinions across different madhhabs and fatwa institutions. Potential interpretive biases were minimised through constant reference to original Arabic texts and strict adherence to established principles of *usul al-fiqh*. This methodological framework provides a robust, reproducible foundation for proposing a potential halal fatwa on maggots that is both faithful

to classical jurisprudence and responsive to contemporary sustainability needs in the halal industry.

RESULTS AND DISCUSSION

Utilization of Black Soldier Fly Maggots: Scientific, Environmental, and Economic Dimensions

Maggots, specifically the larvae of the black soldier fly (*Hermetia illucens* — BSF), represent a critical developmental stage in the insect life cycle and have gained international recognition for their multifaceted applications in addressing contemporary challenges of waste management and protein scarcity. These larvae function as highly efficient biological decomposers, breaking down organic matter into simpler compounds through symbiotic action with decomposing bacteria in their digestive systems. This process not only reduces waste volume but also converts it into high-nutrient biomass, thereby contributing directly to ecosystem sustainability and circular economy models (Nguyen et al., 2019; Diener et al., 2011).

Scientifically, BSF maggots demonstrate exceptional efficiency in mitigating organic waste issues. Research by Diener et al. (2011) establishes that the larvae can reduce organic waste by 65.5% to 78.9% daily, far surpassing conventional composting methods. This rapid decomposition is facilitated by the larvae's ability to process a wide range of substrates, including kitchen waste, agricultural residues, and manure, while emitting significantly lower levels of ammonia and greenhouse gases compared to traditional livestock. Asrowi et al. (2024) further highlight the odourless nature of BSF cultivation, eliminating the common nuisance associated with other fly species and making it suitable for urban and peri-urban environments. Moreover, maggots do not transmit diseases to humans and actively suppress populations of disease-carrying house flies (*Musca domestica*), offering an additional public health benefit (Asrowi et al., 2024, p. 726).

The cultivation of BSF maggots originated in the United States and Europe in the early 2000s as a targeted strategy for organic waste management. The species was selected for its swift life cycle (approximately 14-21 days from egg to prepupa), high feed-conversion efficiency, and capacity to transform low-value waste into valuable protein biomass (Rahman & Abdullah, 2020). This practice has rapidly expanded to Southeast Asia, particularly Malaysia and Indonesia, where pilot projects in fish and poultry nutrition have demonstrated its viability as a cost-effective alternative to imported soybean meal and fishmeal (Faisal et al., 2022; Mangisah et al., 2022). Nutritionally, BSF larvae contain 40-50% crude protein on a dry-matter basis, along with essential amino acids, calcium, phosphorus, and chitin fibre that supports digestive health and natural immunity in livestock (Wallady et al., 2021; Asrowi et al., 2024). A study by Mangisah et al. (2022, p. 46) found that defatted BSF maggots could replace 50% or even 100% of soybean meal in layer chicken diets without adverse effects on growth performance, egg quality, or health, in fact, offering superior nutritional profiles and reduced feed costs.

Economically and practically, maggot production requires no preservatives or synthetic chemicals, relies solely on readily available organic waste, and creates income opportunities for small-scale entrepreneurs and rural communities (Widyastuti et al., 2021, p. 3). The prepupae stage, in particular, serves as high-quality animal feed while the residue (frass) functions as nutrient-rich organic fertilizer, closing the waste-to-resource loop. Comparative

analysis with earlier studies (e.g., Nguyen et al., 2019) confirms that BSF larvae achieve superior biomass conversion rates, significantly lowering reliance on conventional feeds and reducing greenhouse gas emissions from waste decomposition. In urban settings, this positions maggots as a scalable solution to landfill overload and environmental pollution (Rahman & Alawi, 2020).

From the perspective of the halal industry, the role of BSF maggots as decomposers aligns seamlessly with the Qur'anic principle of halal-thayyib (permissible and wholesome; QS. al-Baqarah: 168). They convert potentially impure organic waste into pure, beneficial resources without introducing najis (impurity) or haram elements, provided the substrate is halal and free from prohibited substances (Yusuf et al., 2021). This utilisation embodies Shariah principles of environmental stewardship (hifz al-bi'ah), prevention of waste (israf), and promotion of public welfare (maslahah), making maggot-based products not merely sustainable but also ethically and religiously compliant when processed correctly. However, their classification as hasharat (insects) necessitates careful legal scrutiny under Islamic jurisprudence.

Legal Classification of Maggots as Hasharat and Comparative Fatwa Analysis on Cochineal

In classical fiqh literature, hasharat encompasses small crawling or flying creatures, including insects, lice, and earth-bound organisms. Scholars such as Ibn Qudamah (1997) in *Al-Mughni* and Al-Nawawi (1997) in *Al-Majmu'* Syarh al-Muhadhdhab classify hasharat as creatures not traditionally slaughtered, rendering them outside the scope of permissible meat unless explicitly exempted. Maggots, as the larval stage of *Hermetia illucens* (Diptera), fall squarely within this category due to their insect biology. The majority of scholars (jumhur) from the Hanafi, Shafi'i, Hanbali, and Zahiri schools deem them khaba'ith (repulsive/impure) based on QS. al-A'raf: 157, and mayitah (carion) because they die without proper zabihah. In contrast, the Maliki school adopts a more contextual approach, permitting hasharat if they are beneficial, non-harmful, and killed intentionally prior to use (Sahnun, *Al-Mudawwanah*, Vol. 3).

It is important to clarify what “intentional killing” (qatl al-hashrah qasdan) entails in Maliki fiqh and how it is operationalised in practice. Because hasharat have no flowing blood (la nafsa lahu sa'ilah), Maliki jurists do not require the formal ritual slaughter (dhabh) prescribed for vertebrate livestock. What is required is only that death results from a deliberate human act rather than from natural causes, disease, or neglect, since death by the latter would still render the creature mayitah (carion) and impermissible regardless of madhhab. Commentaries on Sahnun's *Al-Mudawwanah* accordingly recognise any deliberate, controlled method, such as crushing, exposure to fire, or immersion in boiling water, as sufficient, provided the killing is not gratuitously cruel, in keeping with the broader Shariah principle of compassion (rahmah) toward animals.

Translated into halal-industry practice, this criterion is operationalised through standard BSF processing protocols. Live larvae intended for food or feed-grade meal are deliberately killed prior to further treatment, typically by blanching or scalding in hot water, steaming, or controlled freezing, before drying, defatting, and milling (Wang & Shelomi, 2017; Diener et al., 2011). Because each of these steps constitutes a controlled, intentional act of killing performed by the producer, rather than the passive death of larvae left to perish on their own, they satisfy the Maliki precondition in a manner directly analogous to the drying and crushing of cochineal insects that MUI and LPPOM MUI (2015) accepted as an adequate processing

antecedent to *istihalah*. This parallel strengthens the case for applying the same reasoning to BSF maggots: provided that larvae are killed deliberately through documented, verifiable processing steps prior to drying or defatting, and are not collected as already-dead carcasses, the Maliki criterion of intentional killing can reasonably be regarded as fulfilled, removing one of the two jurisprudential obstacles (*mayitah* status) underlying MUI Fatwa No. 24 of 2019.

To resolve the legal status of maggots in processed form, this study draws an analogy (*qiyas*) with cochineal insects (*Dactylopius coccus*), whose extracted dye (carmine/E120) has been subject to extensive fatwa deliberation. Cochineal, a scale insect cultivated on cactus plants, is processed by drying and crushing to extract the red pigment carminic acid. This process raises identical Shariah questions regarding *hasharat* origin and *istihalah* (complete substance transformation).

The Indonesian Ulema Council (MUI) issued Fatwa No. 33 of 2011 concerning food and drink colouring from cochineal insects, ruling it halal provided it is beneficial and non-harmful. MUI adopts the Maliki position that permits certain insects under specific conditions and incorporates processing that removes the original *hasharat* characteristics through *istihalah* (LPPOM MUI, 2015). This ruling balances textual fidelity with contemporary *maslahah*.

Conversely, Lajnah Bahtsul Masail (LBM) Nahdlatul Ulama in East and West Java (2018-2020) maintains a stricter majority (*jumhur*) view, declaring cochineal impermissible in food unless complete *istihalah* occurs, which they argue is not fully achieved in current extraction methods. This reflects a precautionary (*ihtiyat*) approach rooted in Shafi'i and Hanbali interpretations (Bahtsul Masail NU Jatim, 2019; Bahtsul Masail NU Jabar, 2020).

Egypt's Dar al-Ifta (2015/2019) explicitly permits cochineal extract when *istihalah* transforms the substance into a new entity with altered properties, eliminating its *najis* and *hasharat* status. The ruling draws on both Maliki leniency and Hanafi principles of transformation (Dar al-Ifta Egypt). Similarly, Jordan's Dar al-Ifta (2020) allows carmine post-*istihalah* but prohibits it otherwise, emphasising that the chemical change must be irreversible and the final product free of original insect traits (Dar al-Ifta Jordan). Malaysia's JAKIM (2021) aligns with this transformative approach, permitting cochineal in non-ingestible cosmetics and, under strict conditions, in food after purification (JAKIM).

These divergent yet complementary positions illustrate the dynamism of *fiqh* in addressing emerging technologies. The shared use of *qiyas* (analogy) and *istihalah* provides a robust methodological framework for extending rulings to maggots.

Application of Qiyas and Istihalah to Maggots: Pathways to Halal Fatwa

Applying *qiyas* to maggots reveals strong '*illah* (effective cause) with cochineal: both originate from *hasharat*, both undergo processing (drying, defatting, grinding), and both can be bred on halal substrates. Biological differences (larval vs. adult form; Diptera vs. Hemiptera) do not negate the analogy, as the core legal issue is the transformation of the substance. When BSF maggots are reared on pure organic waste and processed into feed or food (e.g., defatted powder or protein isolate), the original insect structure, odour, and characteristics disappear, fulfilling Hanafi and Maliki criteria for *istihalah* (complete change of nature).

Table 1: Qiyas Comparison between BSF Maggots and Cochineal

Qiyas Element	BSF Maggots (Far')	Cochineal (Asl)
Asl (Original Case)	BSF maggot (larval stage of <i>Hermetia illucens</i> , Diptera)	Cochineal (adult scale insect, <i>Dactylopius coccus</i> , Hemiptera)
Legal Category	Hasharat (insect/small crawling creature); prohibited by <i>jumhur</i>	Hasharat (scale insect); prohibited by <i>jumhur</i>
'Illah (Effective Cause)	Insect origin + processing transformation (drying, defatting, grinding)	Insect origin + processing transformation (drying, crushing, extraction)
Substrate (Breeding Medium)	Organic waste / halal substrates (controllable)	Cactus plants (inherently halal substrate)
Biological Form	Larval stage (Diptera) — difference from cochineal	Adult insect (Hemiptera) — difference from maggot
Core Legal Issue	Transformation of substance via <i>istihalah</i>	Transformation of substance via <i>istihalah</i>
Qiyas Analogy Valid?	Yes — biological differences (larval vs. adult; Diptera vs. Hemiptera) do not negate the analogy, as the 'illah (legal cause) is the transformation of substance, not taxonomic identity	Serves as the Asl (original ruling) for the qiyas analogy
Fatwa Precedent	No dedicated fatwa yet; MUI Fatwa No. 24/2019 prohibits raw/live maggots as hasharat	MUI Fatwa No. 33/2011 (halal); Egypt, Jordan Dar al-Ifta; JAKIM 2021 (permitted via <i>istihalah</i>)

Source: Authors' compilation based on MUI Fatwa No. 33/2011, No. 24/2019; Dar al-Ifta Egypt (2015/2019); Dar al-Ifta Jordan (2020); JAKIM (2021).

Hanafi scholars permit this transformation for substances such as alcohol-to-vinegar or impure gelatin; Maliki jurists extend it broadly to beneficial insects. Shafi'i scholars are more restrictive, limiting *istihalah* to specific cases, yet even they allow exceptions in necessity (*darurah*). Thus, processed maggot products satisfy the conditions for permissibility under the Maliki approach (MUI precedent) and *istihalah* (Egypt, Jordan, JAKIM precedent). Raw or live maggots remain subject to the majority prohibition, consistent with MUI Fatwa No. 24 of 2019 on hasharat consumption.

Table 2: Istihalah Application to Maggots by Madhhab and Fatwa Precedent

Madhhab Authority	Position on Istihalah	Application to Maggots	Fatwa Precedent / Institution
Hanafi	Permits <i>istihalah</i> broadly; a substance that undergoes complete transformation (e.g. alcohol → vinegar, impure gelatin → purified product) is rendered halal	Processed maggot (defatted powder/protein isolate) qualifies if original insect structure and odour are eliminated	Dar al-Ifta Egypt (2015/2019); Dar al-Ifta Jordan (2020)
Maliki	Extends <i>istihalah</i> broadly to beneficial insects; permits hasharat that are intentionally killed, non-harmful, and processed until original characteristics disappear	Processed maggots on halal substrate qualify; raw or live maggots remain prohibited	MUI Fatwa No. 33/2011 (cochineal, Maliki approach); JAKIM (2021)
Shafi'i	More restrictive; limits <i>istihalah</i> to specific cases;	Generally not permitted unless <i>darurah</i> (necessity)	LBM NU Jatim/Jabar (2019-2020) —

	exceptions permitted only under necessity (darurah)	is established; processed products remain debated	stricter majority view; no specific maggot fatwa
Hanbali / Jumhur	Generally does not accept istihalah for hasharat; classifies them as khaba'ith (repulsive) regardless of processing	Raw and processed maggots remain prohibited; MUI Fatwa No. 24/2019 aligns with this view for raw/live maggots	MUI Fatwa No. 24/2019 (hasharat consumption haram)

Source: Authors' compilation based on Al-Nawawi (1997); Ibn Qudamah (1997); Sahnun, Al-Mudawwanah; MUI Fatwa No. 24/2019 and No. 33/2011; Dar al-Ifta Egypt (2015/2019); Dar al-Ifta Jordan (2020); JAKIM (2021); LBM NU Jatim/Jabar (2019-2020).

Conclusion on Maggot Legality and Implications for the Halal Industry

This study identifies two primary, mutually reinforcing scholarly pathways for a halal fatwa on black soldier fly maggots: (1) the Maliki school's conditional permission for processed insects (as adopted by MUI for cochineal), and (2) the principle of istihalah combined with qiyas (as applied by Dar al-Ifta Egypt, Jordan, and JAKIM). These approaches reconcile classical fiqh with modern sustainability imperatives without compromising Shariah integrity.

The findings underscore that when maggots are cultivated and processed under controlled halal conditions, they fulfil halal-thayyib requirements and support global food security. To operationalise this potential, the study recommends that MUI, JAKIM, and international Dar al-Ifta bodies issue a joint or harmonised fatwa on insect-derived protein products, accompanied by standardised processing protocols and certification guidelines. Such a fatwa would accelerate innovation in the halal industry, promote environmental stewardship, and provide clear legal certainty for producers, consumers, and regulators worldwide. Future interdisciplinary research integrating empirical processing trials with deeper usul al-fiqh analysis is encouraged to refine these rulings further.

CONCLUSION

This study has comprehensively illuminated the transformative potential of black soldier fly larvae (Hermetia illucens), commonly referred to as maggots, as a sustainable and Shariah-compliant solution for organic waste management and alternative protein sources in the halal industry. Scientifically, BSF maggots excel in biomass conversion, reducing organic waste volume by 65.5% to 78.9% daily while generating high-nutrient biomass that contains 40-50% protein, essential amino acids, minerals (calcium and phosphorus), and chitin fibre beneficial for digestive health (Diener et al., 2011; Mangisah et al., 2022; Asrowi et al., 2024). Their rapid reproductive rates, odourless cultivation process, pathogen-suppressing properties, and significantly lower greenhouse gas and ammonia emissions compared to conventional livestock further underscore their environmental superiority (Wang et al., 2017; Widodo et al., 2021). These attributes not only address pressing global challenges of food security, shrinking agricultural land, and urban waste accumulation but also promote circular economy models by converting halal organic substrates into valuable livestock and aquaculture feed, thereby reducing reliance on costly imported soybean and fishmeal (Fauzi & Sari, 2018; Nyirenda, 2023). The practical implications are substantial: decreased production costs for small-scale Muslim entrepreneurs, scalable urban waste solutions, and enhanced food system resilience in Muslim-majority countries such as Indonesia, Malaysia, and beyond.

From the Shariah perspective, although maggots are classified as hasharat, a category that elicits ongoing scholarly debate, the findings of this research establish a clear jurisprudential pathway for permissibility in processed forms. The majority of classical scholars (jumhur) from the Hanafi, Shafi'i, Hanbali, and Zahiri schools prohibit insect consumption, viewing them as mayitah (animals that die without Islamic slaughter) and khaba'ith (repulsive substances) based on Surah al-A'raf (7:157) (Al-Nawawi, 1997; Ibn Qudamah, 1997; MUI Fatwa No. 24 of 2019). In contrast, the Maliki school adopts a more flexible position, permitting insects that are intentionally killed and non-harmful (Sahnun, Al-Mudawwanah). This study demonstrates that both approaches, when combined with the principle of istihalah (complete substance transformation), offer robust precedents, as evidenced by the treatment of cochineal (carmine) dye. Institutions such as Dar al-Ifta Egypt (2019) and Dar al-Ifta Jordan (2020) have explicitly permitted processed cochineal through istihalah, while JAKIM (2021) and the Maliki-inspired ruling of MUI align with this transformative mechanism. Through the methodological tool of qiyas (analogy) and ilhaq, these rulings can be extended to maggot products when cultivated on pure halal substrates and processed (drying, defatting, grinding) until the original hasharat characteristics are eliminated. Such application upholds the maqasid al-Shariah of hifz al-nafs (preservation of life) and hifz al-bi'ah (environmental protection) while maintaining the integrity of halal-thayyib principles.

The interpretive diversity among fatwa bodies, ranging from the stricter stance of Lajnah Bahtsul Masail NU Jabar/Jatim to the more progressive positions of Egyptian and Jordanian Dar al-Ifta, highlights both the richness of Islamic legal pluralism and the urgent need for harmonisation. This study bridges the identified knowledge gap by showing that classical fiqh possesses the necessary dynamism to accommodate biotechnological innovations without compromising core Islamic ethics.

Practically, the integration of processed BSF maggots into the halal industry could revolutionise waste-to-resource conversion, lower livestock feed costs by up to 50%, and support sustainable halal supply chains. To realise this potential fully, the study recommends that leading fatwa authorities, MUI, JAKIM, Dar al-Ifta Egypt, and Dar al-Ifta Jordan, issue a collaborative or harmonised fatwa that explicitly delineates conditions for permissibility, including substrate purity, verifiable istihalah processes, and quality assurance protocols. Future research should prioritise (1) laboratory validation of istihalah in maggot processing, (2) longitudinal nutritional and safety studies across diverse contexts, and (3) socio-economic analyses of consumer acceptance within Muslim communities.

Ultimately, black soldier fly maggots represent far more than an emerging bio-resource; they embody a profound convergence of ecological innovation and ethical production. By harnessing the flexibility of Maliki jurisprudence and the transformative power of istihalah, this research paves the way for a more sustainable, resilient, and authentically Shariah-compliant halal industry that serves both humanity and the environment in accordance with the timeless principles of mercy, balance, and stewardship.

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Authors' contributions

Fahmi Hasan Nugroho: Conceptualization, methodology, and investigation. Annisaa Hakim: Formal analysis, writing - original draft preparation, writing - review and editing, and corresponding author. Mayang Sri Rahayu: Data curation, literature review, and validation. Raihan Anugerah: Resources, supervision, and project administration. All author(s) read and approved the final manuscript.

Data Availability

All data generated or analysed during this study, including the classical fiqh texts, fatwa documents, and scientific literature reviewed, are included in this published article and its reference list.

Competing Interest

The author(s) declare that they have no competing interests.

Ethics Approval

Ethics approval was not required for this study because it did not involve human participants, animals, or identifiable personal data. This research is a normative-doctrinal legal study based entirely on documentary and literature analysis.

Use of Artificial Intelligence

Not applicable.

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