Under the auspices of the

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REPUBLIC OF TÜRKİYE

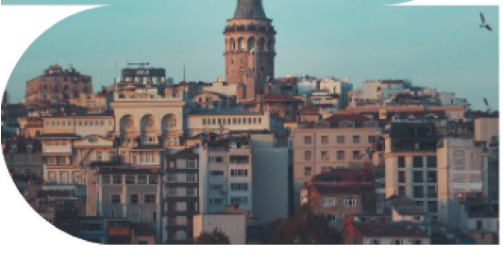
"World Halal Summit"

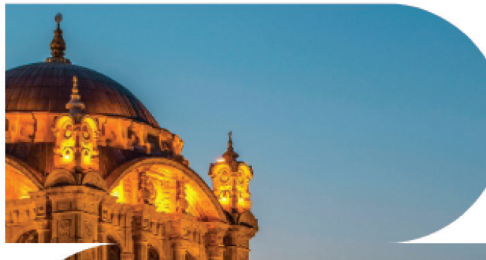
DÜNYA HELAL ZİRVESİ
WORLD HALAL SUMMIT

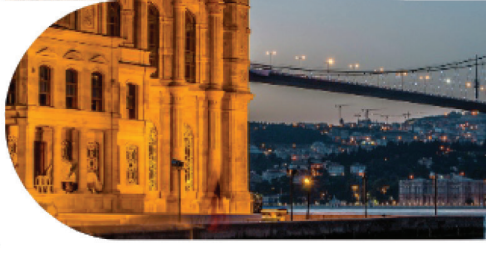
İnovasyon ve Mükemmellikle Helal Endüstrisini Güçlendirmek
Strengthening Halal Industry via Innovation & Excellence

İSTANBUL

26 - 29 KASIM 2025
26 - 29 NOV 2025







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CONGRESS BOOK

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Lokman Hekim University

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World Halal Summit 2025 - Congress Proceedings Book

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Graphic / Layout Design

Savaş Güler

Printing & Binding: American Bound

ISBN: 978-605-71144-4-0

This book was designed and published by **Afşar Medya Matbaacılık San. ve Tic. AŞ.**

Printing Address: Ostim OSB Mah. 1424 Sk. 8/2 Ostim Mega Center. Ostim Yenimahalle / Ankara

Certificate No: 47645

Year of Publication: November 2025

Dear Researchers, Experts, Scientists, Professionals, and Esteemed Colleagues,

It is with great pleasure that we, the Organizing Committee, invite you to the 11th edition of the World Halal Summit Istanbul, organized by the Standards and Metrology Institute for Islamic Countries (SMIIC)—an affiliated institution of the Organization of Islamic Cooperation (OIC), Lokman Hekim University, and Discover Events. This prestigious event will take place from November 26 to 28, 2025, at the Istanbul Expo Center, Türkiye.

The World Halal Summit, alongside Halal Expo Istanbul, serves as a premier platform for experts, researchers, and industry leaders to exchange insights and explore advancements in key areas of the Halal industry. Covering diverse sectors such as Halal food and beverages, cosmetics and personal care, tourism and hospitality, Islamic banking and finance, textile and modest fashion, and beyond, the Summit provides a unique opportunity to engage with the latest trends shaping the global Halal economy.

Designed to foster innovation, collaboration, and industry excellence, the Summit will feature captivating keynote addresses, insightful panel discussions, and scientific presentations delivered by distinguished figures and stakeholders from the Halal sector. Through these engaging sessions, participants will gain valuable perspectives on emerging opportunities and challenges, while contributing to the sustainable growth of the Halal ecosystem.

In our previous edition, we proudly hosted 59 distinguished international speakers from 18 countries across 10 insightful sessions, each dedicated to advancing the Halal industry through informed discussions and strategic dialogue.

The upcoming World Halal Summit 2025, themed “Strengthening Halal Industry via Innovation & Excellence” aims to bring together academics, researchers, policymakers, industry leaders, and business professionals to drive the Halal sector forward through forward-thinking strategies and transformative solutions.

Within the scope of our summit, numerous scholars and industry professionals from various countries will present their papers. In the final declaration of the summit, we believe that the latest research and practical insights shared in the sessions will serve as a valuable dataset for developing a strategic roadmap to shape the future of the Halal sector through innovation and excellence, while also providing a guiding framework for building a sustainable future in this field.

Best regards,

The Organizing Committee

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CONGRESS PROGRAM

26-28 November 2025 Istanbul Expo Center, Türkiye **World Halal Summit** "Strengthening Halal Industry via Innovation & Excellence"		
November 26, 2025		
09:00 – 10:00	REGISTRATION	
10:30 – 12:30	OPENING CEREMONY	• Recitation from Holy Qur'an • Opening Video • Official Opening Ceremony of 10th OIC Halal Expo and 11th WHS
12:30 – 13:30	BREAK	
13:45 – 14:30	**OFFICIAL OPENING SPEECHES OF THE 11TH WORLD HALAL SUMMIT**	
14:30 - 16:15	**SESSION 1:** Halal Quality Infrastructure / Standardization, Certification & Accreditation in Halal Industry	
	(I-16) Halal Accreditation Implementation in Türkiye And International Developments	**Mr. Zafer Soylu** Chairman of BoD of HAK, Türkiye
	(I-17) Shaping the Future of Halal: From Coordination to Integration	**H.E. Eng. Abdulaziz Fahad Alrushodi** CEO of Saudi Halal Center, Saudi Arabia
	(O-01) Simulating Institutional Governance of Halal Accreditation in OIC Countries: An Agent-Based Modelling Approach	**Mr. Mohammad Rahim Shahzad**, Assistant Researcher, SESRIC, Türkiye
	(O-02) A Comparative Assessment of Halal Compliance in Over-The-Counter Medications Across Four Countries with Reference to Saudi Arabia-	**Dr. Al Qarni Bader Ayed** Director of Health Specialties Programs, Internal Medicine Clinical Pharmacy, Jeddah First Health Cluster, Training and Education Supervisor in Clinical Pharmacy, Saudi Arabia
	(O-03) Adopting Innovative Ways of Certifying and Regulating Halal Meat in Muslim-Minority Countries for Export to Muslim-Majority Countries for Export to Muslim-Majority Countries	**Dr. Awal Fuseini** Senior Halal Manager, Agriculture and Horticulture Development Board, UK
16:15 – 16:30	Coffee Break	

16:30 – 17:30	**SESSION 2**: Innovation, Integrity, and Impact: Driving the Halal Economy Through Technology	
	(I-01) Strengthening The Halal Industry Via Innovation & Excellence	**Datuk Seri Mohd Rizal** Group Executive Chairman, Euro Jasmine Holding Sdn Bhd, Malaysia
	(I-02) Halal in the Digital Era: Ethical and Regulatory Perspectives on Artificial Intelligence	**Assist. Prof. Dr. Aldin Dugonjić** Chief Development Officer, the Bridge, Croatia
	(I-03) Halal Logistics in E-Commerce and Last-Mile Delivery	**Dr. Mian N. Riaz** Professor of Food Diversity, Texas A&M University, USA
	(I-04) Future Technologies in Halal Science: Innovations in Materials, Authentication, and Traceability	**Prof. Dr. Irwandi Jaswir** Professor, International Institute for Halal Research and Training (INHART), Malaysia
	(I-05) Integrating ESG Principles to Accelerate Innovation and Excellence in the Halal Industry: A Strategic Pathway to Sustainable Development	**Mufti Naeem Shahid** Director General, International Islamic Institute of Halal, Cultural, Social and Spiritual Sciences, (IHCS), Pakistan
EXPO VISIT & NETWORKING		
November 27, 2025		
09:00 – 09:30	REGISTRATION	
09:30-11:00	**SESSION 3:** Governance & Strategic Excellence in Halal Economy	
	(O-04) Integrating ESG Principles into the Halal Industry: A Path Towards Sustainable and Ethical Development	**Hon. Assoc. Prof. Dr Harlina Suzana Jaafar** Honorary Associate Professor, Department of Technology and Supply Chain Management, Faculty of Business and Management, University Technology Mara, Malaysia
	(O-05) Shari'ah Complaint and Sustainable Financial Inclusion Through Islamic Finance Institutions	**Mr. Aliyu Umar Waziri** Administrative Assistant, Islamic University in Uganda, Uganda
	(O-06) Multi Criteria Decision Making Approaches in Halal-Related Research Based on Sustainability: A Literature Review	**Dr. Mustafa Hamurcu** Industrial Engineer, Kırıkkale University, Faculty of Islamic Science, Türkiye
	(O-07) Evaluate Indonesia's Halal Industrial Estates Criteria in Supporting the Halal Industry Ecosystem in Indonesia	**Mrs. Kartika Listriana** Director General of Marine Spatial Planning, Ministry of Marine Affairs and Fisheries of the Republic of Indonesia, Indonesia
	(O-08) Use of Spatial Analytics for Islamic Sustainable Finance; Enhancing Trust, Transparency and Efficiency	**Ms. Syed Muhammad Abubakar** Resident Shariah Board Member, Dubai Islamic Bank, Pakistan

11:00 12:30	**SESSION 4:** Digital Transformation and Traceability in the Halal Industry	
	(O-09) Innovative AI in Halal Textile and Fashion Industry: MNCs Strategy for Excellence	**Dr. Fatma G. Unay** Istanbul University, Economics, Türkiye
	(O-10) Transformation Towards Efficiency of Halal Supply Chain in Indonesia	**Mr. Habibulloh** Senior Planner, Directorate General of Industrial Resilience, Region and International Industrial Access, Ministry of Industry Republic of Indonesia
	(O-11) Innovative Traceability for the Halal Industry: Alignment with OIC/SMIIC Standards	**Mrs. Fatma Betül Tellioğlu Gül** System Supervisior, Halal Product Application and Research Center, Lokman Hekim University, Türkiye
	(O-12) Enhancing Consumer Confidence through AI-based Halal Traceability Systems	**Dr. Mahir Jameel** Lecturer, Govt. MAO College, Islamic studies Department, Lahore, Pakistan
	(O-13) A Case Study of Halal Logo, Nutritional Content Table and Gross Weight of Some Food Products in the Libyan Market: Traceability Approach at POS	**Prof. Dr. Abdulatef Ahhmed Nesr** Life Science Department, Graduate School of Basic Sciences, Libyan Academy for Graduate Studies, Libya
12:30 – 14:00	LUNCH BREAK	
14:00 - 15:30	**SESSION 5:** Innovative Approaches in Halal Pharmaceuticals, Cosmetics & Dietary Supplements Innovation	
	(O-14) Towards Halal Alternatives: A Strategic Framework for Replacing Non-Halal Ingredients and Processes in the Pharmaceutical Sector	**Dr. Mohammed Ali Alsheikh** Specialist, SMIIC, Türkiye
	(O-15) Alternative Options for Halal Critical Ingredients in Halal Pharmaceutical and Cosmetics	**Assoc. Prof. Dr. Najwa Mohamad** Head of Quality, Department of Pharmaceutical Technology & Industry Faculty of Pharmacy University of Cyberjaya, Malaysia
	(O-16) Halal or Not? Unveiling the Status of Cosmetic Products in Malaysian Community Pharmacies	**Assoc. Prof. Dr. Suraiya Abdul Rahman** Dean, Faculty of Pharmacy University College MAIWP International (UCMI), Malaysia
	(O-17) Scientific Evaluation in the Halal Domain: The Role of Istihala in Innovation and the Assessment of Medicinal Plants	**Dr. Ben Salah Soussi Ahlem** Faculty of Sciences Sfax, Tunisia
	(O-18) Circular Economy: A Sustainable Approach for Halal Cosmetics Production	**Dr. Ruba Al-Thawabeia** Chairperson, SMIIC TC2 on Halal Cosmetics, Jordan
15:30 – 15:45	Coffee Break	

15:45 - 17:00	**SESSION 6:** Innovative Approaches in Halal Food and Functional Ingredients	
	(O-19) Fermented Products and Ethyl Alcohol –Scientific Realities, Shari'ah Rulings, and A Qualitative–Quantitative Framework for Halal Industry Compliance	**Dr. Mufti Sayed Arif Ali Shah Alhusaini** General Manager, Halal Certification, Testing and Research Services, (HCTRS), Pakistan
	(O-20) Harnessing Halal-Certified Bacteriophage to Improve the Safety and Quality of Red Meat: A Novel Approach to Strengthen Halal Food Industry	**Dr. Anum Ishaq** Assistant Professor, School of Food and Agricultural Sciences (SFAS) University of Management and Technology, Pakistan
	(O-21) Human Milk from Cloned Cows; (Islamic Injunction in the Light of Fiqh E Hanafi)	**Dr. M Ashraf Ali Farooqui** CEO, IHIC (International Halal Inspection and Certification), Pakistan
	(O-22) An Integrated Multi Criteria Decision Making Approach Proposal for Halal Food Supplier Selection Based on Sustainability, Food Safety, and Halal Criteria	**Dr. Mustafa Hamurcu** Industrial Engineer, Kırıkkale University, Faculty of Islamic Science, Türkiye
	(O-23) Composite Flours: A Functional Base for Ready-To-Use Halal Meat Analogues	**Prof. Dr. Imran Pasha** Director General, National Institute of Food Science & Technology (NIFSAT), Pakistan
EXPO VISIT & NETWORKING		
November 28, 2025		
09:00 – 09:30	REGISTRATION	
09:30- 11:00	**SESSION 7:** The Global Ascent of Halal Lifestyle: New Frontiers in Standards, Technology, and Market Impact	
	(I-06) Beyond Ingredients: Unveiling Critical Processing Areas in Halal Auditing	**Dr. Mufti Yousuf A.R. Khan** CEO, SANHA Halal Associates **Pakistan**
	(I-07) Strengthening the Halal Ecosystem Through Digital Technologies: A Comparative Study of Malaysia, UAE, and Indonesia.	**Mrs. Amel Mohammed Abdallaha** Technical Advisor, SMIIC, Türkiye
	(I-08) Women Powering the Global Rise of Halal Fashion	**Mr. Asad Sajjad** CEO, Halal Development Council (HDC), Pakistan
	(I-09) Halal as a Space of Encounter and Global Accommodation	**Prof. Khadiyatoulah Fall** Honorary Professor of the Intercultural Research Chair (CERII), University of Quebec in Chicoutimi, Senegal
	(I-10) The Experience of the Halal Standards Committee in Russia in Implementing & Halal & Standards	**Mr. Abbyas Shlyaposhnikov** Chairman, Halal Standard Committee of the Muslim Religious Board of the Republic of Tatarstan, Russia

09:30-11:00	**POSTER PRESENTATIONS**	
	(P-01) The Effects of Halal-Vegan Integration in the Sustainable Food Industry on Consumer Preferences and Market Dynamics	**Sümeyye Aktaş** Halal Product Development Program, Institute of Health Sciences, Lokman Hekim University, Türkiye
	(P-02) Microbiological Cleanliness in Halal Foods: A Bridge Between Food Safety and Religious Compliance	**Emre Kızıl** Biogenetics and Food Laboratory, Turkish Standards Institute, Türkiye
	(P-03) Scientific Verification in the Halal Supply Chain: Contributions of the TSE Food Laboratory	**Şule Aslantaş** Biogenetics and Food Laboratory, Turkish Standards Institute, Türkiye
	(P-04) Strengthening Global Trust in Halal Certification: The Role of Dual Accreditation and Advanced Testing Practices at TSE	**Keziban Yalap** Biogenetics and Food Laboratory, Turkish Standards Institute, Türkiye
11:00 - 12:30	**SESSION 8:** Laboratory Analyses and Verification in the Halal Industry	
	(O-24) ATP Bioluminescence as a tool for hygiene verification in Halal production	**Kemal Sejranić** Head of department for certification and analysis, Agency for Halal Quality Certification, Bosnia and Herzegovina
	(O-25) Driving Excellence in Halal Verification: Utilization of Spectroscopy and Chemometrics for Discrimination of Halal and Non-Halal Slaughtered Chicken Meat	**Dr. Hafiz Ubaid ur Rahman** Associate Professor, School of Food and Agricultural Sciences, University of Management and Technology, Pakistan
	(O-26) A Multiplex PCR Assay for Halal Verification of Botanical Ingredients to Prevent Najis Contamination and Fraud	**Dr. Jawaid Akram** Department of Botany (ISHU), Faculty of Science University of Karachi, Pakistan
	(O-27) Strengthening Halal Authenticity in the Meat Industry Through Advanced Ingredient Detection	**Dr. Usman Mir Khan** Ph.D. Food Technology, National Institute of Food Science and Technology, University of Agriculture, Pakistan
	(I-18) Halal Integrity Control in Manufacturing Sector	**Mr. Rohaizad Bin Hassan** General Manager, Food Safety & Defense, Yıldız Holding, Türkiye
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	(O-28) Evolving Halal Practices Among Muslim Communities in the DMV Region: A Campus-Centered Ethnographic Analysis	**Dr. H. Rümeysa Küçüköner** Associate Professor, Faculty of Theology, Dicle University, Türkiye
	(O-29) Halal Lifestyle and Social Cohesion: How public institutions can foster inclusivity through halal-sensitive policies	**Prof. Dr. Hamza Ateş** Istanbul Medeniyet University, Türkiye
	(O-30) Clarifying Islamic Tourism Terminology: A Conceptual and Taxonomical Study	**Dr. Sedat Yüksel** Associate Professor, Tourism Faculty of Afyon Kocatepe University, Türkiye
	(O-31) Rethinking Halal Certification: Balancing Religious Requirements, Sustainability, and Cultural Context in Muslim-Minority Countries	**Dr. Satomi Ohgata** Professor of International Studies, Faculty of Contemporary Business, Kyushu International University, Japan
	(O-32) Halal Food Preferences in the West Through Qur'anic and Jurisprudential Interpretations	**Assoc. Prof. Dr. Fatih Kanca** President, Diyanet Center of America, USA
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	(I-11) Towards a Halal Tourism Ecosystem in Italy: Public-Private Governance, Standards, and Territorial Impact	**Mr. Karim Benvenuto** President, Italy Muslim Friendly, Italy
	(I-12) The Revival of Islamic Aesthetics: Exploring "Halal Arts" as a Contemporary Universal Language	**Mrs. Sacide Tuba Barkçin** Professional Communicator**,** Türkiye
	(I-13) From Caravanserais to Community Tours: Reviving Islamic Heritage as a Strategy for Destination Branding	**Mrs. Soumaya T. Hamdi** Director, Halal Travel Guide, UK
	(I-14) Halal Navi: Harnessing Tech and Influence to Make Japan Muslim-Friendly	**Mr. Ikuto Hongu** CEO, Halal Navi Co., Ltd, Japan
	(I-15) Connecting The Global Muslim Travel Market and Unlocking Its Potential	**Mr. Waleed Jahangir** Executive Director, British Trade Association / Salam Booking / Muslim Travel Show, UK
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ACADEMIC SECTION 1: ORAL PRESENTATIONS

(O-01) SIMULATING INSTITUTIONAL GOVERNANCE OF HALAL ACCREDITATION IN OIC COUNTRIES: AN AGENT-BASED MODELLING APPROACH

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Abstract

This The credibility and governance of the global halal industry rely on two core mechanisms: Halal Certification (HC) and Halal Accreditation (HA). HC ensures that products and services comply with Islamic ethical and dietary standards, while HA verifies that certification bodies operate with competence, impartiality, and adherence to both Islamic principles and international norms. These mechanisms form the institutional backbone that fosters trust, regulatory assurance, and the smooth functioning of a global halal industry projected to reach $7.7 trillion by 2025.

However, the legitimacy and institutional framework of the global halal industry are significantly undermined by challenges in both HC and HA. On the certification side, the fragmented governance structure, inconsistent application of procedures, and varying interpretations of halal standards—particularly in non-Muslim countries where certification is often voluntary—create consumer confusion and hinder cross-border trade. On the accreditation side, the absence of a unified and credible oversight mechanism leads to weak regulation, irregular inspections, and limited mutual recognition among accreditation institutions. The challenges both in HC and HA increase the risk of fraud, strain the balance between religious authenticity and market demands, and hinder the harmonization of global halal standards.

This study aims to model and evaluate a unified international halal accreditation framework to strengthen the credibility and governance of the global halal industry. It adopts an agent-based modelling (ABM) approach to simulate interactions among key institutional actors—such as certification and accreditation bodies (public, private, and semi-public), Shariah auditors, certified food technologists, regulators, local councils, health and safety departments, producers, and consumers—within diverse governance contexts. The model explores how variations in oversight mechanisms and policy scenarios impact stakeholder trust, fraud risk and the harmonization of global halal standards.

To the best of our knowledge, this study is the first to apply ABM to the institutional governance of halal accreditation. This approach helps identify governance conditions that enhance stakeholder trust, reduce fraud and mislabelling risks, and promote the harmonization of global halal standards. The findings offer deeper insights into the institutional dynamics that can drive a more coherent, transparent, and effective international halal accreditation system.

Keywords: Halal Accreditation Framework, Institutional Governance, Agent-Based Modelling, OIC Countries, Stakeholder Trust, Fragmented Certification Practices

(O-02) A COMPARATIVE ASSESSMENT OF HALAL COMPLIANCE IN OVER-THE-COUNTER MEDICATIONS ACROSS FOUR COUNTRIES WITH REFERENCE TO SAUDI ARABIA

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Abstract

Aim: This study conducted a comparative assessment of halal compliance and ingredient transparency in over-the-counter medications across Saudi Arabia, the United Arab Emirates, Malaysia, and Indonesia, using Saudi Arabia as the reference model.

Methods: A cross-sectional, product-level analysis was performed on fifty commonly available medications spanning five therapeutic categories. Data were collected from online pharmacy platforms to evaluate halal logo visibility, excipient disclosure, and the presence of ingredients with potential halal relevance.

Results: Of 200 product entries, only 4.5 percent displayed a halal logo and 9.5 percent provided transparent excipient labeling, with no products containing explicitly non-halal ingredients. Malaysia and Indonesia showed higher halal logo presence, while the United Arab Emirates demonstrated the greatest excipient transparency.

Conclusion: Findings reveal a gap between established halal certification frameworks and consumer-level labeling practices. Enhanced regulatory alignment and integrated labeling standards are recommended to strengthen consumer confidence and cross-border credibility in halal pharmaceuticals.

Keywords: Halal Pharmaceuticals, Over-the-Counter Medications, Halal Certification, Saudi Arabia, Malaysia, UAE, Indonesia

1. INTRODUCTION

The demand for halal-compliant pharmaceuticals is rising globally, particularly in Muslim-majority countries where religious observance strongly influences medication use (Jaber et al., 2025; Kasri et al., 2021). While halal certification is widespread in food and cosmetics, the pharmaceutical sector, especially over-the-counter (OTC) medications, remains underregulated (Astiwara, 2023; Luthviati & Jenvitchuwong, 2021). Many OTC products may contain potentially non-halal ingredients such as gelatin or ethanol, often without clear labeling, leading to uncertainty and possible avoidance by Muslim consumers (Tukiran et al., 2023).

Saudi Arabia has established a highly structured and globally recognized halal certification system integrating regulation, accreditation, and international cooperation. The Saudi Standards, Metrology

and Quality Organization (SASO) oversees national standards and conformity assessment, while the Saudi Accreditation Center (SAAC) accredits halal certification bodies in accordance with the standards of the Organization of Islamic Cooperation (OIC) and the Standards and Metrology Institute for Islamic Countries (SMIIC) (Khoiriah et al., 2024).

The Saudi Food and Drug Authority (SFDA) regulate and inspects food, pharmaceuticals, cosmetics, and medical devices, accepting only products certified by SAAC-accredited halal bodies. Through its Halal Center, SFDA manages certification registration and international coordination (Khoiriah et al., 2024; M.A.A. & M.M.M., 2012).

Situated in the United Arab Emirates, the International Halal Accreditation Forum (IHAF) functions as the apex body within the global Halal Assurance System (HAS), coordinating and standardizing accreditation frameworks to strengthen international recognition and trust in halal certification (Salam et al., 2023).

Indonesia operates a comprehensive mandatory halal certification system covering food, pharmaceuticals, cosmetics, and medical devices. It is governed by Law No. 33 of 2014 on Halal Product Assurance and implemented by the Halal Product Assurance Organizing Agency (Badan Penyelenggara Jaminan Produk Halal – BPJPH) under the Ministry of Religious Affairs (Kementerian Agama Republik Indonesia) (Luthviati & Jenvitchuwong, 2021).

Malaysia is recognized as a global leader in halal governance. The Department of Islamic Development Malaysia (JAKIM) oversees halal certification and accreditation, guided by national standards MS 1500:2019 for food and MS 2424:2012 for pharmaceuticals. Although certification for pharmaceuticals is voluntary, it is widely adopted for quality assurance, with the National Pharmaceutical Regulatory Agency (NPRA) working alongside JAKIM to verify halal compliance in product registration and labeling (Latiff, 2020).

Saudi Arabia, the United Arab Emirates, Indonesia, and Malaysia exemplify leading institutional models of halal certification in the Islamic world. Each has developed a distinct yet complementary system Saudi Arabia through its integrated national quality infrastructure, the UAE via a federal conformity framework, Indonesia through a mandatory nationwide scheme, and Malaysia with globally recognized standards. Together, these systems illustrate how coordinated efforts between regulatory, accreditation, and religious authorities strengthen global trust, harmonization, and transparency in the halal assurance ecosystem.

This study aims to conduct a comparative assessment of halal compliance in over-the-counter (OTC) medications across four countries, using Saudi Arabia as the reference model. The objective is to examine the visibility of halal certification, the disclosure of ingredients with potential halal relevance, and the level of excipient transparency within national pharmaceutical markets. Our objectives are (1) to benchmark halal labeling and ingredient transparency of OTC medications marketed in Saudi Arabia, the UAE, Malaysia, and Indonesia (2) to assess the availability and visibility of halal logos and certification marks on product packaging across the four countries (3) to analyze the presence of ingredients with potential halal relevance and (4) evaluate the extent of excipient disclosure on product labeling (5) to identify regulatory and market variations that may inform the development or harmonization of future halal pharmaceutical standards.

2. METHODOLOGY

2.1. Study Design

This study employed a cross-sectional, product-level comparative assessment to evaluate halal-related information in over-the-counter (OTC) medications across Saudi Arabia, United Arab Emirates, Indonesia, and Malaysia.

2.2. Product Selection

A total of **50 commonly available OTC products** were identified from the Saudi Arabian market, covering a broad range of therapeutic categories, including pain relief, cold and flu treatments, dietary supplements, and topical formulations. Product selection focused on items widely distributed and accessible to consumers across multiple markets.

2.3. Country Selection

Three comparator countries were included based on their regulatory and market relevance:

- **United Arab Emirates (UAE):** A regional economic hub with comparable pharmaceutical offerings.
- **Malaysia:** Recognized as a benchmark country due to its comprehensive halal certification framework under the **Department of Islamic Development Malaysia (JAKIM)**.
- **Indonesia:** Included for its large Muslim population and rapidly developing halal pharmaceutical ecosystem.

2.4. Data Collection

Data was obtained from leading online pharmacy platforms in each country. For each product-country combination, information was extracted on:

- Product registration and availability
- Visibility of halal certification or logo
- Identification of ingredients with potential halal relevance (e.g., gelatin, ethanol)
- Presence and clarity of excipient information on product packaging

In Malaysia, product halal status was cross-verified against the official JAKIM Halal Product Directory to confirm certification validity.

2.5. Data Analysis

Descriptive statistics (frequencies and percentages) were used to summarize:

- Presence and visibility of halal logos or certification marks
- Product availability across markets
- Transparency of ingredient and excipient labeling
- Frequency of ingredients with potential halal relevance

3. RESULTS

Table 1 presents the overall halal compliance. A total of 200 product entries representing 50 unique over-the-counter (OTC) medications were analyzed across four countries and five therapeutic categories. Overall, only 9 products (4.5%) displayed a halal logo, while 19 products (9.5%) provided transparent excipient labeling. None of the reviewed products contained explicitly identified non-halal ingredients.

Table 1: Overall Halal Compliance

Metric	N (%)
Total Products	200 (100)
Unique Products	50
Countries	4(100)
Categories	5(100)
% with Halal Logo	9(4.5)
% with Non-Halal Ingredient	0
% with Transparent Excipients	19(9.5)

3.1. Halal Compliance by Country

As shown in **Table 2**, variations in halal visibility were evident across markets. Malaysia recorded the highest proportion of products with a halal logo (12%), followed by Indonesia (6%), while Saudi Arabia and the United Arab Emirates (UAE) showed no halal markings on packaging. Transparency of excipient information was highest in the UAE (30%), followed by Saudi Arabia (8%), with none observed in Malaysia or Indonesia.

Table 2: Halal Compliance by Country

Country	No. of Products	Halal Logo	Non-Halal Ingredient	Transparent Excipients
Saudi Arabia	50(25)	0	0	4(8)
Emirates	50(25)	0	0	15(30)
Indonesia	50(25)	3(6)	0	0
Malaysia	50(25)	6(12)	0	0

A Chi-square test demonstrated a significant association between halal logo presence and country ($\chi^2 = 101.53$, $df = 6$, $p < 0.001$), indicating that halal certification visibility differs significantly among national markets.

Table 3: Chi-Square test of association

Variables	χ^2 (Chi-square)	df	p-value
Halal Logo vs Country	101.53	6	< 0.001*
Halal Logo vs Non-Halal Ingredient	16.37	12	0.178
Excipient Transparency vs Halal Logo	15.26	4	0.004*

*P value < 0.05

3.2. Halal Compliance by Product Category

Among therapeutic classes, digestive aids (7.5%) and vitamins/supplements (5%) showed the highest proportions of halal-labeled products, followed by analgesics (5.26%), cold and flu medications (2.38%), and topical (2.5%). Excipient transparency was most evident in topical creams and ointments (22.5%), followed by digestive aids and supplements (12.5% each).

Table 4: Halal Compliance by Product Category

Category	No. of Products	Halal Logo	Non-Halal Ingredient	Transparent Excipients
Analgesics	38(19)	2(5.26)	0	0
Cold & flu medications	42(21)	1(2.38)	0	0
Digestive aids	40(20)	3(7.50)	0	5(12.5)
Topical cream/ointments	40(20)	1(2.50)	0	9(22.5)
Vitamins & supplements	40(20)	2(5.00)	0	5(12.5)

4. DISCUSSION

This study set out to comparatively assess halal compliance and ingredient transparency in over-the-counter (OTC) medications across four national markets Saudi Arabia, the United Arab Emirates (UAE), Malaysia, and Indonesia with Saudi Arabia serving as the reference model. The findings reveal a clear imbalance between the formal presence of halal certification frameworks and their practical visibility on pharmaceutical products. While Malaysia and Indonesia countries with established halal governance systems demonstrated the highest rates of halal logo presence (12% and 6%, respectively), no halal markings were observed on OTC medications sold in Saudi Arabia or the UAE. Conversely, the UAE exhibited the highest excipient transparency (30%), highlighting that regulatory openness in ingredient disclosure does not necessarily translate into visible halal assurance. These results partly support the initial hypothesis that markets with institutionalized halal certification (Malaysia and Indonesia) would show stronger labeling performance; however, the unexpectedly limited visibility even within these systems underscores a persistent implementation gap between regulation and retail practice. Collectively, these findings suggest that the assurance of halal pharmaceutical integrity depends not only on the existence of certification policies but also on their translation into clear, consumer-facing labeling and disclosure standards, a lesson that extends beyond national boundaries toward the global harmonization of halal pharmaceutical governance.

The observed discrepancies between halal certification visibility and ingredient transparency carry important implications for both regulatory authorities and market stakeholders. Despite strong institutional frameworks particularly in Malaysia, Indonesia, and Saudi Arabia the limited display of halal logos on OTC medications suggests that regulatory emphasis remains skewed toward manufacturing and import compliance rather than consumer communication. In contrast, the UAE's relatively higher excipient transparency reflects a consumer-oriented labeling culture that prioritizes ingredient disclosure over religious assurance. This divergence indicates that current halal policies, while structurally sound, may not fully achieve their intended purpose of enabling informed consumer choice in the pharmaceutical sector. From a public health and market trust perspective, these findings

emphasize the need for integrated labeling standards that combine halal verification with transparent ingredient disclosure, thereby enhancing both consumer confidence and cross-border regulatory alignment. Strengthening such harmonization would not only support compliance within national markets but also advance the global credibility and competitiveness of halal pharmaceuticals.

These findings are consistent with emerging evidence highlighting the disparity between halal certification frameworks and their on-market implementation. Previous studies have shown that even in countries with advanced halal ecosystems such as Malaysia's Department of Islamic Development (JAKIM) and Indonesia's Halal Product Assurance Agency (BPJPH) the translation of certification into consistent product labeling remains limited, particularly in pharmaceutical sectors where ingredient disclosure is technically complex and often voluntary (Aziz et al., 2022). Similar challenges have been documented in Gulf Cooperation Council (GCC) markets, where halal verification is integrated within broader regulatory systems overseen by agencies such as Saudi Arabia's Food and Drug Authority (SFDA) and the UAE's Ministry of Industry and Advanced Technology (MoIAT). Together, this body of evidence suggests that the pursuit of a truly harmonized halal pharmaceutical framework requires not only standardization of certification procedures but also alignment of consumer labeling practices across jurisdictions. By situating these results within the global halal governance discourse, this study contributes empirical evidence that supports calls for mutual recognition, transparency, and digital verification mechanisms to strengthen consumer trust and international market integrity.

5. CONCLUSION

This study provides a cross-country perspective on halal compliance in over-the-counter medications, highlighting disparities between regulatory frameworks and on-market labeling practices. Although Malaysia and Indonesia demonstrated higher halal logo presence, overall visibility and excipient transparency remained limited, particularly in Gulf markets. The absence of explicitly non-halal ingredients suggests acceptable formulation practices, yet inconsistent labeling undermines consumer awareness and trust. These findings emphasize the need for unified halal pharmaceutical standards that integrate certification, labeling, and digital verification. Strengthening regional cooperation and transparency will be critical to advancing global credibility and accessibility of halal pharmaceuticals.

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(O-03) ADOPTING INNOVATIVE WAYS OF CERTIFYING AND REGULATING HALAL MEAT IN MUSLIM-MINORITY COUNTRIES FOR EXPORT TO MUSLIM-MAJORITY COUNTRIES

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Abstract

The population of Muslims in the world is estimated to be 2 billion, this is projected to rise because the population of Muslims is relatively young with high fertility rates. This projected increase in population is likely to result in increased demand for Halal meat in Muslim-majority countries. However, most Muslim-majority countries are net importers of Halal meat, with a large proportion of Halal meat originating from non-Muslim countries. Efforts must therefore be made by importing countries to institute measures aimed at strengthening the regulatory framework of meat production in non-Muslim countries.

Innovations are needed in improving slaughter techniques, meat hygiene and meat safety protocols so that meat producers can continue to produce meat that is safety, hygienic and above all, Halal to consume. In this presentation, the author aims to put forward some proposed developments and innovations aimed at improving animal handling, stunning, bleeding and auditing techniques. At the end of the presentation, listeners will be challenged to consider new approaches to Halal meat production and regulation. The aim is to task Halal certification bodies and governments to consider new ways of producing and regulating Halal meat.

Keywords: Halal, Meat, Certification, Regulation, Importers, Exporters

(O-04) INTEGRATING ESG PRINCIPLES INTO THE HALAL INDUSTRY: A PATH TOWARDS SUSTAINABLE AND ETHICAL DEVELOPMENT

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Abstract

The increasing global focus on sustainability has strengthened the adoption of Environmental, Social, and Governance (ESG) principles as a framework for ethical business practices and long-term value creation. Since its introduction in 2004, ESG has guided organizations in addressing environmental stewardship, social responsibility, and governance transparency. At the same time, the halal industry, rooted in Islamic ethics, has grown significantly worldwide. Halal certification not only ensures compliance with dietary laws but also reflects broader values of fairness, trust, and accountability. With global markets increasingly demanding ESG compliance, aligning halal practices with ESG frameworks presents a strategic advantage. This study examines the requirements of Halal Management Systems (HMS) against ESG measures, revealing substantial overlaps. Preliminary findings indicate that many halal practices inherently embody ESG values. Recognizing and formalizing this alignment can position halal certification as a credible tool for ESG reporting, enhancing both market competitiveness and sustainable impact.

Keywords: Environmental, Social, Governance, Ethical, Halal Practice

1. INTRODUCTION

The rise of the halal economy alongside the global shift toward a net-zero economy underscores the relevance of ESG implementation in the halal industry. While halal certification ensures compliance with Islamic dietary laws, scholars argue it also reflects broader ethical values such as animal welfare, sustainability, and fair labour practices. Similarly, ESG that was introduced in 2004 as a global benchmark promotes environmental care, social responsibility, and ethical governance, encouraging businesses to go beyond financial returns. Ethics forms the foundation of both frameworks, with studies showing that knowledge, social impact, relationships, and lifestyle changes contribute to a sustainable halal food industry. This study therefore explores the alignment between halal business practices and ESG principles, and their potential application in ESG reporting.

2. BACKGROUND OF THE STUDY

The halal market is experiencing rapid growth, driven by a rising global Muslim population and increasing consumer demand. By 2050, the Muslim population is projected to reach approximately 2.8 billion, growing faster than any other religious group due to higher birth rates and a youthful demographic profile. By 2070, Islam is expected to become the world's largest religion, with most Muslims residing in the Asia-Pacific region. India is projected to surpass Indonesia as the country with the largest Muslim population by 2050 (The Globalist, 2024). Reflecting this demographic shift, the global halal market is forecasted to reach USD 5 trillion by 2030, underscoring its position as a critical sector for economic worldwide (HIMP, 2020).

2.1 Concepts of Halal

Islamic jurisprudence (Fiqh) defines the concepts of halal and haram, establishing moral and legal boundaries that guide dietary practices, business dealings, and ethical behaviour. In business and finance, it emphasises justice, transparency, and ethical conduct, shaping corporate practices within Shariah principles (Budiman and Suyana, 2022). Studies show that Fiqh strongly influences Muslim consumer attitudes, particularly in areas like food, tourism, and supply chains, where halal integrity and avoidance of contamination with haram elements are vital (Al-Mamun et al, 2019). It also drives the demand for halal certification, especially among small food businesses that affects consumer willingness to pay for certified products. Overall, Islamic jurisprudence not only governs business ethics but also significantly impacts consumer awareness, intentions, and purchasing decisions regarding halal products (Jannah and Al-Banna, 2021).

2.2 Halal Certification

Standards and technical regulations play a crucial role in trade, commerce, and technology transfer, and nontariff barriers. With increasing globalisation and trade liberalisation, there is growing demand for the harmonisation of international standards to reduce trade barriers and address global issues such as environmental degradation (Wilson, 1999). In response, the Standards Metrology Institute for Islamic Countries (SMIIC) was established in 2010 under the Organisation of Islamic Cooperation (OIC) to develop unified standards across Member States, particularly in the halal sector. To date, SMIIC has issued 21 halal-related standards covering food, pharmaceutical, cosmetics, and supply chains etc.

Individual countries also maintain their own standards-setting bodies. Malaysia, for example, has been a pioneer in halal certification, with its first certification introduced in 1965 and formal enforcement under the Department of Islamic Development Malaysia (JAKIM) in 1974. Since then, Malaysia has developed 15-halal-related standards under the Department of Standards Malaysia, which has actively contributed to SMIIC since 2015. Malaysia's halal certification has gained global recognition, being named by the United Nations as a benchmark for halal food in 1997. Today, Malaysia continues to lead the global Islamic economy, ranking first in the Global Islamic Economy Indicator (GIEI) for 11 consecutives years (DinarStandard, 2025).

2.3 ESG and their Relevance to Halal Logistics

Since 2004, ESG framework has been used to evaluate corporate performance in relation to sustainability, ethics, and long-term resilience in general business practices. Increasingly adopted by investors and stakeholders, ESG factors provide insights into risk management, ethical conduct, and a company's broader impact on society and the environment. The environmental component focuses on a company's management of natural resources, energy use, waste, and climate change mitigation. The social dimension relates to stakeholder relationships, including employee welfare, diversity, inclusion, supply chain standards, and community engagement. Governance encompasses corporate leadership, transparency, accountability, executive remuneration, shareholder rights, and ethical management systems. Collectively, these principles support sustainable business practices while reducing risks linked to environmental harm, social inequities, and governance failures.

Parallel to ESG, the halal economy has gained prominence. Halal, meaning permissible under Islamic law, extends beyond compliance with dietary laws to encompass ethical production, waste management, social responsibility, and sound governance (Laldin, 2006). The transition to a net-zero economy by 2050 further highlights the importance of integrating ESG within halal industries, positioning halal-certified companies as natural partners in global sustainability efforts. Many halal systems already require governance structures such as halal committees, executives, and auditors to ensure integrity and transparency (Ramli et al., 2022).

The alignment between ESG and halal practices demonstrates, thus convergence in values. Governance promotes trust through halal assurance systems, social responsibility reflects maqāṣid al-Sharī'ah principles of justice and welfare, and environmental stewardship drives innovation and competitiveness of the industry. Despite barriers such as regulatory inconsistencies and cultural diversity, collaboration and capacity building are essential. Moreover, technologies like blockchain and IoT strengthen traceability, accountability, and compliance. Ultimately, embedding ESG into the halal ecosystem reinforces Islamic ethics, enhances sustainability, and positions halal industries as a benchmark for global sustainable supply chains.

3. RESULTS

To examine the integration of the Halal business and ESG practices, the dimensions of Halal Management System were mapped against ESG concepts, objectives, components, and measures (refer Table 1.0). Two key references were used: the Malaysia Halal Management System (MHMS) 2020 and the OIC/SMIIC 17:2020 Series Halal Supply Chain Standard. The MHMS, developed by JAKIM, provides a structured framework for organizations to achieve and maintain Malaysian Halal Certification through mechanisms such as the Internal Halal Control System (IHCS) for Small Medium Enterprises (SMEs) and the Halal Assurance System (HAS) for larger firms. The OIC/SMIIC 17 standards, particularly Clauses 4.0 (Management Responsibility) and 8.0 (Management Review), defines governance requirements, while other clauses cover operational aspects. Relevant provisions aligned with environmental, social, and governance concerns were identified and analyzed. Table 1 presents the comparison between ESG and the HMS across four aspects: concepts, objectives, dimensions, and measures.

Table 1: ESG and HMS: Concepts, Objectives, Components and Measures

Dimensions	ESG	Halal Management System (HMS)
Concepts	ESG is a framework that guides stakeholders in evaluating how organizations manage environmental, social, and governance risks and opportunities. Beyond environmental issues, it promotes holistic sustainability, balancing economic, social, and governance benefits. As both philosophy and governance method, ESG supports long-term value growth through ethical, responsible, and sustainable practices.	HMS is a structured framework ensuring compliance with Islamic dietary and ethical principles. Extending beyond food to sectors like pharmaceuticals and cosmetics, it integrates Hazardous Critical Control Point (HACCP), Good Manufacturing Pracices (GMP), and sustainability practices to manage risks, maintain integrity, and meet global market demands across the entire supply chain.
Objectives	ESG promotes long-term value by integrating environmental protection, social responsibility, and ethical governance, aiming to reduce impacts, uphold equity and human rights, ensure transparency, build stakeholder trust, and drive sustainable growth.	HMS ensures Shariah compliance across the supply chain, preventing contamination, upholding integrity, and promoting purity, trust, competitiveness, sustainability, and ethical responsibility in Halal-certified products and services.
Components and Measures	**1. Environmental** Environmental matters that may have a positive or negative impact on the financial performance or solvency of an entity, sovereign, or individual. **2. Social** Social matters that may have a positive or negative impact on the financial performance or solvency of an entity, sovereign, or individual. **3. Governance** Governance matters that may have a positive or negative impact on the financial performance or solvency of an entity, sovereign, or individual.	**Halal Assurance System (HAS) – Large and Medium Industry** 1. Halal Policy 2. Internal Halal Committee 3. Internal Halal Audit 4. Halal Risk Control 5. Control of Raw Materials 6. Halal Training 7. Traceability 8. HAS Revision 9. Lab Analysis 10. Sertu **Micro and Small Industry** 1. Halal Policy 2. Raw material control/ Halal Risk Control 3. Traceability

4. DISCUSSION

4.1 Ethical Business

The development of modern companies depends not only on efficient resource use and business strategies but also on fulfilling social and environmental responsibilities. Ethics plays a central role in both Corporate Social Responsibility (CSR) and ESG practices, which are communicated through sustainability reports. While CSR reflects a company's ethical commitments, ESG is more data-driven, integrating sustainability into core business values and measuring performance through environmental, social, and governance metrics (Tam et al., 2024). These metrics are increasingly important to investors and stakeholders in assessing long-term values and responsible management.

Halal practices align closely with ESG values, as halal extends beyond food to encompass ethical principles rooted in Islamic law. Halal emphasizes honesty, justice, compassion, and transparency, while prohibiting unethical behaviours such as deceit or harm. In business, halal principles guide operations to ensure moral and ethical standards, promote fair practices, and foster consumer trust. The rising demand for halal products reflects broader trends in ethical and sustainable consumption, appealing to both Muslim and non-Muslim consumers (Nandala & Arak, 2024). Halal certification strengthens these values by assuring compliance with ethical standards, sometimes including animal welfare and humane practices. Ultimately, halal implementation integrates religious obligations to meet consumer expectations, advancing sustainability, ethical business conduct, and global market growth.

4.2 Environmental Dimension

Hashim and Sulaiman (2022) describe the integration of halal principles with environmental sustainability as the Halal-Green concept, which incorporates sustainable agriculture, efficient resource use, waste reduction, fair trade, and animal welfare within the food supply chain. This approach aligns Islamic values with ecological responsibility, ensuring ethical dietary practices while promoting social and environmental well-being. The Qur'anic principle of halalan thayyiban underscores this link, emphasizing food that is lawful, safe, hygienic, and of high quality throughout the value chain—from raw materials and processing to packaging, distribution, and consumption (Hanapi & Wan Khairuldin, 2017; Arif & Sidek, 2015). For Muslims, fulfilling halalan thayyiban requirements reflects 'ubudiyyah (servitude to Allah), acknowledging divine blessings (Mustaffa, 2019).

Scholars highlight the overlap between halal and green products. Pro-environmental behaviour is defined as practices that conserve nature while meeting societal needs (Sajeewanie et al., 2019). Similarly, green products use recyclable, non-toxic, and environmentally friendly materials (Fakhira et al., 2022). Halalan thayyiban goods embody these same qualities, being both halal and safe for consumers.

Ultimately, the halal-green concept reflects concern for people, the environment, and the Creator. It builds harmonious relationships—between humans and Allah (habl min Allah), among humans (habl mina al-nas), and between humans and nature—strengthening the Islamic worldview of holistic sustainability.

4.3 Social Dimension

The social dimension of ESG focuses on how companies manage relationships with employees, customers, suppliers, and communities, emphasizing ethical treatment and positive societal impact beyond profits. It covers fair labour practices, human rights, diversity, equity, and inclusion (DEI), employee welfare, and community engagement. Companies are expected to provide fair representation, support employee development, foster work-life balance, and engage in meaningful community initiatives. Safeguarding data privacy, ensuring fair pricing, and maintaining product safety are also critical, alongside supply chain accountability, where businesses must ensure ethical labour practices and standards among suppliers. Strong social responsibility generates business value by building trust, enhancing reputation, attracting talent, fostering loyalty, and ensuring long-term resilience. Proactive management of social issues helps mitigate risks such as disputes, boycotts, and regulatory challenges, thereby strengthening competitiveness.

Similarly, social aspect in halal implementation aligns with these principles by extending beyond compliance to promote ethical labour practices, social justice, and community engagement across the halal supply chain. This integration positions halal practices within global ESG standards, enhancing credibility and reputation while creating opportunities for growth. By involving diverse stakeholders, including non-Muslims, halal industries can foster inclusivity, innovation, and sustainable development, establishing themselves as global leaders in ethical, socially responsible business (Asmadi and Saimy, 2025).

4.4 Governance Dimension

The governance aspect of ESG in the halal industry integrates Shariah-compliant ethics with robust internal controls, emphasizing transparency, accountability, and ethical conduct. Key mechanisms include Halal committees, auditors, honest reporting, and supply chain transparency to build consumer trust and align with global ESG standards. Strong governance ensures accurate disclosure of operations and ESG performance, fair labour practices, and executive accountability to long-term interests. The convergence of halal and ESG governance creates synergies grounded in ethical conduct, social justice, and environmental stewardship. By embedding these practices, halal-certified companies strengthen their reputation, enhance consumer confidence, and position themselves as global models of sustainable and ethical supply chains (Nguyen et al, 2024).

5. CONCLUSION

In conclusion, this study provides both theoretical and industry implications.

5.1 Theoretical Implications

This study contributes to the body of knowledge by developing the concept of Halal ESG, which emerges from the integration of the halal management system with the ESG framework. The findings indicate that both halal and ESG practices share similar foundation and intention, i.e., to establish ethical and responsible governance that prioritizes environmental and social responsibility in the production and delivery of goods and services. In Islam, the roots of ethical business practices are derived from the Qur'an, Hadith, and Fiqh (Islamic Jurisprudence), which prohibit usury (riba),

uncertainty (gharar), and gambling (maysir), while promoting values such as justice, honesty, fairness, integrity, and public welfare. These principles, underpinned by the belief in God (Allah) and the role of humans as earthly trustees, provide a strong ethical foundation for economic activity. ESG, meanwhile, serves as a framework to evaluate a company's sustainability and ethical impact. While ESG highlights actions that companies may adopt to achieve sustainability goals, it often lacks deeper elaboration of the underlying values. In this regard, the HMS, as practiced by halal-certified companies, strengthens, and enhances the achievement of ESG objectives in a more effective and value-driven manner.

5.2 Industry Implications

As ESG compliance becomes a global requirement, aligning halal business practices with ESG frameworks presents a strategic opportunity to enhance international competitiveness while advancing environmental and social outcomes. Many halal practices—such as cleanliness, humane treatment of animals, fair labour, and ethical sourcing—already embody ESG values, even if not formally recognized. This study highlights that halal certification can be positioned as a mechanism for ESG reporting, thereby strengthening credibility and compliance. Integrating ESG into the halal industry not only reinforces Islamic ethical values but also supports global sustainability goals, offering dual benefits of moral governance and improved market positioning. This synergy positions the halal sector to lead in ethical, responsible, and resilient business practices.

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(O-05) SHARI'AH COMPLIANT AND SUSTAINABLE FINANCIAL INCLUSION THROUGH ISLAMIC FINANCE INSTITUTIONS

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Abstract

The people have argued in practice that Shari'ah compliance should be sacrificed for profitability, so that Islamic financial system could achieve sustainability and competitiveness in the world economic market. However, Islamic scholars have posted that Islamic financial system risk identity, loss by trading Shari'ah compliance for any other benefit is null and void abinitio. They are of the view that Shari'ah being the main pivot upon which the Islamic finance system rest on, must abide by the Shari'ah principles. In essence, the controversy on whether or not sustainability and Shari'ah compliance could be regarded as mutually exclusive has been very intense and unabated especially among the regulators, industry players and academicians. This paper sets out to investigate achieving both Shari'ah compliance and sustainability through the concepts of Shari'ah. Inductive doctrinal methods were adopted and data were collected from both primary and secondary sources of Shari'ah. The results of the investigations of this paper shows that Shari'ah compliance and sustainability in Islamic finance operations could be achieved through the strictly follow the fundamental principles of Shari'ah.

Keywords: Shari'ah Compliance, Sustainability, Islamic Finance, Islamic Banking System and Principles of Shari'ah.

1. INTRODUCTION

The early 1970s witnessed the development of the modern Islamic banking system through institutional involvement. This was initiated through the conferences of foreign ministers of Islamic countries held in Jeddah and Karachi respectively. The reports from the conferences led to the establishment of the Islamic Development Bank (IDB) Jeddah, Saudi Arabia in 1975, as the first practical model of an Islamic bank. The establishment of the Islamic Commercial Bank of Dubai also followed in the same year in the United Arab Emirates (UAE) (Oladimeji, 2016).

Today almost every sector of the Islamic banking institution is covered by enabling comprehensive statutes. These laws have favourably enhanced the Islamic banking institutions to be operating successfully (Dusuki, *et al* 2011). The laws have specifically defined what Islamic banking and Islamic financial institutions are all about and their *modus operandi*. For instance, In section 27 of the Central Bank of Malaysia Act, 2009, Islamic banking system is expressly recognized and licensed to concurrently operate with the conventional banking system (BNM, 2009). Islamic banking

motility also spread to non-Muslim countries. At first, the involvement of non-Muslim countries was occasioned by the interbank deposit transactions (Rusni *et al,* 2013). In other words, this development is called the Islamic window of conventional banks, while any bank that is operating fully in line with Islamic principles is called a full-fledged Islamic bank (Oladimeji, 2016).

2. METHODOLOGY

The doctrinal methods were adopted by using secondary sources of materials gathering information from sources already existing in the libraries. The libraries provide documents and archival data through the primary sources of Shari'ah; the holy Qur'an and Hadith of Prophet Muhammad (Peace be upon him), textbooks and previous researchers' works contained in academic journals, conference proceedings, scholar websites, periodicals, government publications, regulations and Acts governing Islamic banking system.

3. SHARI'AH COMPLIANCE AND THE ISLAMIC BANKING PRODUCTS

The most prominent principle of Islamic banking is the charging of interest of fees on loans or usury fees. That is commonly known as *Riba*. As cited by Adeyemo (2022) according to *Shar'iah* Appellate Bench (SAB0 of the supreme court of Pakistan, *Riba* is involved in such cases as under; All prevailing forms of interest either in banking or private transactions. Any interest stipulated in government borrowing acquired from domestic or foreign sources.

Nasiru (2014) explained the two types of *Riba* as follows; *Riba alNasi'ah* which means the benefit or excess that arises from the delay of counter value in an exchange based on loans or sales. *Riba al-fadl* which means to exchange/sale transactions is the quality premium in the exchange of low quality for better quality goods of the same genus, e.g in the exchange of dates for dates, wheat for wheat among others.

Among the capital offences in the Islamic law *Riba* has been seriously addressed condemned and denounced so strongly in the Holy Qur'an as has usury (Adeyemo, 2022). The primary sources of Shari'ah Among the verses that condemn *riba*

Among the verses that condemned *riba* from the holy Qur'an are:

O you who have believed do not consume interest doubled and multiplied but fear Allah that you may be successful. And fear the fire which is prepared for those who reject faith (Qur'an 3:130-131) see also the holy Qur'an 2:275-279

The Prophet Muhammad (peace and blessing of Allah be upon him) also made many statements that clearly prohibits and demonstrates the gravity of dealing with interest. For example Abu Hurayrah (RA) narrated that the prophet (Peace be upon him) said; four categories of people are such that Allah has made it binding upon Himself to refuse them admission to the paradise or to them enjoy its goodies. The first is the one who is a habitual drinker of alcoholic drinks. The second is the one who devours interest, the third is the one who devours the wealth belonging to an orphan, without any justification, therefore, and the fourth is the one who is disobedient to his parents. (http://www.LearnIslamicFinance.com)

Jabir reported; the prophet (Peace be upon him) cursed the receiver and the payer of interest, the one who records it (the contract) and the two witnesses to the transaction and said, "they are all alike in guilt" (Muslim). http://www.imaanstar.com

The prophet (Peace be upon him) again said Devouring a dirham of interest is worse than committing adultery 36 times, provided one aware that he is utilizing money earned by way of interest. Among the major prohibitions in the Islamic banking and finance system include *Gharar* (uncertainty). It refers to uncertainty caused as a result of absence of clarity in respect of the subject-matter of the contract-the price of the contract or in respect of the delivery of the quality of the subject-matter (Adeyemo, 2022). The insistence is also for the benefit of the buyer to make sure that what he is purchasing is in tandem with the required standard. Hence, whether or not the goods are of good quality must be within the knowledge of the buyer before the contract is concluded (Oladimeji, 2016).

Maizir (gambling or games of chance) is another (Nasiru & Mansur, 2015). Maisir simply means the games of chance which involve any type of transaction where one party to the transaction only gains while the other party loses. It is forbidden by *Shari'ah* because there is no counterpart of an exchange of commodity as where one party exchanges its asset for its counter value in the form of cash or its equivalence (Ayub, 2007). Therefore, all forms of gambling like lotteries, all schemes based on luck, dicing, betting and draws come under the categories of games of chance and are all forbidden outright in Islamic law (Quran 3: 90).

3.1 Islamic Banking Services and Products

The jurists came up with some alternative products that Islamic banks may offer to their customers, in order to run away from any transaction that contravenes the *Shari'ah* standards. The alternative products gained the support from the *Qur'an* and the *Sunnah* of the prophet and other sources (Usmani, 2008). Such products include *Mudarabah, Musharakah, Murabah, Ijarah* etc. However, all Islamic business arrangements where two or more people will pool their resources together by way of money or money worth, entrepreneurship or trustworthiness fall under *Mudarabah* and *Musharakah* and others (Musa, 2014). Each of these is further discussed below.

3.2 Mudarabah (Profit and Loss Sharing)

Mudarabah is a partnership where one partner called *"Rab-ul-Maal"* means the owner of capital gives money to another partner known as *Mudarib* entrepreneur for investing in a commercial enterprise. The investment comes from the first partner who is called *"Rab-ul-Maal"* while the management and work is an exclusive responsibility of the partner and the profits generated are shared in a predetermined ratio (Yahaya, 2016).

Islamic banks use *Mudarabah* as a mode of financing useful products including construction of buildings, markets, institutions, ports, warehouses, corporate plants, public roads and other infrastructural facilities (Nasiru & Mansur, 2016). The depositors acting on the basis of a *Mudarabah* contract enter into an unrestricted *Mudarabah* contract agreement with an Islamic bank that their money should be used by the bank to finance open-ended list of investments that can be profitable to them. The agreement shall specify the activities to be pursued by the bank, their location and duration

(Aznan, 2011). The bank gives the funds to entrepreneurs in some restricted agreements stipulated in the partnership contract where the bank agrees to finance the entrepreneur project and to share the profits realized on the basis of a mutually agreed percentage. But, if there are losses, the depositors lose their earlier funds given to the bank for those investments (Adeyemo, 2022).

3.3 Musharakah (Partnership)

Musharakah is one of the products meant to invest in various areas of the economy that are in tandem with *Shari'ah* (Yahaya, 2016). Thus, *Musharakah* can be used by Islamic banks in any business transaction whereby the banks and the other party freely agree to jointly contribute in financing and executing a given project with a view to sharing either the profit or loss arising from the project (Ayub, 2007).

With the development of the modern Islamic banking system, *Mudarabah* and *Musharakah* as Islamic banking products, are structured under Islamic partnership. This is because both *Mudarabah* and *Musharakah* activities involve many parties, such as partners and co-partners or between the banks and their customers in respect of the investment being carried out (Ayub, 2007). The parties may agree that the bank stands as *rabbal-mal* in a *Mudarabah* arrangement and the customer will serve as investor or vice versa. So, the same trend is followed in the operation of *Musharakah*. The *Musharakah* contract is a form of equity participation or partnership financing. Both profits and losses are shared between the partners according to their mutually earlier agreed percentages (AAOIFI, 2010).

3.4 Murabahah (Cost-Plus Profit Sale Contract)

Murabahah means a "cost-plus profit sale contract", in which parties bargain on the margin of profit over the known cost price. The seller has to reveal the cost incurred by him for the acquisition of the goods and provide all cost-related information to the buyer. Al-Marghinani, a renowned Hanafi jurist, defined *Murabahah* as the sale of anything for the price at which it was purchased by the seller and an addition of a fixed sum by way of profit. (Ayub, 2007).

The basic rules of *Murabahah* include mutual agreement between the parties; the Islamic bank and customer, the object of the sale must be well known and clearly ascertained by both the buyer and the seller, the object of the sale must be owned by the seller at the time of the contract, the owner must honestly state the original price and other additional expenses incurred on the sale to the buyer and the profit margin must be known and mutually agreed upon between the seller and the buyer (Abu Ghuddah, 2009).

3.5 Istisna' (Order to Manufacture Sale)

The legality of *Istisna'* is based on the *Hadith* where Abdullahi bin Umar reported that Prophet Muhammad (peace be upon Him) requested for the manufacturing of a golden ring for him. IFSB (2009) defines *Istisna'* as an agreement to sell to a customer a non-existent asset, which is to be manufactured or built according to the buyer's specifications and is to be delivered on a specified

future date at a predetermined selling price. *Istisna'* is used in financing for housing, industries, road construction, aircrafts, infrastructure development, etc. Jurists require that the subject-matter of the contract, the date of delivery, the price to be paid and the mode of its payment be agreed upon between the parties in *Istisna'* contract. Islamic banks use parallel *Istisna'* in modern financing. In this manner, a client will approach a bank for the manufacture, construction or development of a specified commodity (Ayub, 2007). The bank will then order a third party to manufacture, construct or develop the same according to the specifications given.

Upon delivery by the third party which is normally before the agreed date with the customer, on the agreed date, the customer will take delivery from the bank upon payment of the price as mutually agreed. *Istisna'* is perhaps one of the most flexible products available by Islamic Financial Institutions. *Istisna'* offers greater future structuring possibilities for trading and financing. The contract can be canceled at any time by any party given a prior notification time before starting the manufacturing process.

3.6 Bay' Salam (Forward Sale)

Generally, the sale of a non-existent object is forbidden due to *gharar.* However, to facilitate certain types of business, exceptions were provided through the contracts of *Salam* and *Istisna'* In the Hadith narrated by Ibn Abbas as quoted by Ogunbado and Umar (2015) that: *The Prophet (peace be upon Him) came to Madinah and found its inhabitants entering salam contracts (with the price paid in advance) in fruits for one, two, and three years. He said: "Whoever enters into a Salam contract, let him specify a known volume or weight, and a known term of deferment"*

Salam trade can occur when a farmer who needs money but his crop is not ripe for harvesting, approaches the bank to buy the products. The bank and the farmer agreed on a lesser price, and the bank pays the money for the produce to be delivered at harvesting period. The bank will then sell the produce delivered and make its profit. (Ayub, 2007). Parallel *Salam* is also used by Islamic banks where an agent is appointed by the bank to negotiate and pay for the *Salam* contract. When the produced product is delivered, the agent hands it over to the principal (the bank) and the bank sells it for profit (Adeyemo, 2022).

4. CONCLUSION

It has been explicated that Islamic banks and associated banking and finance activities are governed by the tenets of *Shari'ah*, which itself are constituted by Allah's dictates in the Holy *Qur'an* and the *Sunnah* of the Prophet. The various norms and ethics of Islamic banking have also been discussed, especially with regard to *riba* prohibition, prohibition of *gharar*, and prohibition of *maisir* or *qimar.* Some attempts were also made to enumerate and explain Islamic banking products and services, which include *mudarabah*, *musharakah*, *murabahah, istisna'* and *bai' salam.* Each of these products and services also has its unique operational guidelines, and they are all in full compliance with *Shari'ah*.

It is recommend that the government and economically buoyant people are encouraged to patronize and invest in the Islamic banks, more so the products and transactions are free-interest. The services

of the bank should be extended not only to Muslims and their non-Muslim counterparts would become beneficiaries of the bank. Since the services and products of the Islamic banks are meant to able an individual or firm to be a partner with the bank's businesses and the profit made will be shared, instead of depending on lending and borrowing. Islamic bank starts gaining an international awareness through its products

As a way of developing the Islamic banking sector, the shareholders of the bank should ensure the productivity, effectiveness and innovativeness of its Islamic Banking products. The bank management should come up with a more products and policy that will enable it receive, consider and utilise researched based recommendations on Islamic banking and finance system. There is need for Islamic bank management to collaborate and work together with Islamic finance academician to view and spreading the virtues of Islam through *Shariah* based banking and finance system. By so doing, the non-Muslims would continue to realize the pristine principles of Islam which have taken care of all aspects of human life including business enterprise. It is strongly believed that if the recommendations are considered and adopted by the relevant authorities, customers and investors, the integrity of the Islamic banking institutions will be enhanced, and the sector will be making significant contributions to economic global sustainability and productivity.

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(O-06) MULTI CRITERIA DECISION MAKING APPROACHES IN HALAL-RELATED RESEARCH BASED ON SUSTAINABILITY: A LITERATURE REVIEW

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Abstract

In recent years, the convergence of halal-related research and sustainability has garnered significant attention across various disciplines, particularly in supply chain management, food production, and ethical consumer behaviour. This study presents a comprehensive literature review of Multi-Criteria Decision-Making (MCDM) approaches applied in halal-focused research with a sustainability perspective. The integration of sustainability considerations into halal-related research is essential for ensuring that halal products meet not only religious and ethical standards but also contribute positively to environmental and social outcomes. As consumer awareness and demand for sustainable products increase, it becomes imperative for halal industries to adopt decision-making frameworks that encompass sustainability dimensions.

By systematically analysing academic publications, the review identifies key decision-making methods such as Analytical Hierarchy Process (AHP), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), and VlseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR), and other decision making applications. It examines how these methods are utilised to evaluate halal compliance, environmental responsibility, and food safety simultaneously. The findings highlight a growing trend toward integrating sustainability dimensions—including environmental, economic, and social criteria—into halal decision-making frameworks.

This study contributes to the body of knowledge by mapping existing research, identifying methodological gaps, and proposing future directions for more holistic and sustainability-oriented decision-making in halal-related contexts. Furthermore, the study classifies halal-related research based on sustainability into seven clusters: (1) halal food; (2) halal certification; (3) halal finance / Islamic finance; (4) halal supply chain; (5) halal tourism; (6) halal lifestyle; and (7) halal standards. This literature review serves as an important resource for researchers, practitioners, and policymakers aiming to align halal practices with global sustainability standards. By providing a structured analysis of existing methodologies and identifying areas for further research, it lays the groundwork for the development of more effective and sustainable halal practices across various sectors.

Keywords: Halal, Sustainability, Literature, Decision Making, MCDM

(O-07) EVALUATE INDONESIA'S HALAL INDUSTRIAL ESTATES CRITERIA IN SUPPORTING THE HALAL INDUSTRY ECOSYSTEM IN INDONESIA

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Abstract

Sharia economy and halal industry have become new drivers of economic growth in Indonesia. The Halal industry contributes to a positive and innovative business climate by adhering to Sharia values. It aligns with the long-term policies of the Indonesian government to strengthen the Sharia economic ecosystem and halal industry in order to become a global center for the halal industry. In 2024, Indonesia successfully ranked in the top three in the Global Islamic Economy Indicator (GIEI) according to the State of the Global Islamic Economy (SGIE) Report 2024 released by Dinar Standard. Indonesia's positive results in GIEI 2024 are closely linked to various strategic efforts by the Indonesian government, particularly in strengthening the halal ecosystem. Following that condition, the establishment of halal industrial estate plays crucial role in the current reinforcement of the halal ecosystem. The Indonesia government is continuously promoting the acceleration of development for that halal industrial estates, which adopted Minister of Industry's Regulation No. 17 of 2020 on the mechanism of Halal Industrial Estate registration. Referring to the regulation, the Indonesian government has designated 3 halal industrial estates, located in Java and Riau Islands. Furthermore, in partnership with private and state-owned enterprises located in KBN Marunda Jakarta and SWL Surabaya, the industrial estate is set to develop marine and fisheries industries in alignment with "blue food" initiatives, as part of the broader Blue Economy framework. In optimizing the development of halal industrial estates, the Indonesian government has conducted assessments using five criteria namely: a) planning aspects; b) facilities and infrastructure; c) halal management; d) development progress; and e) implementation of Sharia finance. The development of blue food—referring to food derived from aquatic resources—is considered more efficient than terrestrial meat processing, particularly in terms of meeting halal requirements. Unlike beef, poultry, or lamb, which require complex halal certification starting from the slaughtering process, seafood generally does not require ritual slaughter (zabiha) since aquatic animals typically die naturally or through methods that do not violate Islamic dietary laws. Hence, blue food as a strategic and practical alternative for the development of global halal protein sources. With lower risks in the halal certification process, combined with its environmental sustainability and wide availability, blue food emerges as a prime candidate in supporting global food security and halal protein accessibility. This paper will examine and describe the improvement of halal industrial estates criteria that can be used as input for the standards of halal industrial estates in Indonesia other Islamic countries. The formulation of halal criteria for halal industrial estates are also needed to enhance the competitiveness as well as to attract more domestic and international tenants.

Keywords: Halal Industrial Estate, Criteria, Indicator, Halal Standard

1. INTRODUCTION

The industrial sector plays a vital role in Indonesia's economic development. This sector has contributed 20.5% to the national economic growth in 2021. As a pillar of national economy structure, industrial sector considers capable of opening employment opportunities, assisting the people's basic needs, and leading to the modernization of the country's economy (Suharto, 2007). In addition, the existence of the industry sector also encourages the increase in added value and significantly contribute to national competitiveness. The industrial sector has recovered rapidly from the contraction due to the Covid-19 pandemic. After recording a contraction of 2.93% (y-o-y) in 2020, this sector could return to growth of 3.39% (y-oy) in 2021 (Indonesia Statistics, 2021). Development Master Plan 2015-2035. The Government of Indonesia has prepared National Industrial Development Master Plan by considering several aspects with solid characteristics and relevance to national industrial development, such as technological developments, environmental sustainability, globalization, qualified labor availability, and the public's need for quality products (including products with the halal assurance). The development of industrial estates is one of the essential factors for the growth of the industrial sector in Indonesia. Industrial estate is a certain area which aims to create a sustainable growth and industrial competitiveness in regional (local) level for export and strengthening domestic national demand. In industrial development, the Government of Indonesia has prepared a strategic, comprehensive, and futuristic of the National Industrial Indonesia is a country with a majority Muslim population. Based on data of Directorate General of Population and Civil Registration of the Ministry of Home Affairs Republic of ndonesia, total population of Indonesia was 272.23 million in June 2021. Based on this census, 236.53 million people (86.88%) are Muslims. The number of Muslim populations affects the consumption of halal products and services. For Muslim population, halal is fundamental. Means that they have a big tendency to pay serious attention in seeking also guaranteeing Islamic lifestyle based on Quran and Islamic demands, including consuming halal products and its derivatives. With most of the Muslim population, it certainly has great potential in the halal industry sector. The halal paradigm has strengthened the production value chain in a sustainable and integrated manner, such as the halal food and beverage industry, halal tourism, Muslim fashion, halal pharmaceuticals and halal cosmetics.

In line with the development of the halal industry, Indonesia maintains its 3rd rank position on The Global Islamic Economy Indicator in the State of the Global Islamic Economy (SGIE) Report 2024/25. In Halal Food sector, Indonesia ranked 4th after UAE and ranked 1st in Halal Modest Fashion sector (SGIE, 2025). Indonesia's demand become a vision to be a paramount of Halal Industry Centre in Southeast Asia, this is also supported with a good performance on providing halal economy productivity as reflected on the **table 1**.

Halal Food				
1. Malaysia,	2. Singapore	3. United Arab Emirates	4. Indonesia	5. Jordan
Modest Fashion				
1. Indonesia	2. Malaysia	3. Italy	4. Turkiye	5. Singapore
Islamic Finance				
1. Malaysia	2. Saudi Arabia	3. Bahrain	4. United A.F	
Pharma & Cosmetic				
1. Malaysia	2. Indonesia			

4. MATERIAL AND METHODS

This study employs a qualitative descriptive approach to analyze the development and policy implementation of Halal Industrial Estates (HIEs) in Indonesia. The research aims to identify the key factors influencing the establishment, regulation, and acceleration of HIE development, as well as to evaluate the government's role and strategic frameworks that support their implementation.

4.1. Data Collection

The data used in this study were obtained from both primary and secondary sources. Primary data were collected through policy documents, ministerial regulations, and official government publications issued by the Ministry of Industry, the Ministry of National Development Planning (BAPPENAS), and the National Islamic Finance Committee (KNEKS). Secondary data were derived from relevant academic journals, reports, statistical databases, and credible news sources discussing Indonesia's industrial estate development, Islamic economy, and global halal industry trends.

4.2. Analytical Framework

The analysis was conducted using a policy analysis framework to assess the institutional, regulatory, and economic aspects of HIE development. The study employed the following analytical stages:

1) Identification of policy context – reviewing legal and institutional frameworks governing Halal Industrial Estates, including Regulation of the Minister of Industry No. 17 of 2020.
2) Mapping of existing initiatives – analyzing the distribution and progress of ongoing HIE projects such as Halal Modern Valley, Safe and Lock Halal Industrial Park, and Bintan Inti Halal Hub.
3) Evaluation of internal and external factors – assessing challenges related to governance, infrastructure readiness, investment climate, and international competitiveness.
4) Synthesis of findings – formulating insights and recommendations to strengthen Indonesia's halal industrial ecosystem and its integration within the global halal supply chain.

4.3. Study Scope

The study focuses on the development of Halal Industrial Estates across Indonesia, with particular emphasis on regions under Free Trade and Free Port Zones (FTZs) such as Batam, Bintan, and Tanjungpinang, as these zones represent potential strategic hubs for halal production and export.

As a democratic nation grounded in a distinctive ideology and a robust constitutional framework, Indonesia has positioned regulations and public policies as pivotal instruments for initiating and accelerating national development. In pursuit of inclusive and sustainable regional economic growth across its 37 provinces, the Government of Indonesia has established Industrial Estates as a strategic mechanism to reduce inter-regional dependency and foster balanced economic development throughout the archipelago. Indonesia hosts 126 Industrial Estates, of which 18 have been designated as National Strategic Projects, enabling them to receive specific incentives to accelerate their

development. Aligned with the government's agenda to strengthen industrial zones as drivers of economic transformation, the development of Halal Industrial Estates has emerged as a national priority aimed at enhancing Indonesia's position within the global halal value chain. This initiative underscores the government's commitment to strengthening the halal industrial ecosystem, thereby supporting sustainable industrialization and national economic growth.

According to the Regulation of the Minister of Industry No. 17 of 2020 on the Certification Mechanism for Halal Industrial Estates, a Halal Industrial Estate is defined as an entire or partial industrial zone designed with systems and facilities dedicated to industries that produce halal-certified products in accordance with Islamic law. The acceleration of halal industrial area development is currently being pursued by encouraging proposals from diverse stakeholders, including public and private entities. Asof now, one estate—Halal Modern Valley in Serang, Banten Province—has obtained a full Halal Industrial Zone Certificate from the Ministry of Industry. Two additional estates, namely Safe and Lock Halal Industrial Park in Sidoarjo, East Java Province, and Bintan Inti Halal Hub in Riau Islands Province, are in the initial development and verification stages. Furthermore, three other industrial estates—Batamindo Industrial Park in Batam (Riau Islands Province), JIE Pulogadung in Greater Jakarta, and Surya Borneo Industrial Estate in Central Kalimantan Province—are currently preparing essential infrastructure to support future halal industry operations (National Islamic Finance Committee, 2021).

In alignment with Indonesia's strategic vision to become one of the leading players in the global halal industry, the government continues to open opportunities for the establishment of new Halal Industrial Estates, including within the Tanjungpinang Free Trade Zone Area. This ongoing development reflects Indonesia's long-term commitment to advancing sustainable, inclusive, and competitive halal industrial growth at both national and global levels.

5. RESULTS

The origin of the halal lifestyle movement in Indonesia can be traced back to 1988, when a study on pork-based ingredients prompted the government to establish the country's first Halal Certification Agency (LPPOM MUI) in the following year (National Islamic Finance Committee, 2018). Halal certification for consumer goods was initially voluntary; however, in 2014, the Halal Product Assurance Law (Law No. 33 of 2014) was enacted, making halal certification mandatory for all consumer products circulated and distributed within Indonesia's jurisdiction. With the rising trend of the halal lifestyle and Indonesia's strong performance in the global halal market, the government issued the Master Plan for Islamic Financial Architecture (MAKSI) in 2016, outlining the country's strategic framework for strengthening national sharia-based finance. Indonesia has since continued to advance the halal industry through a more elaborate and comprehensive version of MAKSI.

In 2019, the Government of Indonesia formulated five national strategies, collectively known as the Main Strategies of the Indonesian Islamic Economic Masterplan (MEKSI), to accelerate the development of the national halal industry (Ministry of National Development Planning, 2019). These strategies include:

a) Global Hub Development Strategy – This strategy focuses on positioning Indonesia as a global halal hub in production and trade. It encompasses several clusters, including Halal Food and Beverages, Halal Tourism, Muslim Fashion, Halal Media and Recreation, and Halal Pharmaceuticals and Cosmetics.

b) Research and Regulation Strategy – This strategy emphasizes strengthening research, regulatory frameworks, and policy instruments to foster the development of halal industry initiatives.

c) Industrialization Strategy – This strategy aims to create added value for halal products in Indonesia, transforming them into competitive and innovative industrial outputs supported by technological advancements and the growing digital economy.

d) Halal Social Preference Strategy – This strategy focuses on increasing public preference and awareness toward the halal lifestyle through social and behavioral approaches. It includes public awareness campaigns designed to familiarize communities with halal practices and enhance compliance understanding.

e) SME Development Strategy – This strategy seeks to empower small and medium-sized enterprises (SMEs) to become global players in the halal industry. It involves strengthening Islamic finance, Islamic banking, the Islamic capital market, social security systems for halal businesses, and the integration of zakat and waqf mechanisms.

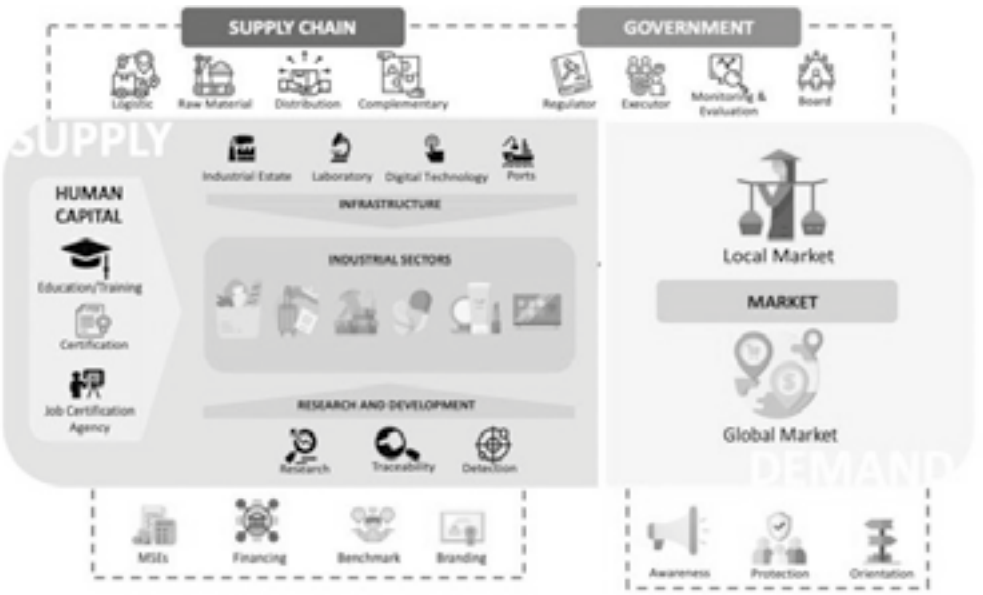

Figure 2. Halal Industry Ecosystem (Source: MEKSI 2019–2024)

To support the aforementioned strategies, the establishment of a comprehensive halal industry ecosystem is essential to serve as a catalyst for implementation. Within the MEKSI 2019–2024 framework, the Halal Industry Ecosystem—as illustrated in Figure 2—adopts a Supply–Demand–Enabler approach. This approach is identified as the most suitable strategy given Indonesia's current state of infrastructure capacity, technological readiness, and human resource capabilities.

6. DISCUSSION

The data presented indicate that Indonesia holds substantial potential within the global halal economy. As illustrated, even capturing 10% of the total import share of halal products—comprising food, fashion, pharmaceuticals, and cosmetics—across OIC and non-OIC member countries could generate significant incremental export opportunities. Furthermore, import substitution through domestic halal production could contribute an estimated USD 1 billion in GDP savings, particularly from halal food, pharmaceuticals, and cosmetics sectors. These prospects represent a strong foundation for the establishment of Halal Industrial Estates (HIEs) within Indonesia's Free Trade and Free Port Zones (FTZs). Supported by the fiscal and non-fiscal incentives provided under the FTZ framework, these estates can optimize manufacturing processes to meet both domestic demand and global market needs.

However, achieving these targets requires increased investment and enhanced international collaboration. Strategic partnerships with other countries will be essential to realize the national Halal Industry Grand Masterplan. As a long-standing member of the Organization of Islamic Cooperation (OIC) since 1969 and an official member of the Standards and Metrology Institute for Islamic Countries (SMIIC) since 2019, Indonesia is well-positioned to strengthen its technical and diplomatic engagement in halal trade and investment cooperation. At the regional level, Indonesia continues to promote collaboration in agriculture, tourism, and finance within the halal context. Through the Brunei Darussalam–Indonesia–Malaysia–Philippines East ASEAN Growth Area (BIMP-

EAGA) 2017–2025 Project List, halal industry development is prioritized under Strategic Priority 2: High-Quality Agro-Based Security in the Subregion and Strategic Priority 2: Ecotourism Product Development. Additionally, under the Indonesia–Malaysia–Thailand Growth Triangle (IMT-GT) Implementation Blueprint 2017–2021, halal product and services development is recognized as one of the seven strategic pillars. In conclusion, the integration of Halal Industrial Estates within Free Trade and Free Port Zones presents a transformative opportunity to enhance Indonesia's competitiveness in the global halal supply chain. Strengthening government coordination, infrastructure readiness, and cross-border collaboration will be key to positioning Indonesia as a leading global hub for halal production, innovation, and trade.

7. CONCLUSION

The prevailing implementation of the Halal Industrial Estate policy by the Government of Indonesia, supported by various regulatory frameworks, has led to several evaluations that are expected to provide constructive input for future policymaking. This paper identifies both internal and external factors as key components of the evaluation. The intersection of these factors lies in the limited governmental role in exploring and further managing halal industry affairs. Such minimal involvement has created unstable internal conditions, including overlapping stakeholder efforts, which, in the long term, may lead to an unbalanced halal ecosystem. Additionally, the uncompetitive quality of halal products and unattractive incentive schemes have contributed to the suboptimal performance of the halal industry in Indonesia.

Externally, the limited government role could potentially hinder progress in establishing regional and international halal standards, an effort that has already been advanced by several other countries. This limitation also affects the halal logistics chain, resulting in globally uncompetitive and high-cost halal products. Intensifying the government's role and strengthening government-to-government (G-to-G) relations would therefore be crucial in establishing an ideal and sustainable halal ecosystem. At present, the Government of Indonesia has developed plans to address both internal and external challenges, as well as to enhance infrastructure development to meet the requirements of Halal Industrial Estates. The initiative to establish and develop Halal Industrial Estates within the Free Trade and Free Port Zones (FTZs) of Batam, Bintan, and Tanjungpinang is expected to generate significant economic stimulus through preparatory and strategic business activities. This initiative is further supported by the National Strategic Project (PSN) policy and the downstream industry development concept to accelerate implementation.

Furthermore, the halal accreditation process in Indonesia will be strengthened through cooperation and collaboration with the Standards and Metrology Institute for Islamic Countries (SMIIC) and other regional development organizations, particularly in Riau Islands Province, where the aforementioned FTZs are located. The recommendations proposed in this paper for the Government of Indonesia will be coordinated through the Coordinating Ministry for Economic Affairs. Further research on Indonesia's Halal Industrial Estate development and its implications for food security is highly encouraged to support evidence-based policymaking and sustainable industrial advancement.

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(O-08) USE OF SPATIAL ANALYTICS FOR ISLAMIC SUSTAINABLE FINANCE: ENHANCING TRUST, TRANSPARENCY AND EFFICIENCY

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Abstract

Mobilizing the funds for sustainable initiatives is one of the key objectives of Islamic finance which promises to invest in avenues that benefit all the stakeholders including the natural resources and human generations to come. Centuries before the world realized the significance of utilizing the resources in a sustainable way and set sustainable development goals (SDGs), Islam introduced the optimized way of using the economic and natural resources. There are many accounts in Islamic traditions which provide guidance on using economic resources and making economic decisions in a manner that does not yield benefit to a handful number of people in an economy only rather it takes into consideration the impact of investment decisions on planet, environment, and societies. However, a key challenge in funding sustainable projects is trust deficit in deployment and tracking of funds mobilized in the name of sustainable finance. This paper attempts to explore how this problem can be solved by using modern tools of geographic information systems (GIS). These geospatial platforms can help in identifying and tracking sustainable finance initiatives. For example, Google Earth Engine which is a cloud platform for spatial analytics with huge amount of geospatial data, can be used to detect the areas which need financing from Islamic financial institutions. The satellite data available on such platforms may be analyzed to monitor the impact of financing on agriculture lands, sea, forest, among other natural resources. Specifically, this paper is focused on using Google Earth Engine to detect the deforestation, track the rainfall patterns, frequency of extreme weather, water quality, crop health and water consumption. Leveraging the data on above-mentioned data points and using spatial analytics have the potential to be a game-changer in Islamic social finance. This will help increase the investors` confidence, enhance Shariah compliance controls, reduce costs, showcasing the true potential of Islamic social finance. The paper concludes with the recommendation of using GIS and geospatial data for other areas related to Islamic sustainable finance. These areas include supply chain traceability, air quality tracking, and sustainable cities.

Keywords: Sustainable Finance, Spatial Analytics, Geospatial Data, GIS, Data Analytics, Objectives of Shariah, Sustainable Development Goals

(O-09) INNOVATIVE AI IN HALAL TEXTILE AND FASHION INDUSTRY: MNCS STRATEGY FOR EXCELLENCE

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Abstract

As Articial Intellegence (AI), widely concieved as a revolutionary development impacting on various aspects of economic relations and social life, has created advance of AI and its interconnections with the financial realm have reconstrracted the global fashion industry al all levels ranging from product design and branding to manifacturing, from marketing and distribution to waste management. Major players of the industry were forced to adapt to ongoing radical changes in fast-fashion trends and tried to reduce the negative environmental and social impact of the accelerated production processes. Brand managers, designers, retailers, consultants and trend forcasters in the conventional fashion world resorted to the use of AI for efficiency puposes such as cost-saving, streamlining operations, reducing demand fluctuations and rationalizing market sizes. Therefore, both advanced forms of machine learning and intense use of AI-driven technologies in Halal sector acquired importance to reduce systemic risks and uncertainties in a tensely competitive and rapidly changing global ecosystem.

This chapter will explore the critical interconnections between the use of vaious AI based technologies in the context of global conventional and halal textile and fashion industries. To this end, the respective realsm of fashion AI will be defined at the outset with special reference to algorithsm, machine learning (ML), deep learning models and AI-powered industrial tools. Afterwards the section titled AI in Design, Branding and Marketing will highlight the employment of AI-inspired technological tools in different stages of pre-production such as fabric and garment design, style illustration strategies, nowcasting, trend forecasting and detecting counterfeits. Then the following sub-section titled AI in Production and Manufacturing will contain analyses on the use of AI and high-tech techniques in the dark and smart factories, automation and robotization to reduce labour costs and pollution-waste. The next part titled AI in Retailing Sector: Selling Tools covers the topics of AI Clothing, virtual Try-On clothes tools with AI Applications, fashion simulators, data collection methods on cosumer behaviour, pricing strategy, inventory management and next-gen AI generated fashion retailing stores. The last sub-section of titled Social Robots and Digital Well-Being Fashion will form the conclusion with references to AI-powered financial decisions in the fashion industry including automated customer service software, supply chain management, cost saving measures in design and manufacturing as well as marketing to achieve maximum contributions to well-being. The chapter will underline the crucial link between the use of AI-based tools for innovation driven transformation and cutting-edge technological capacity to achieve competitiveness in the context of halal textile and fashion as one of the moset creative modern industries.

Keywords: Artificial Intelligence (AI), Innovation, Business Excellence, Halal Industry Tools, Textile-Fashion Industry

(O-10) TRANSFORMATION TOWARDS EFFICIENCY OF HALAL SUPPLY CHAIN IN INDONESIA

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Abstract

The halal supply chain is an integrated system that ensures the halal integrity of products from upstream to downstream stages, encompassing raw materials, production processes, distribution, storage, and consumer services. In Indonesia, as the country with the largest Muslim population in the world, the implementation of a halal supply chain holds strategic importance—not only to meet domestic demands but also to strengthen Indonesia's position in the global halal market. The main challenges faced include the low level of halal literacy among Micro, Small, and Medium Enterprises (MSMEs), limited halal logistics infrastructure, complex certification processes, and the lack of harmonization of standards among countries.

This study aims to provide a comprehensive overview of the direction of development and efficiency of the halal industry supply chain in Indonesia, while also identifying key challenges and strategies for improvement. The research employs a descriptive qualitative approach using document analysis methods. The data used are secondary data obtained from various sources.

The results show that halal supply chain in Indonesia has developed positively, supported by regulatory strengthening through Law No. 33 of 2014 and various initiatives by BPJPH to simplify certification and digitalize the halal system. However, efforts to improve supply chain efficiency still need to be strengthened by enhancing halal education, developing halal logistics facilities, streamlining certification through digitalization, harmonizing international halal standards. Synergy among government, business actors, academia, consumers, and social media plays a crucial role in realizing a successful national halal ecosystem.

This study concludes that with strong policy support, cross-sector collaboration, and effective utilization of technology, Indonesia has a significant opportunity to become a global hub for the halal industry. A robust halal supply chain not only strengthens Muslim consumer trust but also unlocks vast economic potential in the ever-growing global market.

Keywords: Supply Chain, Halal, Efficiency, Integrity, Technology

1. INTRODUCTION

Indonesia has significant potential in developing the halal industry, considering that approximately 87% of its total population is Muslim. This demographic reality positions Indonesia not only as a potential market for halal products but also a prospective global hub for halal production and distribution. The growing trend of a halal lifestyle further extends the implementation of halal principles across various sectors, including food and beverages, cosmetics, pharmaceuticals, fashion, tourism, and Islamic finance. This phenomenon demonstrates that the economic value of halal is not only religious but also strategic in supporting national economic development (Mubarok & Imam, 2023; Ikhwan, 2023).

On a global scale, the halal industry has experienced rapid growth and has become a significant segment of the world economy. Indonesia has a substantial opportunity to become a global halal industry center; however, achieving this requires a strong, efficient, and integrated halal supply chain system. The halal supply chain not only ensures the halal status of end products but also covers all stages from raw material selection, production, storage, and distribution, to consumer services (Rahma & Phahlevy, 2022). Efficient implementation of the halal supply chain is crucial as it guarantees halal integrity while enhancing the competitiveness of the industry in both domestic and international markets (Mubarok & Imam, 2023; Indonesia Halal Markets Report, 2021).

Socially, Indonesian society has shown increasing awareness of the importance of halal products. This awareness extends beyond food and beverage consumption to cosmetics, pharmaceuticals, and Islamic financial services. The younger generation of Muslims, who are more critical and information-literate, has become a primary driver of the growth of the halal lifestyle in Indonesia (YCP, 2024). Economically, Micro, Small, and Medium Enterprises (MSMEs) play a vital role in supporting the national halal industry, particularly in the food and beverage sector. However, many MSMEs still face challenges in implementing halal supply chain principles due to limited knowledge, certification costs, and logistical facilities (Ikhwan, 2023; Mubarok & Imam, 2023).

From a policy perspective, the Indonesian government, through the Halal Product Assurance Organizing Agency (BPJPH), has mandated halal certification as part of the implementation of Law No. 33 of 2014 on Halal Product Assurance. This initiative represents a strategic effort to establish an integrated national halal assurance system. Nevertheless, implementation faces challenges such as a limited number of halal auditors, insufficient regional halal testing laboratories, and weak inter-agency coordination (Maulana et al., 2023; Rahma & Phahlevy, 2022). Therefore, strengthening the halal supply chain is an urgent need to support the effectiveness of these policies.

The rapid development of the halal product industry necessitates a halal supply chain guarantee to ensure product halalness from production to the end consumer. The halal aspect is critical, requiring all stakeholders in supply chain management to engage in ethical, fair, and responsible business practices. Halal products are subject to stricter quality standards than other products in the same category. Any company committed to providing halal products to consumers must fully uphold halal integrity from raw materials to finished products.

In facing globalization and international halal industry competition, Indonesia is required to transform and enhance the efficiency of its halal supply chain. This transformation includes digitizing business processes, improving human resource competencies, and developing competitive halal industrial

zones. Improving supply chain efficiency is expected not only to ensure comprehensive product halalness but also to strengthen Indonesia's position as a global halal economic hub.

The halal supply chain aims to manage the flow of materials or raw ingredients, information, capital, and distribution to consumers. For example, in the halal food industry, supply chain management is critical for production. Halalan Tayyiban principles are meaningless if product halalness and cleanliness are not maintained during delivery from suppliers to end consumers. With halal product assurance, consumers can feel safe and confident consuming products whose halalness is guaranteed.

This study aims to provide a comprehensive overview of the development direction as well as the efficiency transformation of the halal supply chain in Indonesia. The article begins by describing the current state of the halal supply chain in Indonesia, followed by an exploration of the challenges in transforming supply chain efficiency and proposed policies as potential solutions. The article concludes with a summary of the efficiency transformation process in Indonesia's halal supply chain.

2. MATERIAL AND METHODS

This study employs a qualitative approach based on document analysis to understand the practices and challenges in the effectiveness of the halal supply chain in Indonesia. Secondary data were selected as the major source, as they allow for an in-depth analysis of the halal supply chain processes without the need for direct field data collection.

The secondary data sources include government reports, national statistical data, official government regulations, scholarly journals, and relevant industry publications. Documents were selected purposively, focusing on those that provide relevant, credible, and up-to-date information regarding the halal supply chain.

The analysis was conducted systematically by identifying key themes across the documents, such as the potential of domestic and export markets for halal products, government policy support, infrastructure and certification challenges, and opportunities for enhancing competitiveness. The results of this analysis provide a comprehensive overview of the direction of development and the effectiveness of the halal industry in Indonesia.

3. RESULTS

The analysis results indicate that the implementation of the halal supply chain in Indonesia began with the strengthening of regulations through the enactment of Law Number 33 of 2014 concerning Halal Product Assurance (UU JPH)**.** This law mandates that all products circulating and consumed by the Muslim community must obtain halal certification from authorized institutions. Since then, the concept of *halal* has no longer been viewed merely as the final label on a product, but as a continuous process that must be monitored from the beginning**.**

In the context of the supply chain, it implies that all elements of the supply chain — from raw material suppliers, manufacturers, distributors, and logistics providers to retailers — are required to apply halal principles in accordance with Islamic law.

In practice, many large companies in Indonesia, particularly in the food and beverage sector, have integrated the halal assurance system into their quality management systems. They ensure that raw materials are sourced from halal-certified suppliers and accompanied by verification documents. Furthermore, the production process is conducted in facilities that are free from contamination with impure (*najis*) or prohibited (*haram*) materials, and all equipment used has undergone purification if it was previously utilized for non-halal products.

Beyond production, the logistics sector has also begun adapting to halal standards. Although still in its early stages, there have been several initiatives to develop a halal logistics system, such as the establishment of halal warehouses, dedicated containers, and segregated transportation systems to separate halal and non-halal products.

Nevertheless, the implementation of the halal supply chain in Indonesia still faces several challenges. One of the most prominent issues is the low readiness of MSMEs. Other challenges include the limited halal logistics infrastructure**,** the lack of integration within the halal industry supply chain**,** complex halal certification processes, and the absence of harmonized standards across the country.

Overall, the implementation of the halal supply chain concept in Indonesia continues to show positive progre**ss**. Although it has not yet been evenly applied, the direction of government policy and growing public awareness indicate an encouraging trend. In the coming years, with proper policy supports, cross-sector collaboration, and technological advancement, Indonesia is well-positioned to become one of the world's most trusted centers for halal production and distribution.

4. DISCUSSION

As the country with the largest Muslim population in the world, Indonesia has significant potential to become a global hub for the halal industry. However, despite notable progress in implementing the halal supply chain system in recent years various structural, technical, and cultural challenges continue to hinder its full adoption. These challenges not only slow the realization of the national Halal Product Assurance System (Sistem Jaminan Produk Halal, SJPH) but also affect the efficiency and competitiveness of Indonesian halal products in the global market (Putri et al., 2024). Therefore, this issue must be examined comprehensively across the entire halal supply chain—from upstream to downstream.

One of the main obstacles is the low literacy and understanding of business actors, particularly MSMEs, regarding the comprehensive concept of halal. Many business actors still interpret halal merely in terms of raw materials, without considering aspects of processing, equipment usage, storage, and distribution. A study by Fahadha and Sutarto (2025) confirms that most MSMEs in the food sector have not fully implemented Halal Supply Chain Management (HSCM), which directly impacts logistics inefficiencies and the potential for cross-contamination. Low halal literacy also limits MSMEs' ability to obtain halal certification, which is a critical requirement in an integrated halal supply chain.

In addition to understanding, limited halal logistics infrastructure is another important factor reducing supply chain efficiency. According to Masudin et al. (2023), the absence of halal-specific logistics facilities—such as warehouses, vehicles, and distribution systems—increases the risk of

contamination and extends distribution lead times. Their study also indicates that the greatest risk in Indonesia's halal supply chain stems from weaknesses in the storage and transportation stages, which have not fully adhered to halal principles. Therefore, the development of standardized halal logistics infrastructure is essential to enhance efficiency and maintain the integrity of halal products from upstream to downstream.

From a technological perspective, the integration of digital systems within the halal supply chain remains relatively low. Research shows that technologies such as blockchain and the Internet of Things (IoT) can significantly improve transparency, data accuracy, and the efficiency of halal product tracking (Kurniawan, Suparno, & Vanany, 2025). These technologies enable real-time traceability systems that not only verify halal status but also expedite distribution by reducing administrative overlaps. Harsanto et al. (2024), in their systematic review, emphasize that adopting Industry 4.0 digital technologies in the halal supply chain positively contributes to operational efficiency and consumer trust, although challenges remain due to limited resources and digital readiness at the MSME level.

Another challenge arises from the complexity of halal certification processes and the lack of harmonization in international standards. Putri et al. (2024) explain that the fragmented global halal certification system hampers Indonesian exports due to differences among certification bodies. As a result, products certified nationally may not be recognized internationally, reducing supply chain efficiency due to additional processes required for adaptation or re-certification in export markets. Moreover, the limited number of auditors and halal assessment institutions slows domestic certification processes (Usman, 2020), creating administrative bottlenecks in the national halal supply chain system.

The efficiency of the halal supply chain is also influenced by the level of coordination among actors within the halal industry ecosystem—including government, certification bodies, business actors, and consumers. Usman (2020) shows that institutional relationships and stakeholder communication remain weak, resulting in inadequate dissemination of information regarding halal standards and procedures, particularly in remote areas. This lack of inter-agency collaboration undermines efficiency and synergy in implementing the SJPH.

From the consumer side, halal literacy indirectly affects supply chain efficiency. Harsanto et al. (2024) find that increased consumer awareness of halal products encourages companies to strengthen halal assurance systems and accelerate the adoption of traceability technologies. Growing demand for certified halal products drives industry actors to improve distribution systems and logistics management to achieve greater efficiency.

These challenges demonstrate that the efficiency of Indonesia's halal industry supply chain is shaped by the interaction between internal factors (literacy, infrastructure, technology) and external factors (regulations, international standards, market demand). Fahadha and Sutarto (2025) emphasize the need for a systemic approach to building the national halal supply chain, in which all actors and stages are vertically and horizontally integrated. This approach not only focuses on certification but also on operational efficiency, information technology, and institutional collaboration.

Therefore, improving the efficiency of Indonesia's halal supply chain requires a comprehensive strategy, including:

1. Enhancing business actors' capacity through training, certification, and guidance in implementing the SJPH.
2. Developing an adequate and regionally integrated halal logistics infrastructure.
3. Utilizing digital technologies such as blockchain and IoT for real-time halal tracking and verification.
4. Harmonizing international halal standards to facilitate exports and reduce duplicated certification processes.
5. Increasing public and consumer halal literacy to strengthen market demand for efficient and trustworthy halal products.

Through these measures, the efficiency of Indonesia's halal industry supply chain can be improved, thereby reinforcing the country's position as a competitive, sustainable, and globally recognized hub for the halal industry.

5. CONCLUSION

The halal supply chain is not merely a label but a comprehensive and complex system that ensures the halal integrity of a product from upstream to downstream. Indonesia possesses all the fundamental assets—being home to the world's largest Muslim population, having abundant natural resources, and enjoying strong government policy support—to enhance the effectiveness of its halal industry supply chain as part of its efforts to become a global halal hub. However, to achieve this vision, existing challenges must be overcome through synergy among efficient regulations, robust halal infrastructure, technological advancement, and extensive education for all stakeholders. As a result, Indonesia can position itself not only as a consumer of halal products but also as a leading player in the global halal industry.

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(O-11) INNOVATIVE TRACEABILITY FOR THE HALAL INDUSTRY: ALIGNMENT WITH OIC/SMIIC STANDARDS

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Abstract

The halal industry encompasses a wide ecosystem, including halal production, service delivery, certification, accreditation, and related activities. Traceability is essential within this ecosystem, facilitating organizational interaction and serving as a strategic component of the halal quality infrastructure. This study provides a novel perspective on halal traceability practices and proposes recommendations for designing sustainable systems.

Existing traceability systems and technological innovations are examined and evaluated for their alignment with the halal quality infrastructure under OIC/SMIIC standards. Results indicate that digital technologies—such as RFID, IoT, Blockchain, and artificial intelligence—enable data-driven, verifiable, and transparent processes. They support real-time monitoring, enhance operational efficiency, and increase productivity across production, supply chains, certification, and accreditation.

According to OIC/SMIIC standards, traceability involves monitoring the entire chain from production to supply. Control requirements for certificate and brand usage form the foundation of traceability in conformity assessment. This also includes accreditation. Integrating innovative technologies improves operational performance and strengthens trust among consumers and regulators by enabling systematic information flow across all stakeholders.

Nevertheless, risks such as privacy breaches, cybersecurity threats, sensor failures, software errors, human mistakes, and limited adoption of digital systems can compromise data integrity. Current standards do not fully address these challenges. Therefore, it is essential that standards promote digital transformation through effective change management and mandate comprehensive risk management across both processes and organizational levels.

In conclusion, innovative traceability systems integrated into halal standards are expected to strengthen organizational quality infrastructures and support a sustainable, reliable ecosystem that facilitates collaboration across the halal industry. Further empirical studies focusing on sector-specific implementation may provide actionable insights.

Keywords: Halal Industry, Innovative, Traceability, Halal Quality Infrastructure, Halal Standard

(O-12) ENHANCING CONSUMER CONFIDENCE THROUGH AI-BASED HALAL TRACEABILITY SYSTEMS

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Abstract

The global Halal industry's growth presents abundance opportunities to streamline process in the area of certification.

However, the challenges for ensuring product authenticity and transparency remain to be addressed. Issues such as fraudulent labelling, counterfeit certificates, and limited supply chain visibility undermine consumer trust.

This study explores the role of Artificial Intelligence (AI) in developing robust Halal validation and traceability systems to monitor products from origin to consumption. By leveraging machine learning, image recognition, and predictive analytics, certification bodies and stakeholders can enhance ingredient verification, streamline audits, and enable real-time tracking. These advancements ensure Shari'ah compliance without losing compatibility of existing government's requirements to enhance operational efficiency, and bolster market confidence.

The proposed AI-driven smart framework mitigates fraud, enhances transparency, and raises Halal certification standards. Initial results indicate that such systems reduce mislabelling risks, provide verifiable product histories, and foster sustainable growth in the Halal economy. By integrating advanced technology with Islamic principles of integrity and accountability, AI-based traceability systems promote innovation and excellence in the global Halal sector. This study underscores the potential of AI to transform Halal certification practices, ensuring consumer trust and supporting the industry's long-term development.

Keywords: AI, Halal Certification, Consumer Confidence, Food Industry

(O-13) A CASE STUDY OF HALAL LOGO, NUTRITIONAL CONTENT TABLE AND GROSS WEIGHT OF SOME FOOD PRODUCTS IN THE LIBYAN MARKET: TRACEABILITY APPROACH AT POS

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Abstract

Halal food packaging contains the labels, which serve as an essential communication tool between manufacturer and consumers, providing a wealth of information that can empower individuals to make informed choices about the food they eat. In each country, foods are subjected to general labelling requirements, to provide healthy food that fits to people`s religious dietary needs and cultural preferences. For instance, the Islamic dietary rules (Sharia principles) are concerned with food quality and human health that maintain society's behaviour and concern on empowering the faith. Therefore, Muslim consumers want to see proper information on the food labelling, including the name of the product, the manufacturer's information, product weight, nutritional table, Halal logo, any artificial preservative elements, etc. To trust this information, tracking and tracing food products in all supply chains, especially at the point of sale (POS) becomes an obligatory approach.

In recent decades, the problem in Libya is that many violations have been observed in many food products such as non-compliance with packaging laws, particularly exploiting the use of the halal label, frauds in weights, and absence of nutritional content table. Therefore, the aim of this study was to audit some food label information (existence of Halal logo, nutritional table, and net weight) that helps consumers make informed food choices. The research focused on the products either produced in Libya or imported from abroad including the highly processed foods, dairy products and basic food commodities collected at POS in the western area of Libya.

As a result, 100% of the sauces produced in Libya had no Halal logo (HL), but 50% of the products showed a nutritional table (NL). Seventy-nine percent of the sauces exported from non-EU countries showed no Halal logo, and 86 % of them had a visible Halal logo. The HL was only available on 33.3% of the Libyan chips products, but was not available on EU and non-EU products (0%). Nutritional labels were available on all products that were either produced in Libya or imported from abroad (100%). Frauds in the gross weight of the ultra-processed tested products were found in the Libyan and non-EU products at 6.25 and 50%, respectively. In all Libyan dairy products had no HL; however, the nutritional label was available by 100%. All foreign yogurt and Sharab products had no HL, while it was only detected in cheese and milk products from non-European countries by 28.5% and 66.33%, respectively. Nutritional labels on cheeses from EU countries were only in 66.66% of

the tested products. Weight fraud detection was 1.78% in EU yogurt products and 50% in non-EU cheese products. All Libyan dairy products did not have any fraud issues.

In basic commodities, pasta and macaroni had no HL in Libyan and non-Libyan products, while the NL was existent in most of the products. Regarding the frying oil, HL was found in Libyan and non-European products only in 33.33% of the test items, while NL was available on all labels. The Halal logo was detected in rice and Koskos items that imported from the European and non-European states at 33.33% and 50%, respectively. Libyan rice and koskos showed no Halal logo and showed only nutritional labels in 25% of the tested samples. From the results review, the researchers found that the Halal logo is not common on all products, which imposes us to refocus on this issue. Food manufacturers in foreign countries are using the Halal logo more frequently than Libyan producers. In recommendation, there should be new regulation manifestations issued by authorities and approved by the competent authorities on the local and imported food products for the commitment to properly use food logos and signs.

Keywords: Halal Logo, Weight Frauds, Traceability Approach

(O-14) TOWARDS HALAL ALTERNATIVES: A STRATEGIC FRAMEWORK FOR REPLACING NON-HALAL INGREDIENTS AND PROCESSES IN THE PHARMACEUTICAL SECTOR

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Abstract

Halal pharmaceuticals must be free from non-halal ingredients and produced using processes that exclude najis (impure) materials and non-halal components at all stages. However, many active pharmaceutical ingredients (APIs) and certain production techniques are currently derived from/ or use non-halal sources with no available halal alternatives, posing a significant barrier to achieving full compliance with halal requirements.

This paper proposes a strategic framework for the identification and development of halal alternatives both in terms of ingredients and manufacturing processes. The proposed approach prioritizes efforts based on the Pareto Principle (80/20 Rule), focusing on the limited number of critical components that account for the majority of non-compliance cases. Additionally, the strategy incorporates the Halal Pharmaceuticals Opportunities Index, a concept introduced by the author during the 2018 World Halal Summit, to guide prioritization based on market impact and feasibility.

The World Halal Summit, in collaboration with SMIIC, provides an ideal platform to launch and promote this initiative. It is hoped that this strategic approach will inspire further collaboration among OIC member states and contribute to the global advancement of halal-compliant pharmaceutical development.

Keywords: Halal Pharmaceuticals, Pareto Principle, Halal Substitution Strategy, Alternative Ingredients, Halal Opportunities Index

1. INTRODUCTION

Halal pharmaceuticals are defined as pharmaceutical products that are free from non-halal and najis materials not only in their active ingredients and excipients, but also throughout manufacturing, handling, and packaging. According to OIC/SMIIC 50-1:2023 Halal Pharmaceuticals: General Requirements, under 3.16.1 Halal Pharmaceuticals are "pharmaceutical products that contain ingredients permitted under the Islamic Rules which:

a) do not contain any parts or products of animals that are non-halal or any parts or products of animals which are not slaughtered according to Islamic Rules;

b) do not contain najas according to Islamic Rules;

c) safe and efficacious for human use according to prescribed dosage, quality and hygiene;

d) not prepared, processed or manufactured using equipment contaminated with najas according to Islamic Rules;

e) do not contain any human parts or its derivatives that are not permitted by Islamic Rules;

f) during the preparation, processing, handling, packaging, storage and distribution, the halal pharmaceutical products are physically segregated from any other pharmaceutical products that do not meet the requirements stated in items a), b), c), d) or e) or any other items that have been decreed as non-halal and/or najas by Islamic Rules."

Despite this defined framework, the majority of medicines consumed by Muslims globally are not halal-certified, and only a limited number of pharmaceutical manufacturers currently hold halal certification. This does not automatically mean such medicines are non-halal, but rather that halal requirements may not be systematically integrated into manufacturing controls and quality management systems. For Muslim consumers, the halal status of medicines holds significance comparable to safety and efficacy, and therefore requires structured assurance rather than assumption.

There is a well-known fiqh ruling that allows the use of non-halal or najis medicines in situations where no halal alternative exists, based on the principle of *al-ḍarūra* (necessity). However, this ruling has often been applied in a very general manner, placing the final decision in the hands of the prescribing physician. In reality, determining whether a medicine is truly necessary and whether no halal alternative is available requires detailed knowledge of pharmaceutical manufacturing processes, ingredients, sourcing, and technological constraints knowledge that most clinicians do not possess. Therefore, this decision should not be left to individual doctors, but rather should be assessed by a qualified multidisciplinary committee of pharmaceutical scientists, technologists, and Shariah scholars who can evaluate necessity based on accurate scientific and production information.

The author, in the article *Prescribing Haram and Najis Pharmaceuticals: Clinical Guidelines for Doctors, Pharmacists and Other Health Care Related Professionals* presented at the World Halal Summit (WHS 2018), proposed the establishment of a specialized committee to identify and classify non-halal and doubtful pharmaceutical ingredients, and to promote the development of halal pharmaceutical alternatives. This recommendation was later reflected in institutional progress when the Halal Pharmaceuticals Technical Committee (TC16) was formed within SMIIC in 2019, which has since incorporated part of this framework into the ongoing OIC/SMIIC 82 standard project.

In the same publication, the author also introduced the concept of a "Halal Pharmaceuticals Opportunities Index," designed to guide governments and regulatory authorities in prioritizing which medicines require regulatory review, ingredient reformulation, or manufacturing modifications to align with halal requirements. The index functions by assigning weighted scores to specific criteria, producing a priority ranking that can assist both policymakers and investors in identifying products with the greatest strategic value for halal transformation. Medicines scoring 27 points or higher (out of a maximum of 45) are classified as high priority for halal development, while those scoring below 27 are considered lower priority.

The objective of this article is to propose a strategic framework for replacing non-halal ingredients and processes in the pharmaceutical sector, following the significant increase in awareness and structured development efforts that have emerged after the establishment of the SMIIC Halal Pharmaceuticals Technical Committee (TC16) and its ongoing standardization projects. This framework is intended to be practical and applicable for pharmaceutical manufacturers, formulation scientists, and research and development units in universities and industry who are working to identify and develop halal alternatives to non-halal active pharmaceutical ingredients (APIs) and excipients. In principle, halal is broad and inclusive, while non-halal (haram or najis) represents a smaller restricted category; therefore, the majority of medicines should theoretically be suitable for Muslim consumption. However, in practice, the widespread use of certain non-halal or najis excipients and processing aids can render an entire formulation problematic from a halal perspective. For this reason, the article aims to identify and prioritize the key non-halal materials that require replacement, providing direction for manufacturers and guidance for Muslim regulatory authorities such as ministries of health. The Pareto principle, or "80/20 rule," is particularly relevant here: although there are thousands of diseases and approximately 9,000 registered medicines, only a few hundred are routinely stocked in pharmacies and effectively manage the majority of common health conditions. By applying the same strategic logic, the author proposes that focusing on a limited, high-impact group of non-halal ingredients will yield the most meaningful progress in advancing the halal pharmaceuticals sector.

2. MATERIAL AND METHODS

This study employed a descriptive analytical approach using a combined qualitative-quantitative content analysis model to identify high-impact dominant factors within pharmaceutical products relevant to halal substitution priorities. Four levels of analysis were conducted:

1) identification of the most common drug administration routes used in routine clinical practice;
2) determination of the most widely utilized dosage forms among all pharmaceutical dosage categories;
3) assessment of the most frequently used pharmaceutical excipients across standard formulations;
4) recognition of the most commonly dispensed medicine classes that collectively cover the majority of prevalent diseases in a given healthcare setting; and
5) determination of the most widely used process in manufacturing and preparation

Data sources included authoritative pharmacopoeias (USP, BP, Ph. Eur.), regulatory drug databases, national and international formulary lists, and pharmaceutical export and manufacturing databases. The frequency and dominance of each category were evaluated through comparative occurrence analysis to determine which components form the core set that should be prioritized for halal reformulation due to their widespread use and broad therapeutic impact.

3. RESULTS

3.1 From the analysis of drug administration routes reported in pharmacology texts, formularies, and prescribing databases, the oral route was found to be the most common route used in routine clinical practice. Oral medicines represent approximately 85–90% of all pharmaceutical products dispensed to patients globally, mainly because they are convenient, safe, easy to administer, and suitable for long-term use in the community. The oral route is the primary route for treating the majority of chronic diseases such as hypertension, diabetes, dyslipidemia, gastrointestinal disorders, and for most common infections and pain conditions. The second most widely used group are parenteral routes, particularly intravenous (IV) administration, which is essential in hospitals for severe infections, emergency interventions, oncology treatments, and critical care management where rapid and controlled drug delivery is required. Topical and transdermal routes follow, mainly used for dermatological diseases, local inflammation, pain management, and hormone delivery. Inhalation routes are especially relevant for asthma and COPD management. These findings show that focusing on the oral route and its related formulation systems provides the highest practical impact for improving halal pharmaceutical availability, due to its dominance in daily therapeutic use.

3.2 In the present study's analysis of dosage forms, the most widely utilized dosage form globally was found to be the tablet, followed by capsules. Tablets account for approximately 50–70% of all pharmaceutical dosage units, with one recent market estimate placing them at around 53%, and older literature indicating up to 70% of all products. Capsules contribute a further significant portion (approximate secondary share of ~20–25%). The dominance of tablets and capsules is attributable to their manufacturing cost-efficiency, ease of administration, stability, and widespread acceptance in treating common conditions such as hypertension, diabetes, infection, pain, and chronic disorders. By deriving this quantitative insight, the strategic framework prioritizes tablet and capsule forms for halal-compliance interventions, given their outsized impact on overall drug consumption.

3.3 The review of excipient usage patterns demonstrated that a small group of excipients dominates the majority of solid oral pharmaceutical formulations. Data sourced from pharmacopoeias, the USP Inactive Ingredient Database, the Handbook of Pharmaceutical Excipients, and standard formulation references showed that microcrystalline cellulose (MCC), lactose monohydrate, povidone (PVP K-30), croscarmellose sodium or sodium starch glycolate, magnesium stearate, and colloidal silicon dioxide are the most frequently used excipients in tablets due to their essential functional roles in dilution, binding, disintegration, lubrication, and flow regulation. For capsule dosage forms, the capsule shell itself is a critical component, and the most commonly used material globally is gelatin. From a halal perspective, halal-certified bovine gelatin is the preferred option, while HPMC (hydroxypropyl methylcellulose) capsules serve as the primary non-animal or plant-based alternative when halal bovine gelatin is not available or suitable. These findings indicate that focusing halal reformulation efforts on this small, high-impact group of excipients and capsule shell materials offers

the greatest strategic benefit, as altering a limited number of widely used components can influence the halal compliance of a large portion of commonly consumed medicines.

3.4 The analysis of the most commonly dispensed medicines showed that a limited number of therapeutic classes account for the majority of treatment needs in routine healthcare practice. This pattern is reflected in the WHO Model List of Essential Medicines, which identifies the core medicines required to manage the most prevalent diseases worldwide. The essential medicines concept is based on selecting one or two key representatives from each major therapeutic group (for example, one ACE inhibitor for hypertension, one statin for dyslipidemia, one proton pump inhibitor for gastric disease, one or two common antibiotics for respiratory infections, etc.), ensuring wide clinical coverage without requiring hundreds of alternatives. By mapping this concept to halal pharmaceutical development, the priority should focus on reviewing the most widely used tablet and capsule products within these essential classes, identifying any non-halal or doubtful ingredients in their formulations, and replacing them with halal-compliant alternatives. This approach ensures that resource and reformulation efforts are directed toward medicines with the highest public health impact, enabling Muslim consumers to access safe, effective, and halal-compliant treatment options across the most common disease areas.

3.5 The review of manufacturing practices showed that the core processes used to produce tablets and capsules are highly standardized, consisting mainly of weighing, blending, granulation (if required), drying, milling, lubrication, and compression or encapsulation. Because these steps are largely mechanical and do not change the halal status by themselves, the key halal considerations are linked to materials and equipment, not the process flow. The critical halal control points identified in these processes include: (1) the source of excipients, especially gelatin for capsule shells and lubricants such as magnesium stearate; (2) the status of processing aids such as enzymes, filters, and anti-foam agents if used; and (3) the cross-contamination risk from shared equipment, requiring validated cleaning protocols or dedicated lines when non-halal materials are also handled in the same facility. Therefore, the findings indicate that improving halal compliance in manufacturing does not require redesigning the production process, but rather ensuring halal-certified input materials and reinforcing segregation and cleaning controls at defined critical points.

3.6 In comparison to the straightforward processes involved in producing tablets and capsules, biologics manufacturing presents a higher number of halal-critical points and therefore requires more detailed evaluation. Biologics are produced through cell culture and fermentation systems, followed by purification and formulation stages, and these stages often involve multiple inputs, processing aids, and conditions that may originate from non-halal or uncertain sources. Examples include cell lines, fermentation media components, enzymes used in processing, stabilizers, and filtration or chromatography materials whose origins are sometimes not fully transparent. In these complex systems, the manufacturing environment and the biological production platform are integral to the final product, which means that assessing halal status cannot be limited to the final ingredients list alone. Therefore, biologics represent a category where process-level evaluation is essential, and in some cases, modifications of production steps may be required to ensure alignment with halal requirements. This highlights the need for specialized assessment frameworks and cross-disciplinary collaboration when considering halal assurance in biologics.

4. DISCUSSION

The Pareto principle suggests that a small proportion of causes account for a large proportion of effects. However, the exact ratio is not fixed; in this study the pattern more closely resembles a 90/10 distribution, where a limited number of dosage forms, excipients, and medicine classes account for the majority of pharmaceutical use. This foundational observation supports the approach of beginning with the WHO Essential Medicines List, with a specific focus on tablets and capsules, as these forms dominate daily prescribing and patient consumption. This work represents a first-level strategic study, and it is not intended to provide full technical reformulation guidance. Rather, it sets the direction for a more detailed analytical phase. The next stage should involve applying structured problem-analysis tools, such as the fishbone (Ishikawa) model, to identify the deeper determinants affecting halal compliance within each prioritized medicine. Once the key products requiring attention are identified, the previously described Halal Pharmaceuticals Opportunities Index can be used to evaluate broader considerations, including cost, feasibility, morbidity and mortality relevance, and market impact, to determine which products should be advanced first. Therefore, this article should be understood as a starting point. It outlines a framework that must be followed by a systematic, step-wise review of all medicine classes, using the same prioritization principles, until halal-compliant alternatives are identified or developed for the majority of commonly used pharmaceutical products.

5. CONCLUSION

This study highlights that prioritizing halal pharmaceutical development can be approached strategically by focusing on the most widely used routes of administration, dosage forms, excipients, and essential medicines that cover the majority of daily healthcare needs. The findings show that oral tablets and capsules, supported by a small core group of excipients, represent the highest-impact starting point for halal compliance efforts. Beginning with the WHO Essential Medicines List provides a rational, public-health aligned foundation for identifying which products should be evaluated first. This work forms an initial framework that should be followed by more detailed technical analysis and structured assessment methods to identify specific halal-critical points within each formulation and production process. Ultimately, achieving broad availability of halal pharmaceuticals will require systematic, coordinated efforts among manufacturers, regulatory authorities, and SMIIC, with the long-term goal of ensuring that safe, effective, and halal-compliant medicines are accessible to Muslim patients worldwide.

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(O-15) ALTERNATIVE OPTIONS FOR HALAL CRITICAL INGREDIENTS IN HALAL PHARMACEUTICAL AND COSMETICS

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Abstract

The global halal market is expanding fast as halal products establish themselves as a new standard for safety and quality assurance. The constituent of a product, whether pharmaceutical or cosmetic, determines its halal classification. Ingredients that do not correspond to the halal standard are commonly known as critical ingredients. As a result, various substitutes for critical ingredients should be developed to raise global demand for the halal market. This study aims to review the current research development on the alternatives for halal critical ingredients in halal pharmaceuticals and cosmetics and to explore the testing methods used to test the alternative option for halal critical ingredients. This systematic study followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) standards and all the publications in this review meet the research eligibility requirements, which were searched and selected using electronic databases such as PubMed, Scopus, and MyCite. This study examined approximately 21 publications that proposed various substances derived from sources such as plants, animals, marines, and microbes. Descriptive trends showed a publication peak in 2018 and strong Malaysian contributions, reflecting growing demand for halal-compliant technologies. Across the corpus, insulin and gelatin emerged as the most frequently interrogated critical ingredients. Multiple plant and microbe-derived candidates showed insulin-mimetic or sensitizing effects, notably Bolanthus spergulifolius and Acer truncatum leaves. Gelatin alternatives were robust and diverse such as pea protein isolate, mango peel pectin, marine and animal skins delivered favorable gel strength, release control, sensory acceptance, and mechanical profiles comparable to porcine gelatin. The testing methodologies demonstrated that the alternative possibilities are far superior to the critical ingredients in terms of texture, morphology, activity, composition, and even the cost of synthesis. In conclusion, this review highlights multiple feasible options for replacing halal-critical ingredients in pharmaceutical and cosmetic formulations.

Keywords: Halal Critical Ingredients, Pharmaceutical, Cosmetics Insulin, Gelatin

(O-16) HALAL OR NOT? UNVEILING THE STATUS OF COSMETIC PRODUCTS IN MALAYSIAN COMMUNITY PHARMACIES

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Abstract

The concept of Halal, traditionally associated with food, has increasingly extended to consumer goods such as cosmetics, particularly in Muslim-majority countries like Malaysia. As cosmetics are applied directly to the body, their Halal status is crucial to ensure compliance with Islamic principles, covering not only ingredients but also processes of manufacturing, storage, and packaging. Despite the rising demand for Halal-certified cosmetics, gaps remain in the transparency of certification for products sold in community pharmacies, where consumers frequently seek personal care items. This study aimed to assess the prevalence and certification status of cosmetic products in two community pharmacies in Selangor, Malaysia. A descriptive exploratory design was employed, involving physical inspection of 491 cosmetic products between October and November 2024. Product labels were analysed for Halal logos, certification bodies, alternative Halal statements (e.g., vegan, non-animal based, or alcohol-free), packaging characteristics, and halal critical ingredients.

Results revealed that only 23% (115) of products were Halal-certified, predominantly under the Department of Islamic Development Malaysia (JAKIM), while 77% (376) lacked certification. Among the non-certified, 257 products carried Halal-alternative statements, which may confuse consumers. Skin care products dominated the dataset, especially among non-certified items (188). Malaysia was the leading country of origin for Halal-certified products (56%), with bottle and tube packaging in HDPE material and minimalist design being the most common features. Glycerin emerged as the most prevalent critical ingredient, present in both Halal-certified (75) and non-certified (242) products. This study highlights the need for greater awareness, transparency, and regulatory oversight to ensure Halal compliance in community pharmacy cosmetic products. It underscores the importance of standardizing certification, improving labelling practices, and encouraging manufacturers to prioritize Halal certification to meet the ethical and religious expectations of Muslim consumers

Keywords: Halal Cosmetics, Community Pharmacy, Halal Certification, Consumer Awareness, Halal Compliance

1. INTRODUCTION

Islam, the world's second-largest religion with over two billion believers (World Population Review, 2024), has a significant impact on consumer behavior in Muslim-majority nations like Malaysia, where 61.3% of the population practices Islam. The growing awareness of Halal compliance among Muslim customers has had a substantial impact on purchasing decisions, particularly in the cosmetics business (Mohezar, Zailani, and Zainuddin, 2016). As a result, cosmetic items must adhere to Islamic regulations to assure both quality and safety for Halal-conscious consumers.

The term Halal means permissible under Islamic law and applies to products that do not contain prohibited substances or come into contact with non-Halal materials during processing or transportation. In Malaysia, Halal certification is regulated by the Department of Islamic Development Malaysia (JAKIM), with the Halal logo serving as proof of compliance under the Trade Description Order (Usage of the Term "Halal") 1975. While Halal certification initially focused on food and beverages, it has now expanded to include cosmetics, which are defined by the National Pharmaceutical Regulatory Agency (NPRA, 2024) as substances applied to external body parts for cleansing, beautification, or protection.

Despite the growth of the Halal cosmetics market, challenges remain in clarifying and enforcing certification standards, particularly regarding ingredients that can come from both Halal and non-Halal sources, such as glycerin, collagen, and alcohol-based compounds. According to the Department of Standards Malaysia (2019), certified cosmetics must only include permissible substances from Halal sources and be free from impurities (Najs). However, many community pharmacies still carry products with unclear certification status, creating confusion among consumers. This study aims to assess the Halal certification status of cosmetic products sold in community pharmacies, identify key ingredients influencing compliance, and provide insights to enhance transparency and consumer confidence in Halal-certified cosmetics.

2. METHODOLOGIES

This descriptive and exploratory study was conducted at two community pharmacies in Selangor, namely Alpro Pharmacy Neo Cyber and Farmasi Najah Bangi. These sites were selected based on their consent to participate and permit data collection on their premises. The primary objective of the study was to evaluate the Halal status of cosmetic products available at these pharmacies through the analysis of product information obtained from packaging, accompanying leaflets, and online databases. Data collection involved identifying the critical ingredients of both Halal-certified and non-Halal-certified products using established reference sources. All collected data were systematically documented and subjected to descriptive analysis using Microsoft Excel. Only community pharmacies that granted access to their product inventories were included in the study. Products were excluded if they did not fall under the cosmetic classification, were not displayed on shelves, or lacked a valid notification number issued by Malaysia's National Pharmaceutical Regulatory Agency (NPRA). Written consent was obtained from both participating pharmacies after they were briefed on the study's objectives, scope, and data collection procedures. Data collection followed a standardized checklist and was conducted between 9 October 2024 and 13 November 2024, with each session lasting approximately two hours.

The classification of cosmetic products were made according to the U.S. Food and Drug Administration's (US FDA) Cosmetic Product Category Codes, retrieved in May 2024. The legitimacy of each product was verified through its notification number in the NPRA QUEST 3+ Product Search System. The Halal status of each product was first assessed based on the presence of a Halal logo on its packaging and subsequently verified against the list of recognized Halal certification bodies published by the Department of Islamic Development Malaysia (JAKIM) as of 20 May 2024. Additional product details—including Halal alternative claims, manufacturer information, country of origin, packaging materials, and critical ingredients—were gathered from product packaging, manufacturer and pharmacy websites, and the NPRA QUEST 3+ system.

For data analysis, cosmetic products were classified into major and minor classes according to the US FDA's categorization system based on intended use, formulation, and application area. The study compared the proportion of Halal-certified and non-Halal-certified products across different classes to identify the patterns in Halal certification prevalence. The Halal status determination was based on the presence of a Halal logo, with additional analysis of products that lacked certification but included Halal alternative statements such as "non-alcohol-based," "non-animal-derived," or "vegan." The proportion of Halal-certified products versus non-Halal-certified products, including Halal alternative statements and certification bodies, were analysed to assess the overall distribution.

The study also examined various characteristics and aspects of cosmetic products, including their country of origin, packaging type, design, and materials. The country of origin was determined based on the manufacturer's registered country rather than the specific product's place of production. Packaging details were collected through direct physical inspection and online sources. The distribution of Halal certified and non-Halal certified products were compared across these characteristics to identify areas where Halal certification was more prevalent. Additionally, critical ingredient identification played a key role in assessing the halal status of cosmetic products. Critical ingredients, which could be either Halal or haram depending on their origin, were identified using the International Nomenclature Cosmetic Ingredients (INCI) database and manufacturer websites. Halal-certified products were assumed to contain only Halal-compliant ingredients, whereas non-Halal-certified products carried a potential risk of non-compliance. The presence and proportion of critical ingredients were compared between both categories, and the results were visually presented in column charts to highlight ingredient prevalence.

For statistical analysis, the collected data was analyzed and visualized using Microsoft Excel in the form of column charts and pie charts to illustrate product distribution across various types, categories, and characteristics. Frequencies and percentages were used to describe categorical data, providing insights into the overall patterns of Halal certification and ingredient composition in the cosmetic products available in the selected community pharmacies.

3. RESULTS AND DISCUSSION

3.1 Prevalence of Halal Status of Cosmetic Products

3.1.1 Halal Status

In this study, a total of 491 products were collected from two community pharmacies in Selangor. The products were further grouped based on their Halal status, cosmetic classes, country of origin, packaging characteristics and critical ingredients. From the analyzed results which is shown in Figure 3.1, it has been observed that only 23% (115) of cosmetic products were found Halal certified, meanwhile the remaining 77% (376) products were either non-Halal certified or have not yet obtained Halal certification. This notable gap indicated a lack of availability of Halal-certified cosmetics in both community pharmacies. This is because the Halal cosmetics market is facing challenges such as limited consumer awareness, high certification costs, and complex regulatory requirements which hinder manufacturer's decision to apply for Halal certification (Hashim & Mat Hashim, 2013).

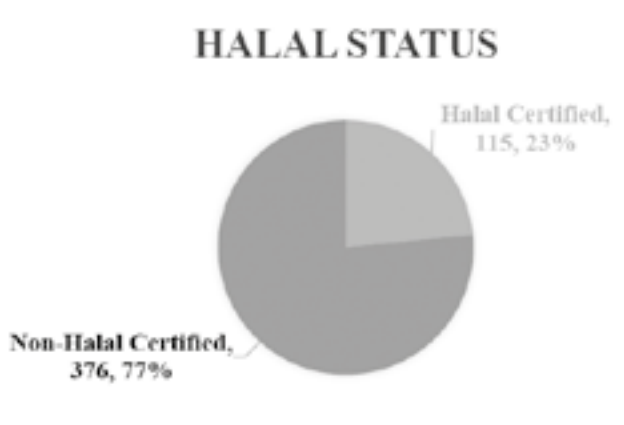

Figure 3.1. Analysis of Halal Status of Cosmetic Products

3.1.2 Halal Alternative Statements

In this study, it was found that the proportion of cosmetic products that have Halal alternative statements such as non-animal based, vegan, and non-alcohol based were 258 products in which non-animal-based account for 43% (112) products, vegan account for 31% (80) products and non-alcohol-based account for 26% (66) products as shown in Figure 3.2. These findings suggested that many products might have aligned with Halal requirements but without a formal certification from the certification bodies. However, products without formal Halal certification even with the presence of Halal alternative statements might not be sufficient to provide reassurance to consumers as certification provides consumer trust (Halal Food Council USA, 2024).

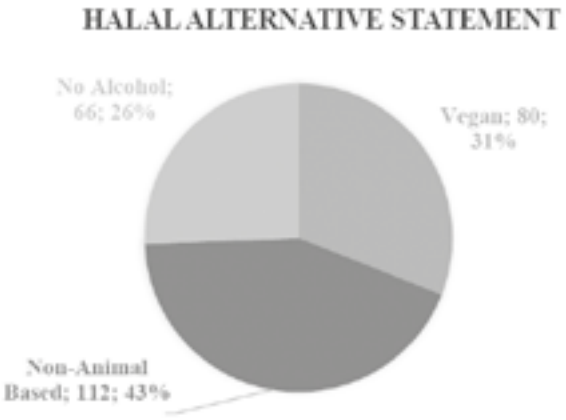

Figure 3.2. Analysis of Halal Alternative Statement of Cosmetic Products

3.1.3 Cosmetic Products Classes

The cosmetic products collected in this study were categorized into major and minor classes according to US Food & Drug Administration's (US FDA). As shown in Figure 3.3, skin care preparations formed the largest major class, which accounted for 237 products in total and being the most prevalent major classes in both Halal certified (49 products) and non-Halal certified (188 products) products. The results from this study were aligned with Market Research Future 2023, which stated skin care category is the largest segment among the cosmetic industry market. Moreover, as referring to Figure 3.4 which highlighted that dentifrices from oral care preparations was the most prevalent minor classes among Halal certified products which accounted for 26 products. This is because products with direct consumption risks such as toothpaste and mouthwash are often more concerned by consumers that opt for Halal compliance (Mahmood, Wahab, & Ali, 2021).

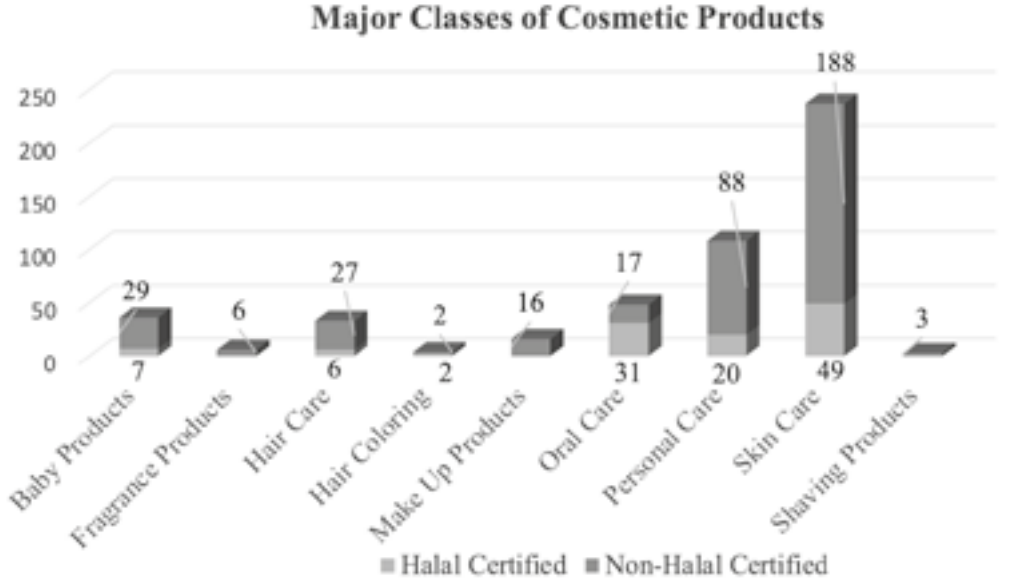

Figure 3.3. Analysis of Major Classes of Cosmetic Products

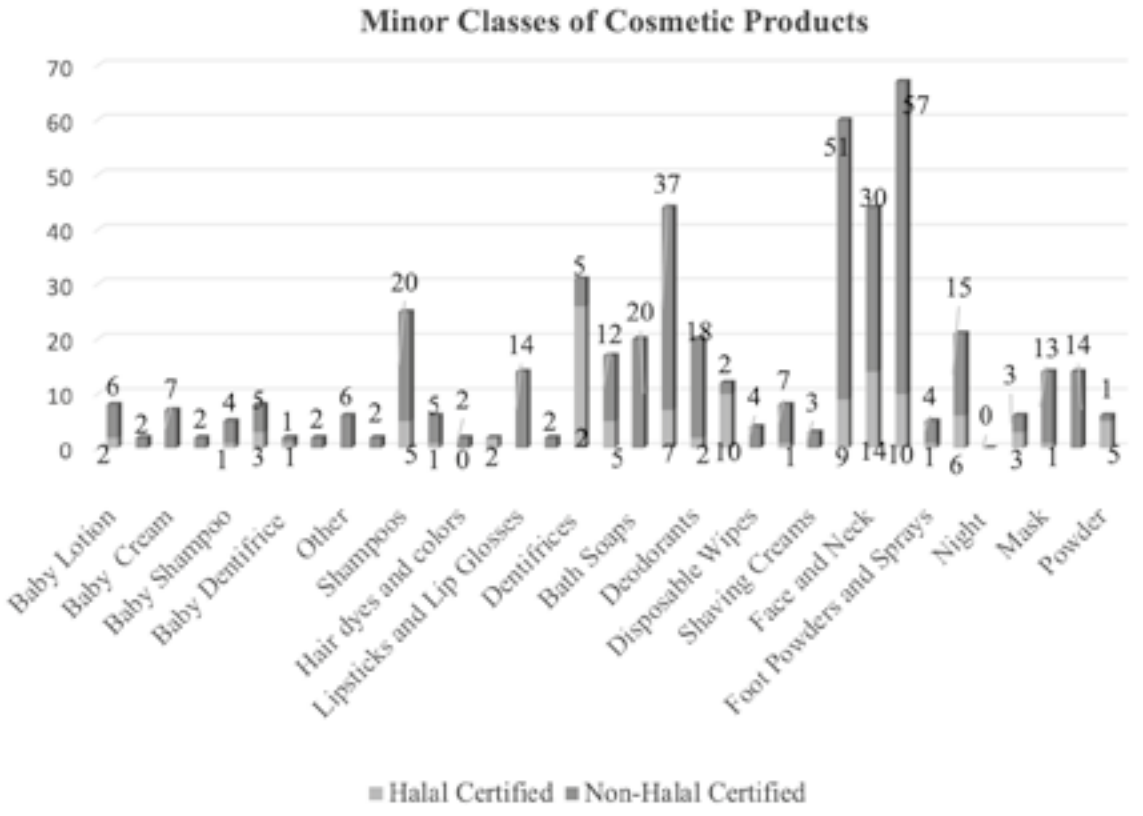

Figure 3.4. Analysis of Minor Classes of Cosmetic Products

3.2 Characteristics and Aspects of Halal Certified Cosmetic Products

3.2.1 Country of Origin

This study has identified 26 countries as the origin of the cosmetic products, with Malaysia in the lead at 182 products out of 491 products, followed by Thailand with 73 products and Australia with 49 products as shown in Figure 3.5. These results were supported by a study which found that Malaysian cosmetic manufacturers' Halal awareness level is significantly high and has contribute to the continuous leading in Halal cosmetic market (Mustafar, Ismail, Othman, & Abdullah, 2018). Other than that, as showed in Figure 3.6, among the Halal certified products, Malaysia is still the leading country which represented by 56% (64) products. This reflects that, particularly in the two community pharmacies involved in this study, Malaysia is the most prevalence in both Halal certified, or non-Halal certified cosmetic products due to strictness of Halal certification standards and high consumer trust.

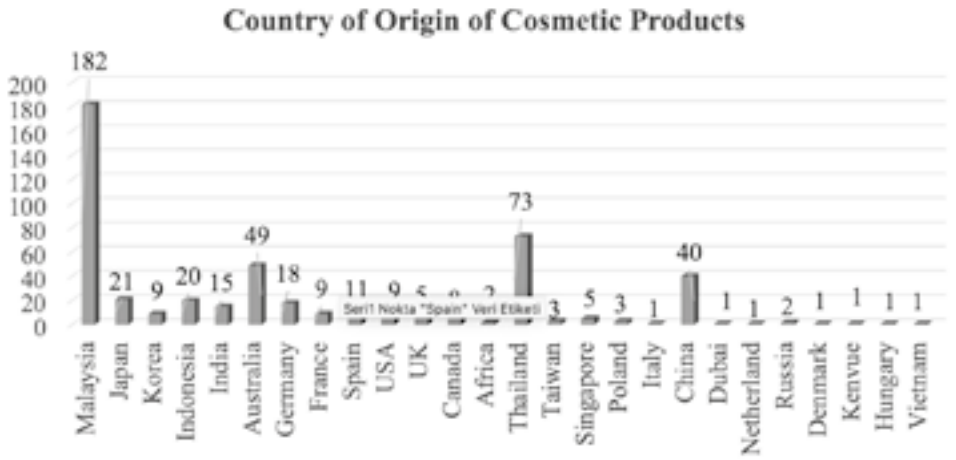

Figure 3.5. Analysis of Country of Origin of Overall Cosmetic Products

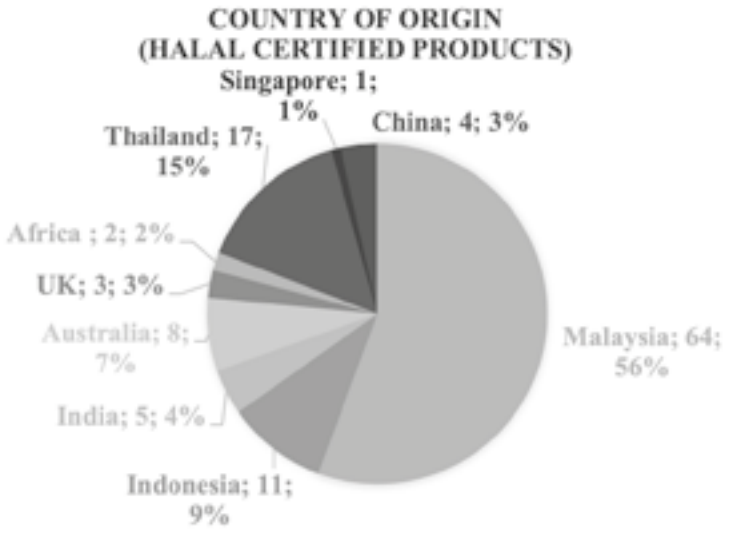

Figure 3.6. Analysis of Country of Origin of Halal Certified Cosmetic Products

3.2.2 Packaging Characteristics

Type of packaging being one of the characteristics that will affect Halal status of a products as it plays a crucial role in maintaining the Halal integrity of the products until it arrives to its destinations such as consumer (Bujang & Bakar, 2023). The results showed in Figure 3.7 indicated that tube packaging was the most prevalent among all cosmetic products, which account for 34% (166) products out of 491 products. While in Figure 3.8, the results indicated that bottle packaging is the most prevalent among Halal certified products. The preference for bottles in Halal products production may be linked to perceptions of purity and contamination prevention which are also the key aspects of achieving Halal compliance.

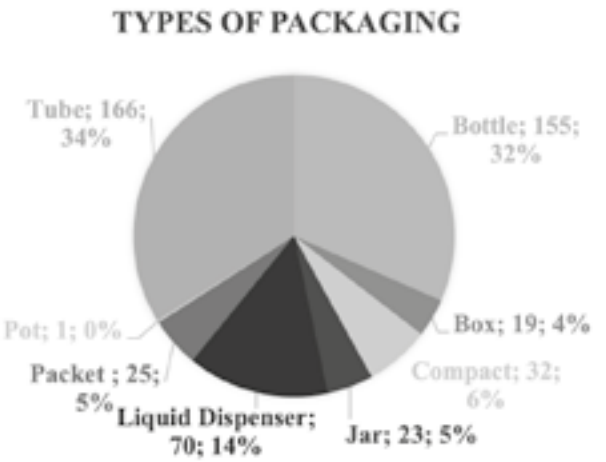

Figure 3.7. Analysis of Types of Packaging for Overall Cosmetic Products

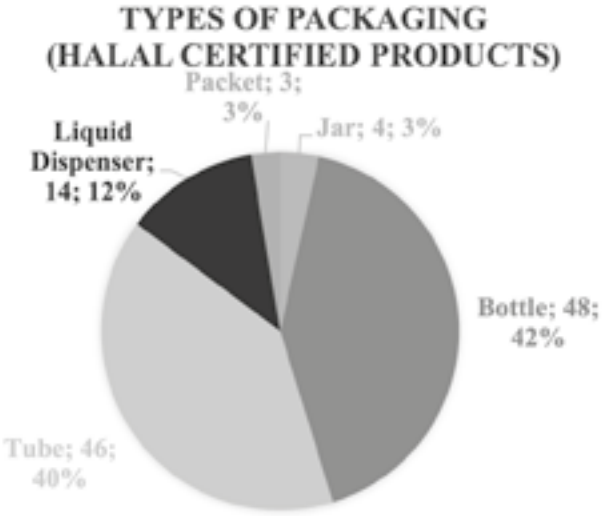

Figure 3.8. Analysis of Types of Packaging for Halal Certified Cosmetic Products

Another packaging characteristic involved in this study includes packaging materials. High-Density Polyethylene (HDPE) was the most frequently used material that accounted for 43% (212) products and particularly accounted for 43% (50) products among Halal certified products in this study. This was found to be due to its durability, protective properties and its compliance with Halal requirements. The results were shown in Figure 3.9 for overall cosmetics and Figure 3.10 for Halal certified cosmetics.

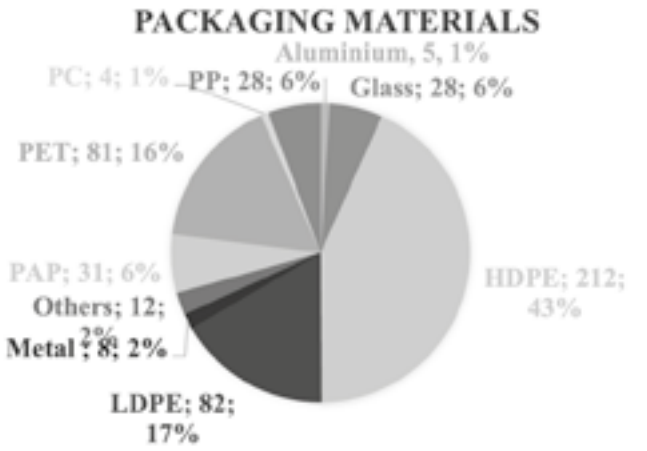

Figure 3.9. Analysis of Packaging Materials for Overall Cosmetic Products

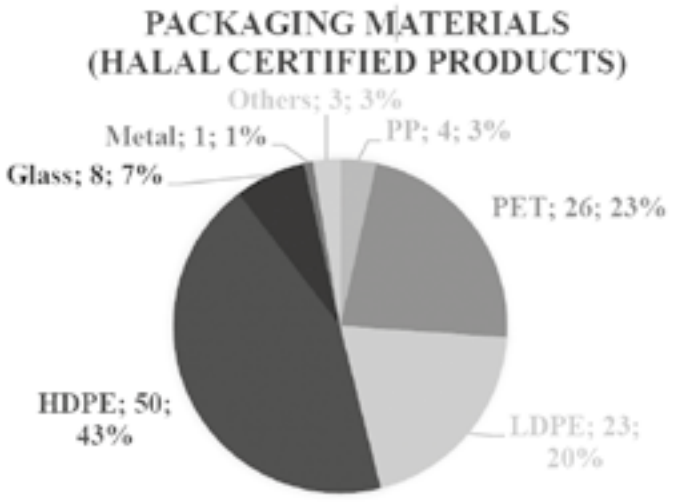

Figure 3.10. Analysis of Packaging Materials for Halal Certified Cosmetic Products

This study also found that minimalist design was the most prevalent, which accounted for 45% of all cosmetic products included in this study as shown in Figure 3.11. While among the Halal certified products, minimalist design also was the most prevalent, which accounted for 38% of all Halal-certified cosmetic products as shown in Figure 3.12. The preference of minimalist designs in all cosmetic products reflects a desire for clarity and transparency that aligns with Halal principles and its modernity that appeal to a broader consumer base. This preference was aligned with the Malaysia Standards MS 2634:2019, which stated that packaging design and labelling including symbol, logo, name, and picture shall not be misleading and/or contravening the principles of Shariah law. This reflects that minimalism with the simplest design complies with the Islamic law.

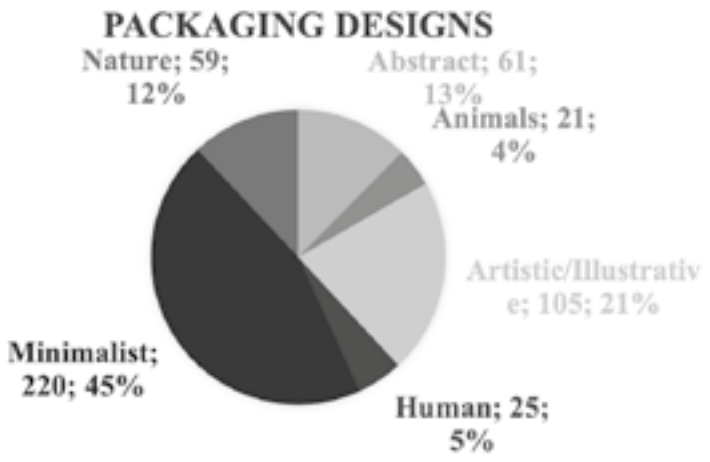

Figure 3.11. Analysis of Packaging Designs for Overall Cosmetic Products

Figure 3.12. Analysis of Packaging Designs for Halal Certified Cosmetic Products

3.2.3 Halal Certification Bodies

There is an abundance of Halal certification bodies worldwide and it plays a crucial role in ensuring that products are adhered to Halal standards. In this study, ten Halal certification bodies were identified with Malaysia's Department of Islamic Development Malaysia (JAKIM) being the most prevalent that certifying 84 out of 115 Halal-certified products. This is because JAKIM has the strictest procedures in granting Halal certification whereby certification bodies from other countries which are not recognized by JAKIM have a lack of standardization for the authenticity of certification (Ismail Abd Latif et al. , 2014). This reflects that products certified or recognized by JAKIM often provide higher trust and confidence to the consumer who is concerned with Halal compliance. However, there were three certification bodies that were not yet recognized by JAKIM identified in this study. The certification bodies that are not yet recognized by JAKIM might be due to the differences in the requirements for Halal standards and this might raise concerns about the consistency and reliability of Halal certification to the consumer. The result of Halal certification bodies was shown in Figure 3.13 and the recognition of certification bodies by JAKIM was shown in Figure 3.14.

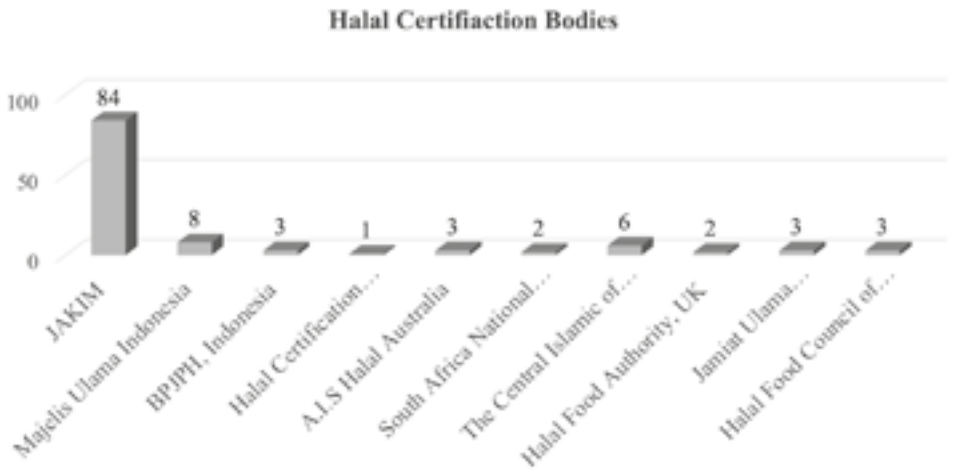

Figure 3.13. Analysis of Halal Certification Bodies of Cosmetic Products

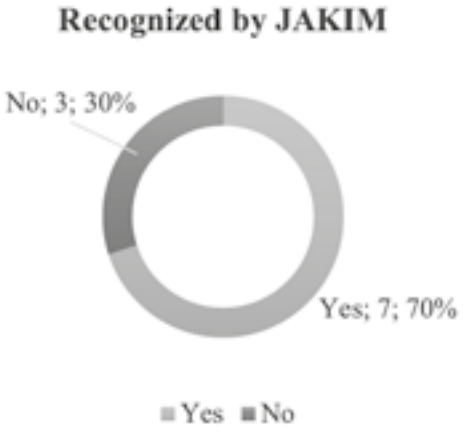

Figure 3.14. Analysis of Halal Certification Bodies Recognized by JAKIM

3.3 Critical Ingredients of Cosmetic Products

Identifying critical ingredients is a key aspect in ensuring the Halal compliance of cosmetic products. In this study, it has been observed that Glycerin is the most prevalent ingredient overall which was found in 242 non-Halal certified products and 75 of Halal certified products. This is possibly due to the Halal status of the glycerin which will depend on the source whether it was derived from Halal source like plant source or haram source like animal source that does not slaughter according to the Islamic law.

Similarly to propylene glycol and tocopherol which showed that majority of the products containing these ingredients were non-Halal certified products. This is because propylene glycol is commonly derived from natural petroleum which is considered as Halal source and same as tocopherol which is commonly found from plant-based source, yet it can also be made synthetically in the labs and thus affecting the Halal status (SpecialChem, 2024). Critical ingredients such as sodium lauryl sulphate and lactic acid showed a more balanced distribution

between Halal certified and non-Halal certified products. In addition, some ingredients such as collagen, taurine, elastin, and hydrolyzed keratin were found only in non-Halal certified products as these substances are commonly derived from animal sources and their Halal status will be dependent on the animal's slaughtering method. The analyzed results were shown in Figure 3.15 in the form on the column chart. It indicates that glycerin that accounted for a total of 317 products out of 491 products, represents the most prevalence within all cosmetic products, either Halal certified, or non-Halal certified cosmetic products.

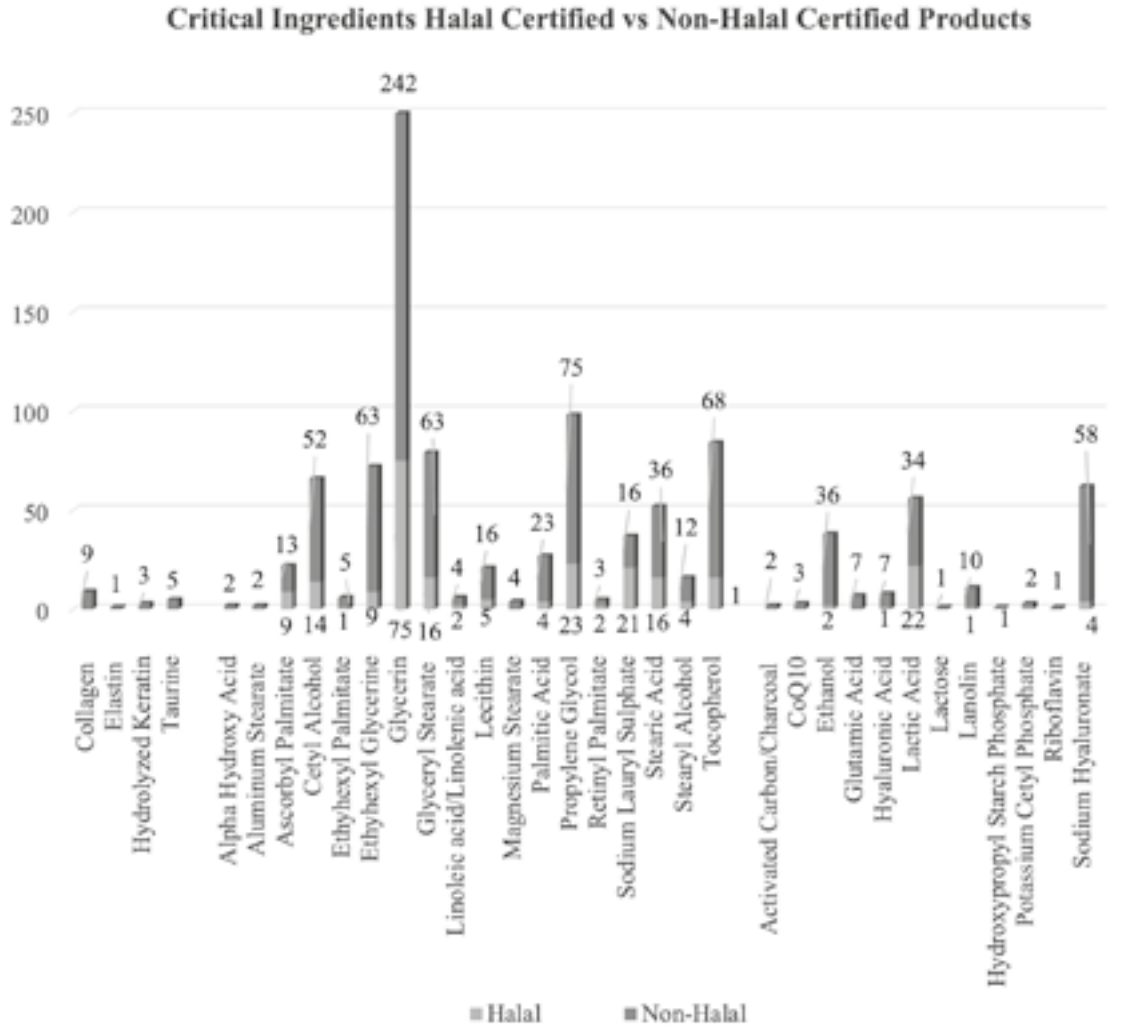

Figure 3.15. Analysis of Critical Ingredients Across Halal Certified and Non-Halal Certified Cosmetic Products

4. CONCLUSION

As a conclusion, this study analyzed 491 cosmetic products from two community pharmacies in Selangor, Malaysia, where halal certification status, product packaging characteristics, and its critical ingredients were considered. 115 (23%) of the products collected were halal-certified, and 376 (77%) were not. There were some products with halal alternative statement, of which 43% indicated non-animal-based, 31% indicated vegan, and 26% indicated non-alcohol-based. Skin care products dominated the major classes in both Halal and non-Halal certified products, but oral care products, particularly dentifrices, were predominantly in Halal certified products. Most products were locally manufactured in Malaysia, from which 56% of Halal-certified products originated, reflecting the country's strict halal requirements. Halal status was influenced by packaging characteristics, with bottle packaging (42%) and high-density polyethylene (HDPE) material (43%) dominating among Halal-certified products. Minimalist design, as aligned with Malaysia Standard MS 2634:2019 halal standards, was prevalent on both Halal certified and non-Halal certified products (45%). JAKIM was the most recognized halal certification body with 84 products certified by them. However, three certification bodies were not recognized by JAKIM which were a concern in terms of certification authenticity. Critical analysis of ingredients reflected differences between Halal certified and non-Halal certified products, with glycerin being the most common in both. Propylene glycol, tocopherol, collagen, taurine, elastin, and hydrolyzed keratin occurred mainly in non-halal certified products. The findings underscore the requirements to assess the source of critical ingredient for Halal compliance. Future research can expand the sample size and geographical coverage to more diverse community pharmacies from different regions and countries for a broader view of Halal-certified cosmetics. In addition, sales data analysis might shed light on consumer preference, purchasing patterns, and demand driven by Halal certification. These in-depth investigations will meet the expectations of Muslim consumers and advance Halal awareness in the cosmetic industry.

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(O-17) SCIENTIFIC EVALUATION IN THE HALAL DOMAIN: THE ROLE OF ISTIHALA IN INNOVATION AND THE ASSESSMENT OF MEDICINAL PLANTS

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Abstract

The expansion of the halal industry beyond food into pharmaceuticals, cosmetics, and biotechnology necessitates the development of rigorous scientific evaluation frameworks that ensure both religious compliance and the integrity of innovation. This paper proposes such a framework by transposing the methodological principles of research project assessment—originality, feasibility, and impact—into the halal domain, grounded in the central theological concept of istihala (substantial transformation).

We argue that istihala provides the essential conceptual foundation for the scientific evaluation of complex transformation processes, particularly those involved in biotechnology and nanotechnology. The role of istihala is therefore twofold: it serves as an evaluative criterion to determine the halal status of a transformed substance, while simultaneously acting as a catalyst for innovation by enabling new applications through advanced purification and synthesis processes.

The field of medicinal plants is presented as a paradigmatic case study to validate this approach. We demonstrate how innovative processes, such as the green synthesis of nanoparticles from plant-derived metabolites, can be analyzed through the lens of istihala. The scientific evaluation of such transformations requires the use of advanced analytical tools (mass spectrometry, chromatography, sequencing) to objectify molecular change and certify the purity of the final product.

By embedding istihala into a structured and standardized evaluation process, this paper advocates a vision in which halal certification becomes synonymous with scientific excellence and sustainable innovation. This convergence between Islamic ethics and scientific methodology positions the halal framework as a benchmark of quality and trust at the international level, particularly in the development of modern, ethical therapeutics and cosmetics.

Keywords: Halal Scientific Evaluation, Istihala, Biotechnological Innovation, Medicinal Plants, Nanoparticles, Green Synthesis, Sustainability, Certification, Substantial Transformation

(O-18) CIRCULAR ECONOMY: A SUSTAINABLE APPROACH FOR HALAL COSMETICS PRODUCTION

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Abstract

The implementation of sustainable and innovative approaches in cosmetics production became crucial; due to its role in reducing the negative environmental impacts in all phases of the cosmetic product life cycle. In addition to its evident positive impact both at economic and social levels.

Recently, Circular Economy is considered an important tool to achieving sustainability within many sectors including cosmetics industry.

This study will cover the current sustainable trends in cosmetics production with focus on the implementation of Circular Economy principles. Analysis of the principles of this business model and how it could impact the Halal perspectives will be conducted from the point of view of its compliance with the Halal requirements, and the expected positive impacts on promoting and marketing of Halal cosmetics.

The possibility of coupling halal food production with halal cosmetics will also be studied in the context of Circular Economy principles, highlighting challenges and proposing solutions.

The role of International Standards in promoting Circular Economy and how standardization bodies including SMIIC could be engaged and contribute will also be underlined in this study.

Keywords: Halal Cosmetics, Circular Economy, Sustainability

(O-19) FERMENTED PRODUCTS AND ETHYL ALCOHOL – SCIENTIFIC REALITIES, SHARI'AH RULINGS, AND A QUALITATIVE–QUANTITATIVE FRAMEWORK FOR HALAL INDUSTRY COMPLIANCE

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Abstract

Fermentation is a pivotal biological process in food, pharmaceutical, and cosmetic industries, producing diverse end-products such as vinegar, soy sauce, dairy items. A critical by-product of this process is ethyl alcohol (ethanol), the presence and concentration of which have sparked significant Shariah debate and regulatory challenges within the Halal certification framework. While ethanol can be naturally formed in minute amounts as a result of microbial activity, its permissibility from an Islamic jurisprudence perspective depends on various factors including source, intention, concentration, and final transformation.

This paper investigates the scientific basis of ethanol formation in fermented products, evaluates typical quantitative thresholds using Shari'ah theoretical techniques. The study integrates Islamic legal rulings and fatwas from authoritative scholars and Halal standards bodies (e.g., IIFA, SMIIC) to analyze how ethanol content can influence Halal status.

Importantly, the paper highlights the jurisprudential differentiation between ethanol in food, cosmetics, and pharmaceuticals, recognizing that Shariah rulings may differ based on external vs. internal application, ingestibility, and functional necessity (الضرورة). For example, trace ethanol in fermented sauces may be tolerated below 0.5–1.0%, while its presence in ingestible health supplements or beverages is more strictly scrutinized. The concept of complete transformation and istihālah (conversion) is critically examined as a mechanism that may render previously impure substances Halal under certain conditions.

The paper concludes by proposing practical ethanol limits in fermented products based on scientific data, primary and secondary Shariah sources including, Shari'ah objectives (Maqāṣid al-Sharī'ah), and existing Halal certification practices. Recommendations are made for a harmonized Halal regulatory approach that balances technological realities, Shari'ah compliance, and consumer trust in the Halal market.

Keywords: Halal Certification, Ethanol Limits, Fermented Products, Istihālah, Islamic Jurisprudence, Ethyl Alcohol, Najāsah, Halal Food Science, Industrial Fermentation, Cosmetics, Pharmaceuticals

(O-20) HARNESSING HALAL-CERTIFIED BACTERIOPHAGE TO IMPROVE THE SAFETY AND QUALITY OF RED MEAT: A NOVEL APPROACH TO STRENGTHEN HALAL FOOD INDUSTRY

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Abstract

Meat is generally considered as the prime source of infection caused by foodborne pathogenic bacteria. Ensuring meat safety from farm to fork comes from both training and legislation as well as the careful monitoring of safety throughout the food chain. Worldwide, many guidelines have been developed to introduce safety standards throughout the meat supply chain. Nevertheless, foodborne illness outbreaks continue. Moreover, improper food handling has also enhanced the possibility of foodborne complications due to augmented prospect of microorganisms to spread and sequester in the food matrix. For decades, a wide range of antimicrobial interventions has been adopted for decontaminating meat and meat products to ensure the safety and quality of meat products. In this regard, use of various biological approaches has been studied for controlling the microbial growth in meat-based products. In the recent times, bacteriophages have been widely recognized as potential bio-control agents in food industry. The key applications of bacteriophages include their utilization as anti-bacterial agents in animal health studies, detection of pathogenic bacteria in food systems and bio-preservatives for controlling microbial growth in food systems. The current study was performed to explore the efficacy of Halal bacteriophage, individually and in different combinations to evaluate its impact on microbial status and quality of meat during refrigeration storage. Before treating the samples with bacteriophage, meat samples were firstly inoculated with Listeria monocytogenes. After that, Halal-certified List-shield (Phage) from Intralytix having initial concentration of 1×109 PFU/mL was applied according to the following treatment plan. A momentous reduction in the growth of L. monocytogenes was seen in phage-treated samples during storage i.e., 5.2 log CFU/g on Day 1, 3.9 log CFU/g on Day 5, 3.5 log CFU/g on Day 10 and 2.9 log CFU/g on Day 15. The water holding capacity, texture and nitrogenous losses were affected in a significant way but positively. Additionally, various combinations of bacteriophage, UV light and clove essential were used to decontaminate beef samples and a profound log reduction was recorded in multiple hurdle-treated meat samples which supported the effectiveness of all the combinations of UV light, bacteriophage and clove extract. Conclusively, bacteriophage and other hurdles were effective in improving the safety and quality of meat.

Keywords: Halal Bacteriophage, Halal Meat, Meat Safety

(O-21) HUMAN MILK FROM CLONED COWS: ISLAMIC INJUNCTION IN THE LIGHT OF FIQH E HANAFI

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Abstract

This Article explores the Hanafi School of Thought's perspective on the ruling of consuming human milk from cloned cows, taking into account the advancements in cloning technology. Cloning, as a scientific practice, has raised numerous ethical and religious concerns across different faiths and legal systems. In the context of the Hanafi School of Thought, this article delves into the intricate considerations surrounding cloning and its implications for the permissibility of consuming milk derived from cloned cows.

The Article begins by providing a brief overview of cloning technology, emphasizing its relevance to the production of human milk from cloned cows. It proceeds to outline the ethical dilemmas associated with cloning, particularly from the perspective of the Hanafi School of Thought, which holds a prominent position in Islamic jurisprudence.

Within the Hanafi School, the article explores the key principles and sources of Islamic law that inform the ruling on cloning. It highlights the Hanafi scholars' approach to assessing the permissibility of novel technologies and the role of ijtihad (independent legal reasoning) in determining the religious verdict.

Furthermore, the abstract examines the specific concerns raised by cloning technology, such as the potential alterations to the natural order, the preservation of species boundaries, and the potential impacts on human health and well-being. It discusses the views of Hanafi jurists on these concerns and their analysis of the ethical implications surrounding the consumption of milk from cloned cows.

In conclusion, this research highlights the need for a comprehensive and nuanced understanding of the Hanafi School of Thought's position on cloning technology and its implications for human milk consumption. It emphasizes the importance of engaging in scholarly discussions and conducting further research to address the complex ethical and religious questions posed by advancements in cloning technology within the Islamic legal framework.

Keywords: Ruling on Human Milk from Cloned Cows: A Perspective from the Hanafi School of Thought on Cloning Technology

(O-22) AN INTEGRATED MULTI CRITERIA DECISION MAKING APPROACH PROPOSAL FOR HALAL FOOD SUPPLIER SELECTION BASED ON SUSTAINABILITY, FOOD SAFETY, AND HALAL CRITERIA

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Abstract

The selection of appropriate halal food suppliers has become increasingly critical in today's globalized and ethically sensitive markets. The selection of halal food suppliers is a complex decision-making process that requires the simultaneous consideration of various criteria, including sustainability, food safety, and halal compliance. Traditional supplier evaluation methods often fall short in capturing the multidimensional nature of these requirements. In response to this gap, this study proposes an integrated Multi-Criteria Decision-Making (MCDM) approach for halal food supplier selection. The proposed model incorporates a structured decision framework that blends sustainability indicators (environmental, economic, and social), food safety standards, and halal-specific requirements to ensure a comprehensive and ethically aligned supplier evaluation process. By reviewing existing MCDM techniques and integrating them into a unified methodology, the study offers a robust decision making process for practitioners and decision-makers in the halal food industry.

This research contributes to the literature by addressing the intersection of food safety, halal criteria, and sustainability for halal food supplier selection problem. The findings aim to support organizations in developing more responsible and value-based supply chains aligned with both global standards and religious principles. Moreover, the integrated MCDM model enables decision makers to identify trade-offs between competing criteria and prioritize suppliers that align with both business objectives and ethical values. Additionally, this study serves as a foundational resource for supply chain specialists, halal certification bodies, policymakers, and researchers dedicated to developing supply chains in the halal food sector that are transparent, responsible, and oriented around core values.

Keywords: Supplier Selection, Sustainability, Food Safety, Halal Food, MCDM

(O-23) COMPOSITE FLOURS: A FUNCTIONAL BASE FOR READY-TO-USE HALAL MEAT ANALOGUES

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Abstract

The global halal food market, valued at USD 2.5 trillion, is rapidly expanding with increasing demand for functional, sustainable, and plant-based halal products. Composite flours offer an innovative solution by integrating plant and marine resources into versatile, shelf-stable, and ready-to-use halal foods. This study developed composite flour formulations from peas, lentils, and nutrient-rich seaweed powder to produce plant-based meat analogues compliant with halal dietary standards. Five formulations (pea:lentil ratios of 90:5, 80:15, 70:25, 60:35, and 50:45) containing 5% seaweed were evaluated for proximate composition, mineral content, antioxidant activity, and sensory attributes against a chicken-based control. Results showed high protein content (up to 21.94% vs. 21.86% in control), over threefold higher antioxidant activity, and significant mineral enhancement, calcium and iron increased over fourfold and threefold, respectively, in the most acceptable treatment (T3). Sensory analysis revealed strong consumer acceptance of the plant-based analogues, particularly with a 70:25 pea-to-lentil ratio, showing comparable flavor, texture, and appearance to traditional meatballs. The composite flour approach enhances shelf life, portability, and convenience while aligning with halal principles and offering solutions in regions with limited access to halal animal proteins. This research demonstrates the feasibility of legume–seaweed-based composite flour technology for nutrient-dense halal meat replacers and highlights future potential in fortification, advanced packaging, and traceable halal certification systems.

Keywords: Halal Food, Composite Flour, Meat Analogues, Plant-Based Meat, Seaweed

1. INTRODUCTION

Animal-derived meat has long been a vital component of human nutrition due to its high-quality protein, appealing flavor, and cultural significance (Romao et al., 2022). However, global consumption of animal protein is declining because of environmental concerns, rising production costs, limited livestock resources, and health-related issues (Dekkers et al., 2018). In response, plant-based meat alternatives have emerged as sustainable, cost-effective, and nutritionally beneficial substitutes. Developing composite protein sources from multiple plant ingredients offers a promising solution to reduce reliance on animal meat (Yuliarti et al., 2021).

The World Health Organization encourages increased consumption of legumes, grains, fruits, and vegetables to combat malnutrition and chronic diseases. Legumes, particularly lentils (*Lens culinaris*) and peas (*Pisum sativum L.*), are nutrient-dense, affordable, and widely available protein sources (Neacsu et al., 2017). They contain essential minerals such as zinc, magnesium, calcium, and iron, along with B vitamins and antioxidant compounds that contribute to various health benefits. Their excellent functional properties, including high water-holding and emulsifying capacities, make them ideal for developing meat analogues. Lentils typically contain 26–30% protein, while peas provide 18–30%, offering complementary amino acid profiles suitable for plant-based meat formulation (Arshad et al., 2022).

Seaweed, a marine macroalga, represents an underutilized yet valuable ingredient for enhancing plant-based products. It consists mainly of 30–70% carbohydrates, 10–30% proteins, and bioactive polysaccharides such as alginates and fucoidans, which improve texture and nutritional value (Farghali et al., 2023). Seaweed is also rich in minerals like calcium, magnesium, potassium, and iodine, providing both functional and fortifying potential. Its umami flavor enhances sensory appeal, making it a natural choice for improving plant-based food palatability (Murai et al., 2021).

Meatballs, traditionally made from minced animal meat, are a popular protein-rich food enjoyed globally. Developing legume-based meatballs presents a sustainable and affordable option with similar sensory and nutritional characteristics but lower fat and cholesterol levels (Talens et al., 2022). Plant-based meat analogues, also termed “mock meat” or “meat substitutes,” aim to mimic the taste, texture, and appearance of animal meat while supporting environmental and ethical goals. The success of such analogues depends largely on achieving desirable texture, mouthfeel, and flavor that satisfy conventional meat consumers (Tuorila et al., 2020).

Combining peas and lentils provides a balanced amino acid profile and desirable functional traits, while incorporating seaweed further enhances nutritional value and antioxidant activity. Therefore, this study aimed to develop and evaluate **seaweed-supplemented plant-based meatballs** formulated from pea and lentil composite flours. The research focused on assessing their **nutritional composition, functional properties, antioxidant potential, and sensory acceptability**, providing a sustainable, halal-compliant alternative to traditional meat. It is hypothesized that such formulations could reduce environmental pressure, improve food security, and promote healthier dietary options for a growing global population.

2. MATERIALS & METHODS

2.1. Materials

Raw materials such as lentils, peas, chicken, bread and all other ingredients were acquired from the local or regional market of Faisalabad, Pakistan. Seaweed powder was purchased online. We utilized polythene-sealed bags as a packing material to store the ingredients.

2.2. Preparation of composite flour

Lentils were cleaned to remove all unwanted stones. Then lentils, peas and chicken were rinsed with clean water separately. Lentils and peas should then be dried in the sun for a couple of days after draining out the water. Then all the ingredients were separately milled or ground in the milling room of NIFSAT, University of Agriculture, Faisalabad. In the preparation of composite flour, all the raw flours were manually mixed according to the various treatments until they were properly settled. Then the composite flour was weighed, packed, and prepared for further use.

2.3. Preparation of plant-based meatballs

Six different formulations of plant-based meatballs were prepared as T_0: control, T_1 (90% Lentil, 5% Pea, 5% Seaweed), T_2 (80% Lentil, 15% Pea, 5% Seaweed), T_3 (70% Lentil, 25% Pea, 5% Seaweed), T_4 (60% Lentil, 35% Pea, 5% Seaweed), and T_5 (50% Lentil, 45% Pea, 5% Seaweed). Plant-based meatballs were developed by utilizing lentils and peas with the addition of seaweed powder and prepared by following the preparation methods described by Afzal et al. 2022 with some modifications.

2.4. Proximate analysis & Mineral analysis

The composite flour and plant-based meatballs of six different formulations was subjected to measure the content of moisture, crude fat, crude protein, ash, crude fiber and nitrogen free extract by following the protocols of AACC. Minerals like Mg, Fe, Zn and Ca were analyzed by using an atomic absorption spectrophotometer and a flame photometer according to the AOAC protocol.

2.5. Phytochemical & Antioxidant analysis

Total phenolic and flavonoid contents were measured using modified Folin–Ciocalteu and Demir methods, expressed as mg GAE/g and mg QE/g, respectively (Palanisamy et al., 2019; Demir, 2021). Antioxidant activity was determined using the DPPH assay (Xing et al., 2022).

2.6. Functional, Textural & Physical properties

Bulk density, foaming capacity/stability, and water/oil absorption capacities were determined as per Razavizadeh et al., 2021; Wang et al., 2020; and Stone et al., 2019. Texture was analyzed using a TA-XT Plus analyzer (Stable Micro Systems, UK). pH, cooking yield, and color (L*, a*, b*) were evaluated following Chiang et al., 2021; Mishal et al., 2022; and Bakhsh et al., 2021.

2.7. Sensory & Statistical evaluation

A trained panel evaluated sensory attributes using a 9-point hedonic scale (Meilgaard et al., 2016). Data were statistically analyzed using Montgomery (2017), expressed as mean ± SD for triplicate determinations.

3. RESULTS

Proximate analysis showed significant differences ($p<0.05$) among formulations. T1 (90% lentil, 5% pea, 5% seaweed) showed the highest protein (21.94%) and mineral content (Fe: 4.39 mg/100g; Mg: 169.67 mg/100g). T5 had the highest ash (2.31%) and fiber (5.06%) contents. Antioxidant activity was greatest in T1 (DPPH 28.53%), correlating with elevated phenolic content (11.48 mg GAE/100g). Functional tests revealed higher water absorption (1.89 g/g) and foaming capacity (25.67%) in T1, whereas T0 (control) showed maximum oil absorption. Textural analysis indicated reduced hardness in plant-based variants compared to chicken control. Color parameter L* decreased with increased plant inclusion, indicating darker appearance. Sensory evaluation found T3 (70% lentils, 25% peas, 5% seaweed) to have the highest overall acceptability (8.0/9), balancing flavor, texture, and aroma.

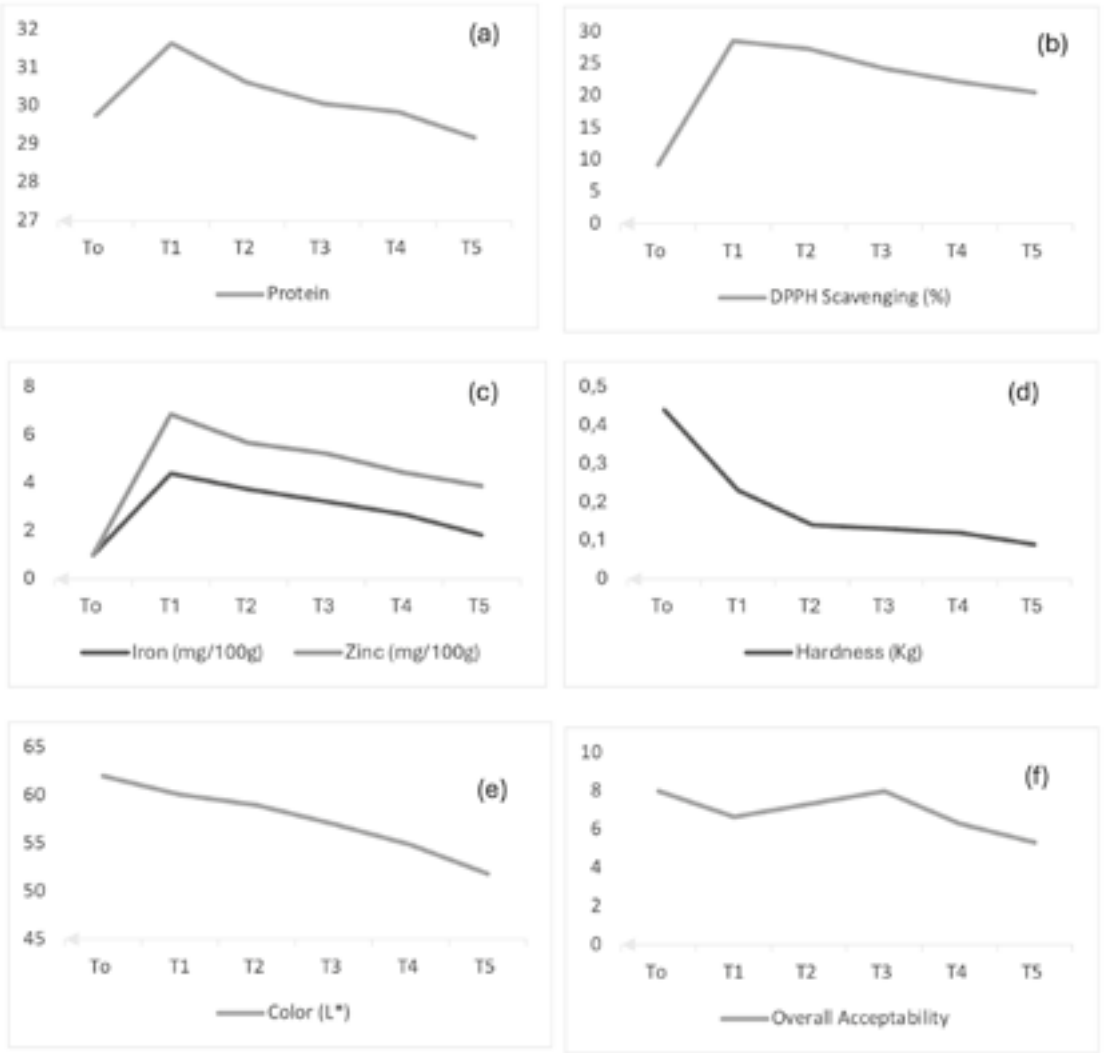

Figure 1. Comparative analysis of functional and quality attributes of seaweed-supplemented plant-based meatball formulations. Line graphs represent (a) protein content, (b) DPPH radical scavenging activity, (c) mineral content, (d) hardness, (e) color lightness (L*), and (f) overall acceptability for treatments T0 (control), T1 (90% lentil, 5% pea, 5% seaweed), T2 (80% lentil, 15% pea, 5% seaweed), T3 (70% lentil, 25% pea, 5% seaweed), T4 (60% lentil, 35% pea, 5% seaweed), and T5 (50% lentil, 45% pea, 5% seaweed).

4. DISCUSSION

Seaweed-supplemented plant-based meatballs were successfully developed using different ratios of lentil and pea composite flours. Among all treatments, **T1 (90% lentil, 5% pea, 5% seaweed)** exhibited the highest protein (21.94%) and mineral content, including iron, zinc, magnesium, and calcium. **T5** (50% Lentil, 45% Pea, 5% Seaweed) showed the greatest moisture and fiber levels, while fat content remained lowest across all plant-based formulations compared to the chicken control. The inclusion of seaweed significantly enhanced the antioxidant properties, with DPPH activity in **T1 (28.5%)** being more than triple that of the control. Functional analysis revealed that T1 had superior bulk density, foaming capacity, and water absorption, while T5 demonstrated higher cooking yield. Texture evaluation showed reduced hardness in plant-based meatballs compared to chicken, improving tenderness. The color values were slightly darker in plant-based versions, consistent with natural legume pigments. Sensory evaluation identified **T3 (70% lentil, 25% pea, 5% seaweed)** as the most acceptable formulation, scoring highest in aroma, taste, and overall acceptability, comparable to conventional meatballs. Overall, the study demonstrates that legume-seaweed composite flours can produce halal, nutritious, and sensory-appealing meat analogues with improved antioxidant capacity and extended shelf-life potential, offering a sustainable alternative to conventional meat.

5. CONCLUSION

The study demonstrated that seaweed-supplemented lentil-pea meatballs provide an excellent nutritional and sensory alternative to traditional meat. Formulation T3 achieved optimal quality attributes, making it suitable for health-conscious consumers and sustainable food markets. Integrating marine and legume-based ingredients could revolutionize future plant protein products, supporting environmental and dietary sustainability.

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(O-24) ATP BIOLUMINESCENCE AS A TOOL FOR HYGIENE VERIFICATION IN HALAL PRODUCTION

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Abstract

In halal food production, maintaining a high level of hygiene is not only a legal requirement but also a religious obligation. For food producers, ensuring a clean environment is crucial to the production process. One of the modern tools increasingly used to verify cleanliness and prevent contamination is ATP swab testing, based on bioluminescence technology. Adenosine triphosphate (ATP) is a molecule found in all living organisms – including food residues, bacteria, and other microorganisms. Its presence on surfaces after cleaning may indicate inadequate hygiene and a potential risk of contamination, including contact with haram or impure (najis) substances, which are strictly forbidden in halal production. The ATP test uses a bioluminescent reaction, similar to the natural glow of fireflies. After swabbing a surface, the swab is placed into a luminometer that measures the amount of emitted light. Results are expressed in Relative Light Units (RLU) – the higher the value, the greater the level of contamination. The amount of organic matter on the tested surface is directly linked to microbial activity. A higher RLU value indicates a greater contamination risk. Organic matter serves as a nutrient source for microorganisms, and other favorable factors such as temperature, pH, and water activity (aW), which commonly exist in production facilities, promote their accelerated growth. Therefore, it is essential to minimize or completely eliminate organic matter. The application scope of ATP testing is broad – it can be used under various conditions and on all types of surfaces, including testing the hygiene of water. Its greatest advantage lies in hygiene control during the reorientation of production facilities. In such situations, thorough cleaning of the facility is crucial to ensure that no residues from previous production remain. Test results are available immediately, allowing for repeated cleaning and disinfection processes until a satisfactory level of hygiene is achieved. In addition to work surfaces, hygiene control can also include employee testing (hands, gloves), work equipment, and even tap water. If a facility previously produced non-halal products and intends to switch to halal production, Islamic cleaning rules must be applied prior to halal production, in accordance with the specific technological process. Recommendations and approval for using the facility and equipment for halal production can only be issued by an authorized halal certification body, following inspection and verification. In the case of reorienting a facility, for example in the meat industry, a series of steps must be taken to ensure halal production. Key steps include a visual inspection of all equipment, cleaning and sanitation materials, followed by the disassembly of all process equipment. This involves removing all movable machine parts such as blades, pipes, mixers, fillers, etc., and conducting a thorough cleaning and disinfection process. Swabs are then taken from all critical points, such as dead corners and hard-to-reach areas. The critical points and number of swab samples are determined according to the type and size of the equipment. For instance, a filler in the meat industry is one of the most complex devices to clean due to many hard-to-reach parts that come into direct contact with the product. Integrating ATP swab testing in food processing plants provides a practical, rapid, and objective method for verifying cleanliness and ensuring compliance with halal requirements. This technology enhances hygiene monitoring, supports halal certification demands, and contributes to a transparent and trustworthy halal food supply chain.

Keywords: ATP (Adenosine triphosphate), Luminometer, RLU (Relative Light Units), Hygiene, Swab

(O-25) DRIVING EXCELLENCE IN HALAL VERIFICATION: UTILIZATION OF SPECTROSCOPY AND CHEMOMETRICS FOR DISCRIMINATION OF HALAL AND NON-HALAL SLAUGHTERED CHICKEN MEAT

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Abstract

The demand for meat and meat-based products has been growing rapidly due to their rich source of protein. The expansion in the meat supply chain has raised concerns about the authenticity of Halal meat in the market. Considering these factors, a study was designed in which poultry birds were subjected to various slaughtering methods: Halal slaughtered (HS), Non-Halal slaughtered (NHS), Jhatka slaughtered (JS), Dead meat (DM), and compared for their origin through traditional and advanced methods (FTIR and fluorescence spectroscopy). Meat samples were analyzed for their composition (Moisture content, crude protein analysis, and crude fat determination) and quality parameters (pH, water holding capacity, microbial, and TVBN analysis) by using traditional methods. The moisture, crude protein, and crude fat contents of HS meat were 74.16, 19.3, and 0.98%, which were quite different from all other slaughtering methods. HS method showed lower TVBN value (9.81 mgN/100g), higher water holding capacity (72.02%), and higher pH (6.56) compared to all other slaughtering methods. The microbial analysis of the HS method showed the lowest values for TPC (4.28 $\log_{10}$ CFU/g), *Enterobacteriaceae* counts (3.12 $\log_{10}$ CFU/g), *Salmonella* (2.74 $\log_{10}$ CFU/g), and *E. coli* (2.78 $\log_{10}$ CFU/g) compared to NHS, JS, and DM. FTIR and fluorescence spectroscopy coupled with Principal Component Analysis (PCA) were employed to identify the spectral differences among the poultry meat samples obtained from HS, NHS, JS, and DM. Results showed that PCA differentiated some samples into distinct groups based on various slaughtering methods, with minimal overlapping. PCA explained that FTIR spectral information can be used to differentiate Halal and non-Halal chicken meat samples by applying proper chemometric tools. Furthermore, dead meat samples can also be distinguished from slaughtered samples by using FTIR spectroscopy. Fluorescent spectra taken from meat samples obtained from variously-slaughtered and dead broiler birds at different fixed excitation wavelengths with respective emission ranges describe that the variations in the peak heights and positions provided the evidence that spectral differences were due to differences in the light absorption by fluorophores present in meat. Slaughtering methods were supposed to induce changes in the amino acid and nucleic acid stability which resulted in varied absorption of light at different excitation wavelengths.

Keywords: Halal Meat, Meat Adulteration, Authenticity, FTIR, Fluorescence, Chemometrics

(O-26) A MULTIPLEX PCR ASSAY FOR HALAL VERIFICATION OF BOTANICAL INGREDIENTS TO PREVENT NAJIS CONTAMINATION AND FRAUD

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Abstract

The development of advanced verification technologies for its most vulnerable components, botanical ingredients, has lagged behind the exponential growth of the worldwide Halal industry, which today includes pharmaceuticals and cosmetics in addition to food. The current Halal assurance system, which mainly relies on physical inspection and documentary audits, is not prepared to identify minute najis (impure) contaminants or sophisticated adulteration in intricate botanical matrices such as starch, Prunus dulcis (almond) oil, Zingiber officinale (ginger) powder, and Crocus sativus (saffron). By creating a multiplex Polymerase Chain Reaction (PCR) assay intended for the identification of non-Halal animal pollutants, this study fills a significant knowledge and application gap. We chose these high-risk plants and purposefully tainted them with DNA from the donkey Equus asinus, the horse equise, and the swine Sus scrofa.We created a set of primers that target species-specific sequences after refining DNA extraction procedures for these processed products. In order to detect serious Halal infractions, the resultant multiplex PCR methodology showed excellent sensitivity and a detection limit of 0.1% for animal pollutants. This approach is remarkable because it directly applies forensic molecular biology to the particular practical and theological requirements of Halal compliance. In order to strengthen the Halal Quality Infrastructure (HQI), combat economic fraud, and eventually rebuild fundamental customer trust, certification bodies can implement this assay as a regular operating process. It offers a reliable, easily accessible, and scientifically sound method.

Keywords: Halal authentication, *najis*, qPCR, Limit of detection (LOD), DNA

1. INTRODUCTION

For the 1.9 billion Muslims around the world, the Halal industry remains the center of ethical sourcing. According to Tieman (2018), personal care, pharmaceuticals, and cosmetics are just a few of the significant diversification of investments from the food industry. This growth stems from Islamic law, which distinguishes between what is permissible (Halal) and what is not (Haram) with a particular emphasis on the prohibition of *najis al-'ayn* (inherently impure substances), primarily pork and its derivatives al-Qaradawi, 2013). The Halal Quality Infrastructure (HQI) has emerged as an ecosystem to enhance compliance. The Sophisticated systems for certification integration are built to HQI standards are built to HQI standards (Khan, Abdullah, Borzooei, 2020). Quality plant matter is the goal and valued like gold. Moore, Spink & Lipp (2012) demonstrate how plant ingredients close the gap between powerful finished products, and underlying critical plant cosmetics like and high-grade spices, thickeners, oils, and blends. Supply chain vulnerabilities are severely exploited by economically motivated adulteration (EMA), where authentic botanical material is substituted or diluted with less valuable plant matter which is the type of fraudulent and assumed to cause. The placing of porcine-derived gelatins as a binding agent in Starches, shared processing lines and equipment, and careless storage becoming rodent habitats (as in Demirhan, Ulca, & Senyuva, 2012) are all examples of routs to najis contamination. The highly processed commodities in question denature proteins, destroy morphological markers, and thus traditional inspection and immunoassay methods like the ELISA become useless (Zhang et al, 2019).

This leads to a deeply troubling dilemma. For a Muslim consumer, practicing the principles of Halal is a matter of faith, and there are no grounds for scientifically certifying the integrity of a product undermines the trust-based economy central to Halal. (Bonne & Verbeke 2008) The same PCR techniques used in forensic food authentication due to the stability of DNA and the high specificity of the methods, like those of Lockley and Bardsley in 2000, omnipresent as they are, have been greatly underutilized in the complex issues of botanical matrices and overly meat-centric methodologies for inter and intra-species identification and, especially, meat.

As analyzed above, there is no existing study that develops a multiplex PCR assay to detect non-Halal animal impurities in high-risk botanical ingredients. It is hypothesized that a properly optimized assay can, in a single reaction, sensitive detect DNA traces of Sus scrofa (porcine), Equus asinus (donkey), Equise (horse - non-Zabiha slaughter cases), and Rattus rattus (rodent) at high specificity within intricate botanical matrices. Such information is scientifically very important, propound, and cherish for labs working on Halal assurance. From the Muslim perspective, the Halal industry is a religious obligation, and from the global perspective, it is an ever-growing and rapidly expanding industry that, as of 2023, is estimated to generate over USD 2 trillion annually (Thomson Reuters, 2023). In addition to the precepts of faith, Halal has evolved to include social and environmental responsibility, aligning with the prevailing consumer demands for responsibility in sourcing and goods. The integration of faith and the burgeoning market of ethical consumerism is quite unprecedented, and it has given quality and integrity dimensions to the Halal certification, which many non-Muslims use and appreciate. The expansion of Halal markets is critical but poses serious management challenges. There is fragmentation in national certification standards, cross-accreditation, and laboratory examination protocols and systems. A Halal-certified product in one jurisdiction may lack Halal certification in another and possibly due to competing systems of fiqh

without adequate molecular determination. Developments of the SMIIC and of the OIC are inter-state attempts to unify standard in Islam, but the SMIIC remains standardless, while OIC sciences lack properly coordinated validation mechanisms. Rational systems of affirmation based on molecular systems of authentication should serve to transcend the jurisdictional divisions underpinning the scientifically validated assertion of compliance with the Islamic standards of business conduct. DNA as a molecular determinant of najis species can serve the certifying and the regulatory bodies of Islam to Halal the claims of the certifying bodies.

The global nature of the complexity of the supply chains of the botanical ingredients is due to the geography of the growing regions of the raw materials. These are South and Southeast Asia, Africa, and Latin America and these developing countries often supply the world with raw materials. During chemical, physical, and microbial treatment of diverse materials, particularly in the framework of Cleared Systems Maintaining the Integrity of trade routes, these ingredients can be contaminated. Economic adulteration is common. Botanicals such as saffron, ginseng, and turmeric are some of the most common botanicals to be adultered and cut with other cheaper botanicals, or may even be replaced with other entire species (Wang et al., 2021). Even more troubling is the cross-contamination with najis material, which can happen when the same machines are used to process Halal and non-Halal products without any form of separation. For example, gelatin, glycerin and stearic acid which are used as emulsifiers and stabilizers, are often made from porcine or horse sources. In cosmetics and pharmaceuticals, these compounds are common, and the sources are proprietary and rarely ever shared.

The literature suggests that poor product protection from pests during duration of storage and transport, can also enable rodent infiltration. The presence of rodent DNA, excreta and hair poses health and safety issues, but more significantly, the products are deemed as najis, and thus lose their Halal certification, as the products have been made with najis material (Hashem & Shabana, 2020).

The standard procedures for verifying Halal compliance still involves physical observation, checking labels, and using chemical assessments like gas and liquid chromatography and infrared. Though these procedures do identify certain materials, they do not distinguish whether the source materials originate from animals or plants after the chemical transformation of these materials (Ali, Hashim, & Ab Rahman, 2014). ELISA assays can detect materials, but only after the denatured proteins are subjected to heat or solvent extraction, the assays become useless. PCR and other DNA based methods have changed species identification as a result of the longevity of DNA and the targeted nature of the designed primers and the advancements in PCR technology. Rapid, simultaneous detection of more than two species using Real-Time PCR (qPCR) and multiplex PCR (Rastogi et al, 2016) is very beneficial in terms of convenience, time, cost, and accuracy. However, in Halal compliance verification of plant materials the methodologies are still very limited because of the technical difficulty of obtaining amplifiable DNA from plant DNA rich in polysaccharides, phenols, and other secondary metabolites (Wilson, 1997). These PCR inhibitors and the inability to balance extraction buffers, purification techniques and amplification methods make for amplifiable DNA very challenging.

This research plans to create and refine a multiplex PCR assay that can identify residual animal DNA in difficult plant samples. Our innovation is the design of DNAextraction and multi-target primers to design systems that can detect the four najis species—porcine, donkey, non-Zabiha horse, and rodent—within a single reaction system.

This method has significant advantages.

1. **Analytical Efficiency:** Multiplexing reduces the number of reactions, reagents, and time required for screening, improving laboratory throughput.
2. **Sensitivity and Specificity:** Optimized primer pairs targeting mitochondrial or nuclear DNA regions ensure high discriminatory power, even in degraded or low-DNA samples.
3. **Cross-Sector Applicability:** The method can be adapted across food, pharmaceutical, and cosmetic products, enhancing versatility.
4. **Regulatory Impact:** The results can contribute to the establishment of standardized molecular protocols within the Halal Quality Infrastructure, promoting global harmonization.

This chapter will focus on comparing silica column purification, CTAB extraction, and other magnetic bead techniques for the purpose of determining the most effective method of removing PCR of the botanicals. It is likely that the results of this study will have implications beyond the laboratory. Scientifically validated Halal authentication enhances consumer confidence and profoundly shifts industry accountability while streamlining regulation. As more stakeholders begin to address the requirements of consumers by surpassing the minimal compliant certification logo, this technology will provide another layer of assurance. In the case of Halal certification bodies, DNA based methods can provide supplementary proof in case of disputes or in the course of certification audits. For the manufacturers, these techniques can serve as in-house control systems to evaluate the quality of the inputs prior to formulation. Most importantly, it enhances the availability of dependable traceable Halal food which sits at the center of the ecosystem balancing consumer rights and religious obligations.

Authentication of Halal products using molecular processes assists in achieving the Sustainable Development Goals set by the United Nations, particularly Goals 12–"Responsible Consumption and Production." With the reduction of fraud and waste as well as the removal of ethically questionable practices in the sourcing of raw materials, the sustenance of international trade is supported within the Halal industry. No work has previously addressed the intersection of molecular biology, food sciences, and Islamic jurisprudence, and this research tackles that gap. It offers a framework for additional interdisciplinary endeavors. Methodological NGS-based met barcoding refinements aimed at assessing multi-species contamination of complex products could facilitate broader contamination assessments.

2. METHODOLOGY

2.1 Sample Selection and Preparation

The genuine and halal-certified samples obtained from trusted manufacturers included Zingiber officinale (ginger) powder, Crocus sativus (saffron), starch, and Prunus dulcis (almond) oil. These constitute a range of complex matrices: dry powder, delicate floral tissue, and highly purified carbohydrate in addition to oil rich in lipids.

2.2 Artificial Contamination (Spiking)

In this case, spiking is the act of contaminating samples with known impurities to assist in the possible quantification of the impurities. To simulate contamination, botanical samples were spiked with powdered tissues from porcine, donkey, and bovine sources. To simulate contamination, botanical samples were spiked with powdered tissues from porcine, donkey, and bovine sources.

- Contamination with Porcine, Donkey & Bovine Contamination: Botanical powders were homogenized with powdered porcine, donkey, and bovine tissues to achieve final contamination levels of 10%, 5%, 1%, 0.5%, and 0.1% (w/w).

Unspiked samples were used as negative controls.

2.3 DNA Extraction

According to the user's manual for the Qiagen DNeasy® Mericon Food Kit (QIAGEN, Germantown, MD, 93 US), Genomic DNA (gDNA) was extracted from 200 mg of each spiked botanical sample using the Qiagen DNeasy® Mericon Food Kit according to the manufacturer's instructions. Prior to extraction, 2.0 g of each sample was flash-frozen in liquid nitrogen and ground to a fine powder using a mortar and pestle. The DNeasy Mericon Food Kit by Qiagen is preferred because of the convenience, reliability, and ability to extract DNA of significant complexity and high quality from the defined matrices. The kit is much more effective than the manual methods as it strategically eliminates contamination while maximizes extraction and isolation of DNA.

The Qubit High-Sensitivity dsDNA test kit (Thermo Fischer Scientific, MA, US) was used to measure the amount of the isolated gDNA. 1% agarose ge electrophoresis was used to evaluate the quality of the extracted gDNA. The purity of the gDNA was evaluated using a Qubit Fluorometer 3.0 (Invitrogen Life Technologies, US). The isolated DNA was stored at −20 °C.

2.4 DNA Quantification using Florescent Technique

The extracted samples were quantified using Qubit Fluorometer 3.0 (Invitrogen Life Technologies, US). Qubit standards S1 and S2 were prepared by adding 189 µL of stabilizing buffer along with 1ul of fluorescent dye and 10 µL of standard, which were provided along with the Kit. Sample preparation was performed by adding 198ul of buffer into a tube (Qubit Assay Tubes, Thermo Fisher scientific) containing 1 µL dye. 1 µL DNA sample was added, incubated in the tubes at room temperature (25 ± 5 ºC) for 1 minute and inserted in a Qubit fluorometer to take readings (Demeke & Jenkins, 2010). Hence, the quality of the extracted genomic DNA was determined via 1.5% agarose gel electrophoresis.

2.5 PCR Detection

The use of qPCR for pork, horse and donkey DNA detection has the benefit of being a practical approach for detecting, identifying, and quantifying pork, horse and donkey in Zingiber officinale (ginger) powder, Crocus sativus (saffron), starch, and Prunus dulcis (almond) oil products. Real-time PCR combines target-specific primers with TaqMan probes for targeted amplification (Muflihah et

al., 2023), as shown in Figure 1. Real-time PCR amplification with TaqMan® probes was performed using a Real-time PCR (QIAGEN Rotor-Gene Q, Germany). The total volume is 25 µL PCR reaction mixtures that contain 12.5 µL Basic Mix and 7.5µL of Oligo Mix with 5 L of DNA template (approx. 10 ng.) Real-time PCR was set on conditions where the initial denaturation step was 95°C for 10 min and 45 cycles at 95 °C for 15, whereas amplification was done at 60 °C for 90 sec. The results were interpretation was done using QIAGEN rotor gene Q series software (version 2.3.1). For the negative control, a no-template control (NTC) was used for this method. Real-time PCR assay was done using a based amplification method. The Eurofins|GeneScan DNAnimal Identification Halal RT PCR kit, which contained the pork target gene, was used.

2.6 Limit of Detection

For the identification of the quantitative method for LOD with porcine, donkey, and beef at concentrations of 10%, 5%, 1%, 0.5%, and 0.1% (w/w).

Unspiked samples served as negative controls.

1. DNA Extraction Errors: Incomplete lysis, low DNA yield, or contamination from non-target DNA.
2. PCR Quantification Errors: Pipetting inconsistencies, primer inefficiency, PCR inhibitors in food samples, or cross-contamination leading to false positives/negatives.

3. RESULTS

3.1 DNA Extraction and Quantification using Florescent Technique

High-quality genomic DNA (gDNA) was successfully extracted from all meat admixture samples using the Qiagen DNeasy® Mericon Food Kit. The extracted DNA showed intact bands without degradation on 1% agarose gel electrophoresis, confirming good DNA integrity. The concentration of extracted DNA, as measured by the Qubit Fluorometer 3.0 using the High-Sensitivity dsDNA assay kit. DNA concentrations, as determined by the Qubit Fluorometer 3.0, ranged from [X] ng/µL to [Y] ng/µL, indicating sufficient yield for downstream PCR analysis. The extracted DNA samples were quantified using a wavelength range of 430–495 nm (blue) and 510–580 nm (green) to detect the purity and yield of all extracted DNA.

3.2 PCR Detection

Quantitative Real-Time PCR (qPCR) assays using TaqMan® probes successfully amplified species-specific DNA fragments corresponding to **pork, equine, and equas** in the tested samples. The sensitivity and specificity of the assay was confirmed for all target species in the spiked samples when amplification curves were generated. With no amplification in unspiked (negative control) samples or no template controls (NTC) the results confirm no contamination and no false positives. The ability to detect porcine, donkey, and horse DNA by the kit was shown to have a Limit of Detection (LOD) of 0.1% (w/w), which reveals the method's efficiency and ability to identify non- halal slaughtered animals' DNA within complex botanical mixtures such as *Zingiber officinale* (ginger), *Crocus sativus* (saffron), starch, and *Prunus dulcis* (almond) oil.

The amplification was shown to have consistent over the 10%, 5%, 1%, 0.5%, and 0.1% ranges, as the Cq (quantification cycle) values decreased in proportion to the increasing DNA concentration. The qPCR assay's ability to detect 0.1% concentration as shown in figure.1 of the sample demonstrates the assay's robustness, and sensitivity for halal verification and the assessment of potential adulteration to the sample.

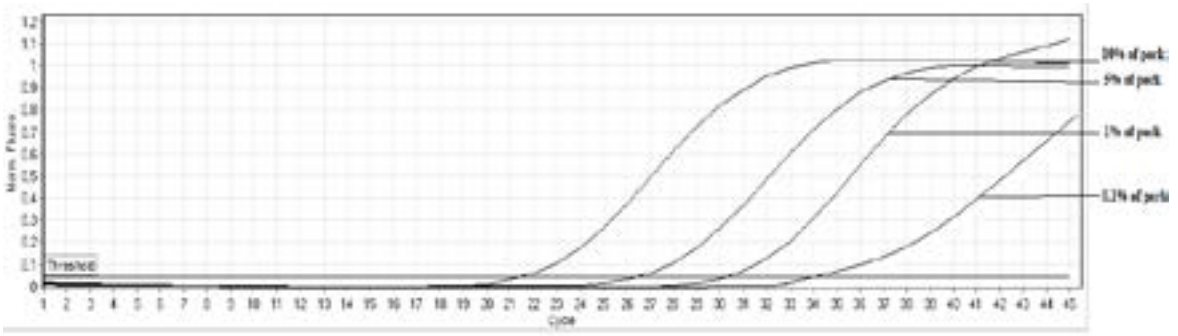


Figure 1 The amplification was shown to have consistent over the 10%, 5%, 1%, 0.5%, and 0.1% ranges

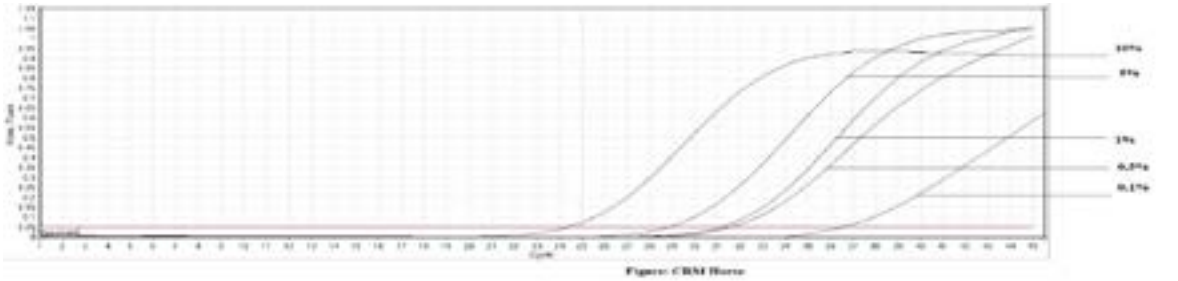


Figure: 2 The amplification was shown to have consistent over the 10%, 5%, 1%, 0.5%, and 0.1% ranges

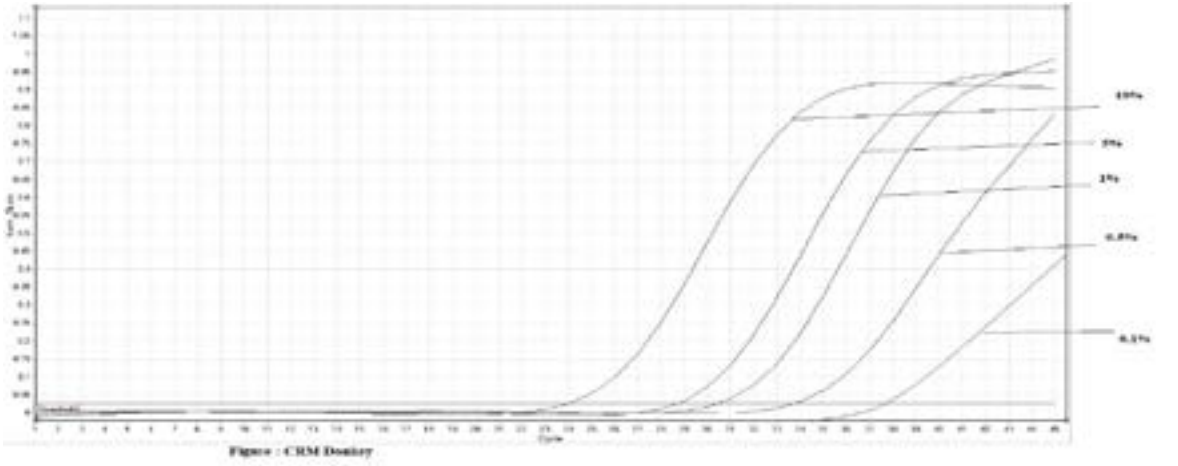
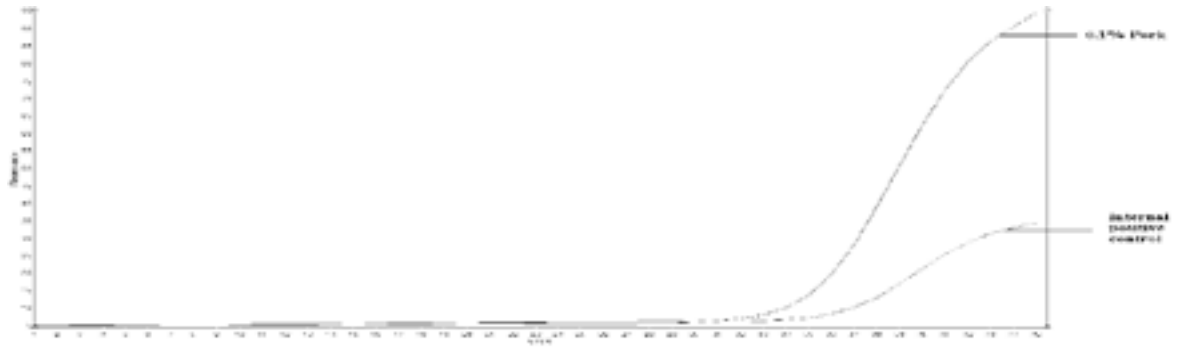
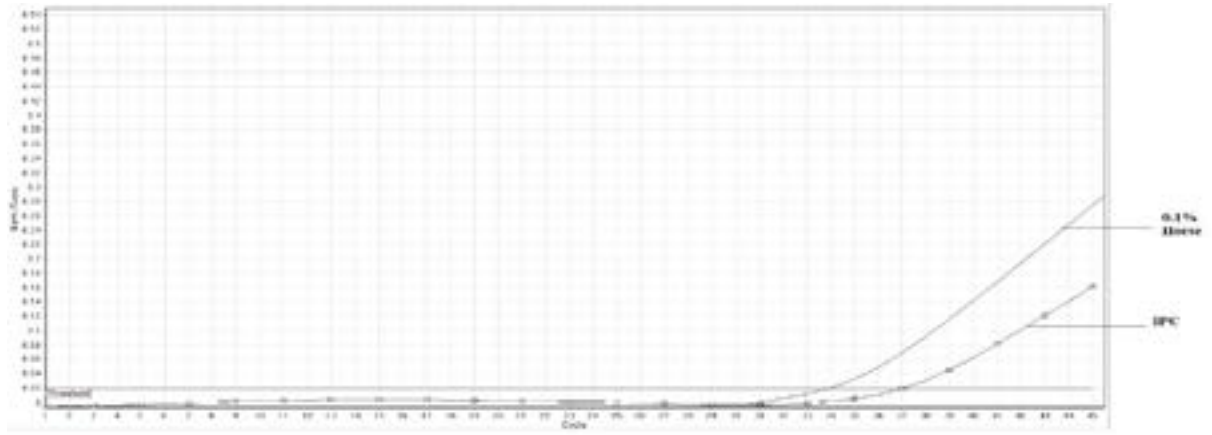


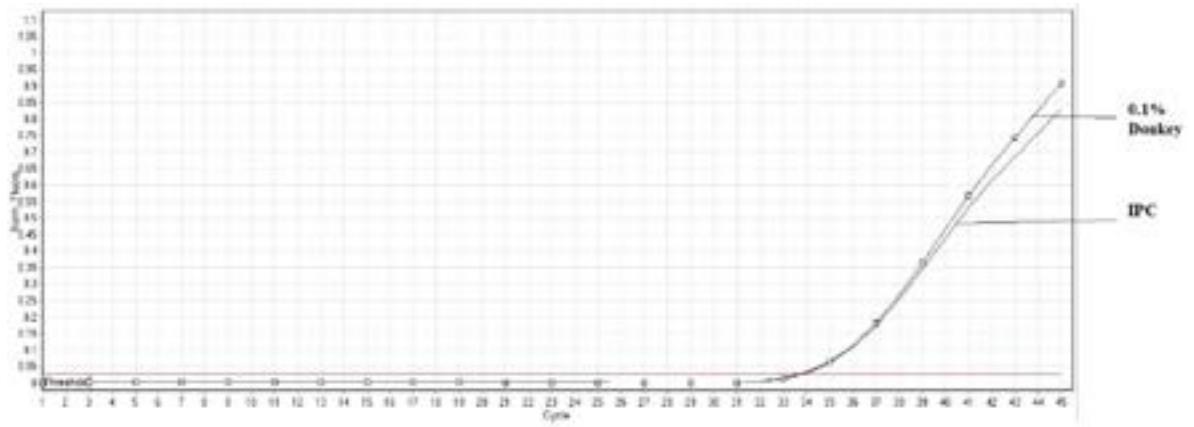
Figure: 3 The amplification was shown to have consistent over the 10%, 5%, 1%, 0.5%, and 0.1% ranges



Sample 1a: The qPCR assay's ability to detect 0.1% concentration Pork



Sample 1b: The qPCR assay's ability to detect 0.1% concentration donkey



Sample 1c: The qPCR assay's ability to detect 0.1% concentration Horse

4. DISCUSSION

The notable success in detecting porcine (Sus scrofa), donkey (Equus asinus), and horse (Equise) DNA in all tested botanical matrices also demonstrated the strength and accuracy of the developed multiplex PCR assay for pinpointing najis adulteration in complicated plant based materials. In all four matrices (Zingiber officinale (ginger) powder, Crocus sativus (saffron), starch, and Prunus dulcis(almond) oil), amplification was achieved across all 10%, 5%, 1%, 0.5%, and 0.1%(w/w) contamination levels. Success in amplification at the lowest contamination level (0.1%) attests to the high analytical sensitivity of the assay, which is critical to the authentication of Halal products as such products can be deemed as non-compliant with najis materials even in the minutest traces.

All three species in all matrices showed strong amplification bands that were clear and well defined for all three species and matrices at 10%, 5%, and 1% contamination, which shows that primers were efficiently bound and stable amplification occurred. There were clear signs of amplification at both 0.5% and 0.1%, however, the intensities were variable and depended on the matrix. Samples that contained ginger powder and saffron displayed porcine, donkey, and horse DNA amplicons that were clear and sharp even at 0.1% concentration, which indicates effective and high-quality DNA recovery from the samples and plant metabolites did not have strong inhibitory effects. Starch samples also showed high amplification for all concentrations, however, the samples at 0.1% concentration showed a modest decrease in amplification which is most likely due to polysaccharides which could inhibit polymerase activity. Almond oil, on the other hand, showed more faint bands at the lower concentrations due to the more concentrated samples resulting from the more difficult DNA extraction from matrices rich in lipids. In all matrix samples of 0.1% concentration, it is still a positive result that all three species were detected and indicates successful use of a cetyltrimethylammonium bromide (CTAB) extraction method optimized with hexane pre-wash to eliminate lipids and extract amplifiable DNA.

Finding Sus scrofa, Equus asinus, and Equine DNA at 0.1% concentration in ginger, saffron, starch, and almond oil verifies the assay's use in powdered and oily matrices at different stages in food and cosmetic production. High secondary metabolite concentrations in ginger and saffron can lead to PCR amplification inhibition, while the optimized protocol maintained amplification efficiency. DNA fragments can exist in even the most extreme processed foods–like starch–even after being subjected to heating, bleaching, and enzymatic modification. Advancements in DNA extraction and PCR technologies now enable the detection of trace DNA fragments even in highly processed and challenging matrices like refined oils. (which is highly neglected in Halal analysis).

For Islamic point of view these outcomes have great importance with respect to Halal quality assurance. Document based and observational audits rely on traditional certification methods, which do not adequately ascertain molecular purity. E.g. adding DNA proof adds a layer of certification trust, adds another layer of verification, and strengthened certification trust. Also of note, this assay identifies and quantifies najis to contamination levels of 0.1%, assisting laboratories in addressing potential non-compliance issues prior to consumer access, thus improving compliance and accountability throughout the supply system. The multiplex configuration, which captures the essence of the assay's practicality, also significantly decreases cost effectiveness and industrial laboratories with high sample throughput. This study provides the first approach to molecular Halal verification to agricultural raw materials for value added consumer products and thus moved beyond the earlier

works primarily focusing on the authentication of meat and gelatin. The assay's ability to detect 0.1% cross contamination of porcine, donkey, and horse DNA within these matrices also illustrates the potential of the assay to be a standard tool in Halal Quality Infrastructure.

Furthermore, the developed multiplex endpoint PCR assay is particularly suited for lower-resource laboratories due to its cost-effectiveness, sensitivity, and practicality, thereby democratizing access to reliable Halal verification. Because of that, the molecular verification of Halal status can be done in many more locations around the world.

In conclusion, the developed multiplex PCR assay demonstrated high sensitivity, specificity, and reproducibility in detecting porcine (Sus scrofa), donkey (Equus asinus), and Horse (Equise) DNA contamination as low as 0.1% in Zingiber officinale (ginger) powder, Crocus sativus (saffron), starch, and Prunus dulcis (almond) oil. The result demonstrates using the method for Halal authentication on food, cosmetics, and pharmaceuticals, even on highly processed and oily matrices, is feasible. This study strengthens global Halal assurance systems and improves public confidence in the integrity and authenticity of Halal-certified products. It does so by providing an authentication method capable of detecting trace molecular contaminants.

5. CONCLUSION

The works explores the creation and assessment of a multiplex m-PCR technique with the sensitivity and specificity necessary to identify non-Halal animal contaminations within high-risk botanical ingredients as well as its identification and classification of the najis--porcine, donkey, horse, and rodent--at 0.1% concentration. This detection limit is adequate to preserve the Halal status of materials.

This study provides a pivotal contribution by integrating forensic molecular biology with the specific requirements of Islamic jurisprudence, thereby strengthening the Halal Quality Infrastructure. This is the first work within the Halal Quality Infrastructure system which has assisted in the reestablishment of trust for Muslim clientele around the globe. Certification and its corresponding bodies will also benefit, as the system assures trust and does not implement lack of faith. In our view, this work should be implemented as the preferred Standard Operating Procedure within Halal Testing and Accreditation Laboratories.

(O-27) STRENGTHENING HALAL AUTHENTICITY IN THE MEAT INDUSTRY THROUGH ADVANCED INGREDIENT DETECTION

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Abstract

Maintaining consumer trust and strengthening the halal food business depend on the authenticity and halal compliance of ingredients used in food products. In restaurants that serve meat-based cuisine, there is a significant chance of contamination or misuse of non-halal products. The integrity of halal food ingredients is essential for both consumer trust and religious compliance. In order to confirm the authenticity of ingredients used in meat-based products, this study explored the use of advanced halal ingredient identification tools. The study aimed to identify non-halal ingredients in different meat-based meals, including alcohol-based marinades, non-halal-certified additives, non-zabiha meat, and porcine derivatives. Thirty samples of meat-based foods were gathered from restaurants in three major cities of Pakistan—Islamabad, Karachi, and Lahore. Advanced analytical methods were used, including Fourier-Transform Infrared Spectroscopy (FTIR) for fat and emulsifier analysis, Liquid Chromatography–Mass Spectrometry (LC-MS) for alcohol detection, and Polymerase Chain Reaction (PCR) for DNA-based species identification. Results revealed that 13.3% of the samples contained non-zabiha poultry DNA, 6.7% had ethanol levels above halal limits, and 10% used animal-based emulsifiers without halal certification. The findings highlight weaknesses in halal supply chain verification and emphasize the need for regular, scientific monitoring. An integrated halal traceability system supported by digital and laboratory verification is proposed to enhance compliance, accountability, and global trust in the halal meat sector.

Keywords: Meat, Traceability, Detection Techniques, Halal Authentication, Halal Compliance

1. INTRODUCTION

The global halal meat market has become one of the fastest-growing sectors, appealing not only to Muslim consumers but also to those seeking ethically and hygienically produced food (Nakyinsige et al., 2012). Ensuring halal authenticity is central to maintaining consumer confidence and meeting international trade standards. However, due to complex supply chains and ingredient sourcing from multiple regions, there is a significant risk of non-halal contamination, intentional or accidental (Rahman & Kamarudin, 2021).

Food authenticity and traceability have been extensively studied to ensure that food is natural and can be tracked back to its source because of the complexity of food and its products as well as the growing demand for food. A food labeled "halal" indicates that it has been approved for human consumption following expert examination and that conformance assessment methods were followed to ensure the quality of the ingredients and final products. The way that the origin of food is considered of has changed dramatically as a result of the detection of adulteration and fraud in the food business using state-of-the-art tools like GC-IRMS and EA-IRMS. High-throughput analysis of numerous samples at once is now possible because to NGS (Ahmad et al., 2025).

In order to guarantee that food is free of any ingredients that are forbidden by Islamic law, halal verification has become crucial in the food sector. Concerns about adulteration and the diversification of food origins have been brought up by Muslim customers (Mahesar et al.. 2025). Verification of food ingredients and their purity is therefore crucial. Different diagnostic techniques that rely on measurements of proteins or DNA have arisen from traditional techniques based on physical and chemical characteristics. In order to guarantee that food is free of any ingredients that are forbidden by Islamic law, halal verification has become crucial in the food sector. Concerns about adulteration and the diversification of food origins have been brought up by Muslim customers. Verification of food ingredients and their purity is therefore crucial. Different diagnostic techniques that rely on measurements of proteins or DNA have arisen from traditional techniques based on physical and chemical characteristics (Kua et al., 2022).

In Pakistan, where the halal food market holds substantial local and export potential, the verification of halal integrity is often limited to documentation rather than molecular or biochemical validation. Restaurants and food manufacturers may unknowingly use flavor enhancers, marinades, or emulsifiers derived from non-halal sources, undermining consumer trust (Aris et al., 2017). To address these challenges, modern scientific tools such as Fourier-Transform Infrared Spectroscopy (FTIR), Liquid Chromatography–Mass Spectrometry (LC-MS), and Polymerase Chain Reaction (PCR) have emerged as reliable methods for ingredient authentication. These techniques allow for precise detection of prohibited materials at molecular levels, providing scientific credibility to halal assurance systems (Ng et al., 2022).

This study investigates the application of such advanced techniques in verifying halal authenticity in meat-based meals from major Pakistani cities. The findings contribute to strengthening halal compliance, promoting consumer confidence, and fostering transparency in the meat industry.

2. MATERIAL AND METHODS

2.1 Sample Collection

A total of thirty (30) cooked meat-based food samples were collected from selected restaurants across Islamabad, Karachi, and Lahore. The selection included a variety of dishes—such as kebabs, steaks, gravies, and burgers—to ensure representative sampling. Each sample was labeled, coded, and stored at 4°C before analysis.

2.2 Analytical Techniques

Three analytical tools were utilized:

2.2.1 Fourier-Transform Infrared Spectroscopy (FTIR)

FTIR analysis determined fat and emulsifier composition, comparing spectra against reference databases for animal versus plant-based emulsifiers (Usman et al., 2024).

2.2.2 Liquid Chromatography–Mass Spectrometry (LC-MS)

LC-MS detected ethanol and alcohol-based compounds in sauces, marinades, and flavoring agents, ensuring compliance with halal-permissible ethanol levels (<0.5% v/v) (El Sheikha et al., 2017).

2.2.3 Polymerase Chain Reaction (PCR)

PCR provided DNA-based species identification using specific primers targeting porcine and poultry DNA sequences (Rohman et al., 2022).

2.3 Data Analysis

Statistical analysis summarized frequencies and percentages of non-halal components across techniques for reliability (Montgomery et al., 2019).

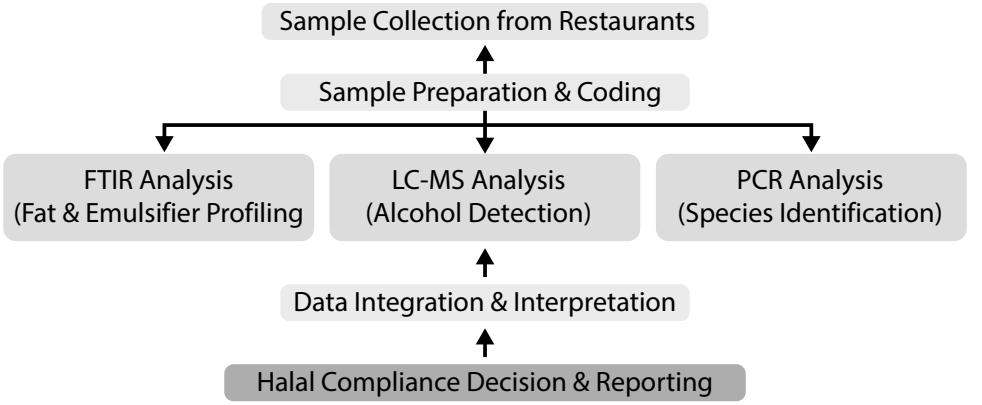

Figure 1. Workflow for advanced halal ingredient verification in the meat industry

Technology	Application	Result
Biosensors	Detection of pig DNA using hybrid nanobioprobe.	Detected 1% pork DNA in autoclaved binary admixtures with over 90% accuracy in halal meat products.
	Alcohol detection using biosensors	Detected limit of 5 μM of ethanol with high selectivity and specificity.
	Alcohol detection in fermented beverages.	Detected limit of 0.001% with a lifetime of up to 7 weeks when stored at 4°C.
	Protein sensing with gold nanoparticles (AuNPs).	Effective for rapid detection of pork in halal meat, but higher detection limit than real-time PCR.
	E-nose combined with GC-MS	Effective in detecting meat adulterants related to halal issues
Metabolomics and proteomics	Metabolomics analysis for differentiating edible oils and detecting lard adulteration in olive oil.	Effective in identifying lard adulteration with specific metabolite markers.
	Proteomics combined with LC-MS/MS.	Successfully detected pork in meat mixtures.
	RP HPLC combined with proteomics.	Differentiated pork from halal meats.
	MS-based proteomics datasets for gelatin differentiation.	Differentiated bovine, porcine, and fish gelatin.
Artificial intelligence	Al-based HalalNet for classifying halal and non-halal slaughtered chicken using deep neural networks.	Achieved accurate classification of halal and non-halal chicken.
	Machine learning (ML) for detecting pork adulteration in beef using optimized electronic nose system (OENS).	Achieved a high accuracy rate of 98.10% in classifying meat samples.
	Convolutional neural network (CNN) image recognition for identifying adulterated minced mutton.	Provided high accuracy in real-time authentication of adulterated minced mutton.
	ML. integrated with near-infrared spectroscopy and classification algorithms for alcohol content classification.	Accurately classified alcohol content in beverages.

Table 1. Advanced techniques used for halal authentication

Technology	Material detected	Method	Results
DNA based techniques	Species adulteration in food products	PCR	Detected species adulteration in food products, including nonhalal ingredients, with high sensitivity and specificity
	Meat and fat contents of various animals	PCR-RFLP	Analyzed meat and fat contents of animals like sheep, cow, chicken, and pig with accuracy
	Small amounts of swine DNA in processed foods	PCR-southern chip hybridization	Offered improved sensitivity and reproducibility for detecting small amounts of swine DNA
	Porcine gelatin in food mixtures	Real-time PCR	Precise and sensitive detection of porcine gelatin in complex food mixtures was achieved
	Bovine, porcine, and fish gelatin in a single test	Multiplex PCR	Simultaneously detected of multiple gelatin sources, offering enhanced stability, sensitivity, and reliability
	Species composition in complex mixtures	Next-generation sequencing (NGS)	Provided a comprehensive, high-throughput examination of genetic material for food authentication
Spectroscopy-based technique	Pork adulteration in beef meatballs	FTIR	Identified pork adulteration in beef with high sensitivity and specificity
	Pork in halal and non-halal sausages	FTIR coupled chemometrics	Differentiated pork in halal and non-halal sausages with high sensitivity and specificity
	Fish, porcine, and bovine gelatins	UV-vis spectroscopy	Differentiated gelatin sources based on browning values and chemometrics
	Volatile organic compounds in animal fats and oils	PTR-MS	Quantified volatile components of fats and oils with high accuracy
	Lard-adulterated butter	Proton nuclear magnetic resonance (1H-NMR)	Detected lard adulteration in butter based on characteristic proton peaks
	Lard in mixtures with animal fats and oils	Raman spectroscopy	Differentiated and quantifies lard in mixtures using chemometrics
	Gelatin in candy and beef gelatin	MALDI-TOF MS	Detected up to 1% gelatin in candy and 20% pig gelatin in beef gelatin
	Lard in palm oil and porcine gelatin	IR spectroscopy	Detected and analyzed lard in various products, with classification using chemometrics
Chromatography based techniques	Pork in food products	GCMS-HS combined with PCA	Significant variance in sample separation based on lipid oxidation products
	Lard in oils	GC-FID and chemometrics	Distinguished lard from beef tallow and chicken fat by LOD of 0.5% lard content
	Lard adulteration in olive oil	GC-MS Metabolomic approach using FAME separation	Differentiated pure and adulterated samples for halal authentication
	Lard adulteration in virgin coconut oil	GC x GC-TOF/MS	Successfully analyzed of lard adulteration
	Animal meats	GC-MS-HS-SPME	Discriminated between animal meats based on aroma
	Ethanol in marketed products	GC-FID	Highlighted non-halal components in some samples
	Pork from other meats	RP-HPLC	Achieved 94.75% total variance explanation
	Horse and pork in processed foods	HPLC-MS/MS	Achieved a limit of detection of 0.24%
	Gelatin and collagen samples	HPLC-fluorescence detection	Distinction between non-halal gelatin and collagen was achieved
	Non-halal components like porcine gelatin	LC/MS-MS	Identified pork differentiation protein markers

Table 2. Fat and protein contents of the Meat

Treatments	Samples	Day 0	Day 7	Day 14	Day 21	Mean
Fat %	To	8.15±0.06 ^{d}	8.13±0.04^{d}	8.13±0.04^{d}	8.12±0.05^{c}	8.18±0.04^{d}
	T1	8.66±0.05 ^{c}	8.52±0.05^{c}	8.54±0.07^{c}	8.55±0.17^{b}	8.58±0.02^{c}
	T2	8.85±0.04 ^{b}	8.82±0.12^{b}	8.84±0.60^{b}	8.87±0.14^{a}	8.85±0.70^{ab}
	T3	8.91±0.05^{a}	8.95±0.07^{a}	8.91±0.14^{b}	8.59±0.06^{b}	8.89±0.09^{a}
Protein %	To	10.51±0.07^{d}	10.56±0.07^{d}	10.54±0.13^{d}	10.60±0.07^{d}	10.58±0.08^{d}
	T1	10.96±0.04^{c}	10.95±0.12^{c}	10.96±0.05^{c}	10.98±0.06^{c}	10.95±0.10^{c}
	T2	11.33±0.08^{b}	11.39±0.13^{b}	11.39±0.15^{b}	11.41±0.08^{b}	11.38±0.11^{b}
	T3	11.61±0.03 ^{a}	11.68±0.07^{a}	11.70±0.01^{a}	11.75±0.16^{a}	11.69±0.06^{a}
pH	To	4.52±0.05 ^{a}	4.49±0.08^{a}	4.46±0.24^{ca}	4.45±0.10^{ab}	4.48±0.05^{a}
	T1	4.49±0.04 ^{b}	4.48±0.19^{a}	4.47±0.05^{bc}	4.46±0.05^{a}	4.49±0.04^{a}
	T2	4.47±0.22^{b}	4.47±0.12^{ab}	4.42±0.29^{ab}	4.47±0.02^{a}	4.45±0.02^{b}
	T3	4.42±0.07^{c}	4.43±0.10^{bc}	4.44±0.04^{a}	4.40±0.05^{c}	4.42±0.07^{bc}

3. RESULTS

PCR revealed non-zabiha poultry DNA in 4 out of 30 samples (13.3%), LC-MS detected ethanol above halal limits in 2 samples (6.7%), and FTIR identified animal-based emulsifiers in 3 samples (10%). Combined results indicate weaknesses in documentation, supplier verification, and traceability systems. PCR amplification showed four (13.3%) samples contained DNA from non-zabiha poultry sources, indicating possible cross-contamination during processing. A comparative interpretation demonstrated that restaurants relying on imported flavoring agents or bulk emulsifiers were more likely to exhibit halal non-compliance. These findings emphasize the need for stronger supply chain audits and periodic halal verification testing. The study revealed notable instances of non-halal contamination and mislabeling among restaurant meat dishes (Table 3).

Table 3. Summary of detected non-halal components in restaurant meat samples (n = 30)

Detection Method	Non-halal Findings	Number of Samples	Percentage (%)
PCR	Non-zabiha poultry DNA	4	13.3
LC-MS	Ethanol above permissible limit	2	6.7
FTIR	Animal-based emulsifiers (non-certified)	3	10.0

4. DISCUSSION

The integration of FTIR, LC-MS, and PCR in halal authentication offers a multidimensional verification approach. FTIR rapidly screens for lipid composition, while LC-MS precisely identifies volatile contaminants such as alcohol. PCR adds molecular-level species confirmation, forming a robust analytical trio. The combined results highlight the weaknesses of relying solely on supplier-provided halal certificates, which may not account for cross-contamination or hidden ingredients (Hossain et al., 2021).

The body of research on halal food authentication shows notable progress, especially in the application of technologies like blockchain, spectroscopy, artificial intelligence (AI), and machine learning (ML), which improve the precision and effectiveness of authentication procedures. Consumer trust has been strengthened by methods such as convolutional neural network (CNN) image recognition models and real-time polymerase chain reaction (PCR), which have demonstrated great accuracy in identifying non-halal components. These sophisticated techniques, however, can be expensive and complicated, needing specific tools and knowledge that not all halal certification organizations or smaller manufacturers may have (Haseeb, 2025). Furthermore, there is a lack of industry-wide standardization, with various research using disparate methodologies, which leads in inconsistent findings. Additionally, regulatory frameworks find it difficult to keep up with technological advancements, which makes it difficult to guarantee that procedures are both morally and scientifically sound. Research on consumer attitudes and the moral ramifications of these technologies is also necessary (Mortas et al., 2022).

Halal cuisine is essential to Muslims, and laws are in place to safeguard its authenticity and quality, including ways to keep out prohibited ingredients. The foundation of Halal analyses is the detection and removal of non-Halal materials, which encourages the advancement of analytical methods for the verification of Halal products (Haider et al., 2024). Among the most widely used methods in Halal food analysis are gas chromatography-mass spectroscopy (GC-MS), electronic nose (e-nose), Fourier transform infrared (FTIR), high-pressure liquid chromatography (HPLC), and real-time polymerase chain reaction (RT-PCR). When paired with chemometrics, FTIR spectroscopy is a great method for testing halal food because of its positive outcomes, simple methodology, and lack of harmful preparation (Jafari et al., 2025).

By discussing FTIR in combination with chemometrics for Halal authentication, Authentication of Halal Products using FTIR Spectroscopy seeks to expand the understanding of Halal food. This combination, which offers the most recent link between Halal analysis and authentication as well as thorough coverage of FTIR and chemometrics for Halal authentication, has never been covered in such detail previously (Gracia-Vaquero and Mirzapour- Kouhdasht, 2023). Along with Halal production, processing, ingredients, storage, logistics techniques, and a global viewpoint, this section covers the authentication of Halal meat, fat, oil, consumer goods, and pharmaceuticals (Roslan and Tukiran 2024).

In the future, authenticating halal food should entail utilizing technology developments, combining several approaches, filling in the gaps in existing approaches, and taking ethical and legal considerations into account. The accuracy, dependability, and efficiency of halal food verification procedures are expected to be greatly improved by the quick development of technologies like blockchain, spectroscopy, and DNA-based techniques (Dirong et al., 2021). These developments

offer improved contamination and adulteration detection, boosting customer confidence and maintaining market integrity. Furthermore, integrating the advantages of several approaches to overcome their shortcomings can result in more complete and reliable authentication systems (Sani et al., 2025). Significant gaps still exist in present approaches, nevertheless, such as the requirement for methods that are quicker, less expensive, and more broadly applicable. Continued investigation and creativity will be needed to close these gaps. Furthermore, as technology advances, ethical and regulatory frameworks must also change to ensure that new techniques are not just sound from a scientific standpoint but also socially and religiously acceptable. The long-term development of halal food certification will depend on striking a balance between ethical and legal issues and technology advances (Airin et al., 2025).

Advances in lipidomics and metabolomics are used to determine the authenticity of meat. The technique uses lipid or metabolite profiles that vary from species to species. Animal flesh can be verified for authenticity through metabolite and lipid analysis using devices that interface directly with metabolite and lipid database software. We were able to interpret complex mass spectrometric data from an unknown source using contemporary multivariate analytical methods made available by chemometric procedures (Salih, 2017).

The findings highlight gaps in halal assurance within meat supply chains. Advanced analytical methods such as FTIR, LC-MS, and PCR enable detection of contaminants with precision, ensuring scientific credibility in halal verification (Rahman & Kamarudin, 2021). Integrating these methods into certification processes can enhance compliance and global acceptance. A digital halal traceability system linking farms, slaughterhouses, processors, and restaurants would ensure transparency and real-time verification (Rohman et al., 2025). Establishing centralized halal testing laboratories would further strengthen consumer confidence and regulatory oversight.

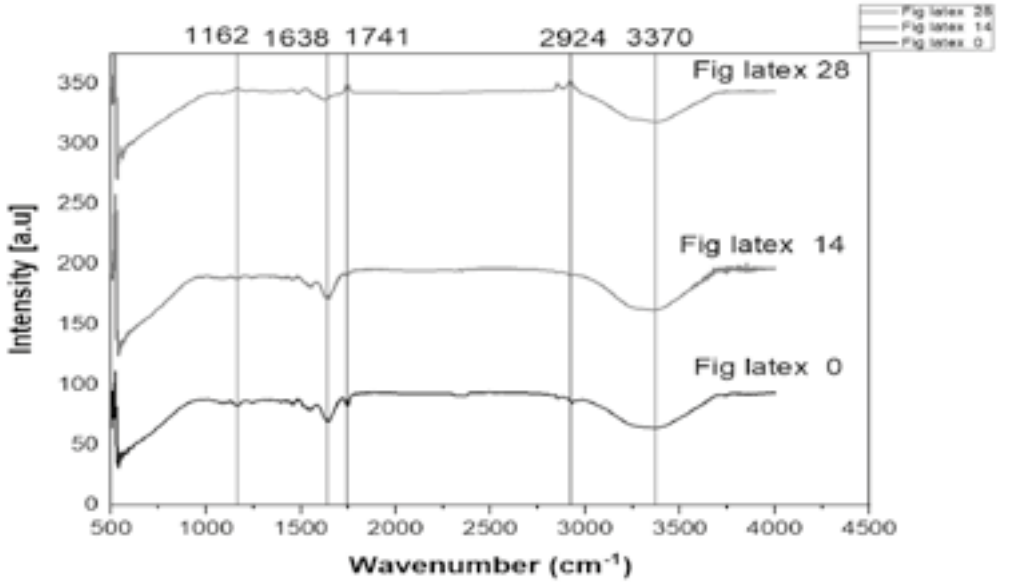

Figure 2. FTIR spectrum for detection of meat

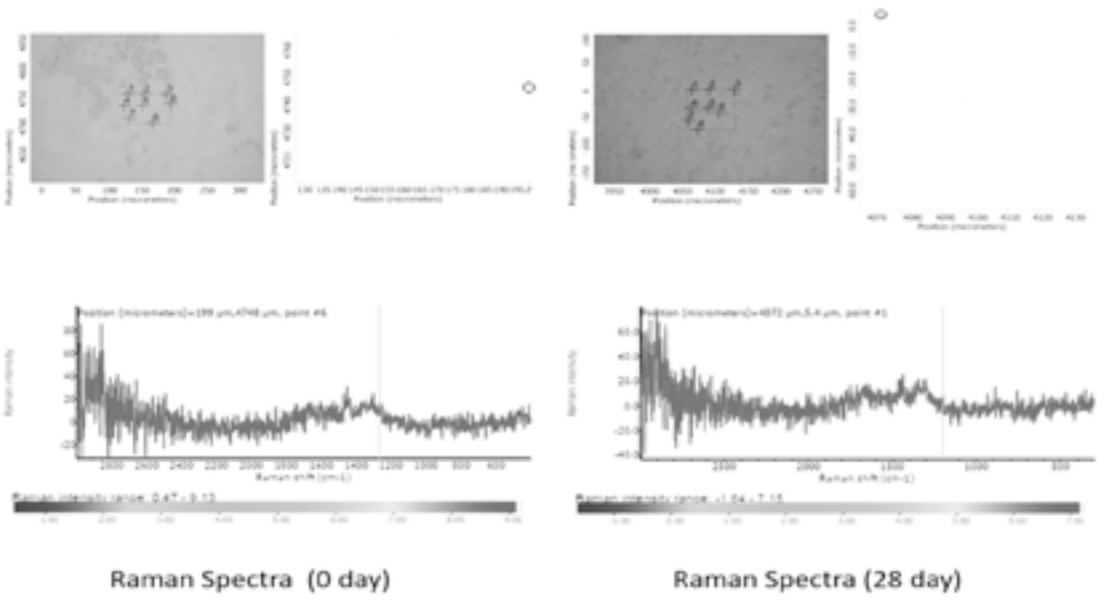

Figure 3. Raman spectra for detection of meat

5. CONCLUSION

Scientific authentication tools can significantly improve halal assurance in the meat sector. The detection of non-zabiha meat, ethanol residues, and uncertified animal emulsifiers underscores the need for continuous monitoring and advanced verification. Implementing digital traceability and molecular authentication can position Pakistan's halal meat sector as a trusted global player. This study demonstrates that advanced analytical techniques play a crucial role in maintaining halal authenticity in the meat industry. The findings indicate notable incidences of non-halal elements, such as ethanol residues and non-zabiha DNA, among restaurant-prepared foods. A national strategy combining molecular verification, digital traceability, and centralized halal testing facilities is vital for sustaining consumer trust and ensuring compliance. Adoption of science-driven halal assurance frameworks will position Pakistan as a reliable global leader in halal meat production and export.

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(O-28) EVOLVING HALAL PRACTICES AMONG MUSLIM COMMUNITIES IN THE DMV REGION: A CAMPUS-CENTERED ETHNOGRAPHIC ANALYSIS

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Abstract

This study explores the diversity and evolution of Halal practices among Muslim communities in the DMV region (District of Columbia, Maryland, and Virginia), with a specific focus on university campuses. Drawing upon personal experiences, field observations, and in-depth interviews with Muslim college students, the research investigates how generational, cultural, and institutional dynamics influence interpretations of Halal. Findings indicate a dichotomy between the strict adherence of first-generation immigrants and the more flexible, context-driven approaches of second- and third-generation Muslims. The role of Muslim Student Associations (MSAs) and broader communal dynamics in shaping these behaviors is critically examined. This paper contributes to understanding how religious practices adapt in diaspora contexts within multicultural societies.

Keywords: USA, Halal, Muslim Students, DMV Region, Religious Practices, Cultural Adaptation

1. INTRODUCTION

The concept[1] of Halal, particularly in dietary practices, holds central religious and cultural significance for Muslim communities. While Halal is often reduced to its dietary component in public discourse, it also encompasses a broader ethical and spiritual framework. However, this broader understanding is frequently overshadowed by daily practicalities, especially among youth in diaspora contexts.

In the United States, specifically within the DMV region (District of Columbia, Maryland, and Virginia), Muslim communities from diverse ethnic, theological, and generational backgrounds coexist and interact. These interactions generate evolving interpretations of what it means to observe Halal in an American setting. This study investigates how Halal is practiced and understood by different generational and cultural groups of Muslims, with a particular emphasis on university campuses where young adults navigate complex intersections of tradition, secularism, and cultural integration (Abdallah, 2019, 2019; Hakam, 2023; *Meat & Myth*, t.y.).

1. The data in this study were obtained as a result of research conducted at George Mason University, USA, within the scope of the TÜBİTAK 2219 International Research Fellowship and the project numbered 1059B192202209. I am grateful to TÜBİTAK for its support of my project.

2. METHODS

This qualitative research employs an ethnographic approach based on:

- Participant observation in university campuses and community events
- In-depth semi-structured interviews with 72 Muslim students (43 female, 29 male) from diverse ethnic backgrounds (Egyptian, Pakistani, Saudi, Indian, Somali, Turkish, and American-born Muslims)
- Field notes and reflexive journaling to contextualize observations

The universities included in the study are: George Mason University (GMU), Georgetown University, George Washington University (GWU), and University of Maryland College Park (UMCP). The majority of participants were affiliated with George Mason University (GMU), reflecting the institution's large and active Muslim student population. This strong representation provided in-depth insight into how a dominant campus culture can influence the dietary and theological practices of students.

3. RESULTS

3.1 First-Generation Muslim Immigrants

Participants from this group exhibit a consistently high degree of adherence to traditional Halal standards, particularly those based on zabiha requirements. For many first-generation Muslims, especially those who migrated from Muslim-majority countries such as Egypt, Pakistan, Saudi Arabia, Somali and Turkey, Halal is not merely a dietary rule but a marker of religious identity and moral discipline. Their understanding of Halal is deeply shaped by the religious norms and community expectations of their countries of origin, where access to Halal-certified food is taken for granted.

In the DMV region, these individuals often make significant efforts to preserve their dietary integrity. They actively seek out Halal-certified grocery stores, butchers, and restaurants, even if this requires longer travel times or higher costs. Many organize collective grocery trips or maintain social media groups to share reliable Halal food sources within their communities. This behavior reflects a collective sense of responsibility to uphold Islamic dietary principles in a predominantly non-Muslim society. Additionally, for many, adhering to Halal is more than just a religious obligation; it serves as a means of cultural preservation and personal affirmation in an unfamiliar social environment. Especially during the early stages of migration, maintaining Halal practices offers emotional stability and a tangible connection to one's homeland and values, reinforcing a sense of belonging amid the challenges of adaptation.

3.2 Second- and Third-Generation Muslims

Students in this category often show a more flexible and individualized approach to Halal dietary practices compared to their first-generation counterparts. Many of these students were either born in the United States or moved there at an early age, and thus their engagement with Islamic dietary laws

is deeply influenced by their upbringing in a secular, pluralistic society. Rather than viewing Halal as a fixed set of rules, they tend to interpret it through the lens of personal understanding, situational ethics, and practical considerations.

While a number of second- and third-generation students continue to uphold strict Halal standards, particularly those with strong family or religious community influences, a significant portion adopt a more context-based or principle-driven approach. For instance, some participants stated that they consume non-zabiha meat provided it is not pork and they say "Bismillah" before eating, an act they believe sanctifies the food. Others reported being comfortable with eating vegetarian or seafood options from non-Halal certified establishments, especially when dining with non-Muslim peers or in situations where Halal food is not readily accessible (Abdallah, 2019; *Difference Between Zabihah And Non-zabihah | AMJA Online*, t.y.).

This pragmatic approach is closely tied to broader patterns of American youth culture, which values convenience, efficiency, and spontaneity. Many Muslim students echoed this sentiment, noting that the pressure of academic schedules, social events, and on-the-go lifestyles often discourages the effort required to locate Halal-specific options. Fast food, campus dining halls, and casual eateries become default choices, and Halal considerations are sometimes compromised in the interest of practicality.

In several cases, students described feeling conflicted about their dietary choices, expressing a desire to be more observant while also acknowledging the complexity of maintaining traditional practices in a secular environment. Some found ways to reconcile this tension by adopting a "minimum harm" approach, favoring vegetarian options or ethically sourced food over strict zabiha meat when necessary. These adaptations reveal an ongoing negotiation between religious identity and cultural assimilation, shaped by both internal reflection and external social influences.

3.3 Theological and Cultural Influences

The understanding of Halal among Muslim students is deeply shaped by their theological orientations and cultural upbringings. Certain groups, such as those aligned with Sufi traditions or modernist Islamic thought, often emphasize the primacy of intention (niyyah) and spiritual consciousness over strict adherence to legalistic rituals. For these students, the ethical and moral dimensions of eating, such as gratitude, mindfulness, and avoiding excess, carry as much weight as formal slaughter practices (Abdallah, 2019; *Difference Between Zabihah And Non-zabihah | AMJA Online*, t.y.; *Meat & Myth*, t.y.; Hakam, 2023).

3.4 Role of Muslim Student Associations (MSAs)

MSAs significantly shape campus Halal norms, acting as both religious reference points and social communities for Muslim students. These student-led organizations often determine what kinds of food are deemed acceptable at events, how strictly Halal standards are enforced, and what theological perspectives are emphasized in religious discussions and programming. As such, they serve as institutional filters through which diverse interpretations of Halal are either reinforced or challenged (*About MSA*, t.y.).

The ideological orientation of an MSA greatly influences the campus environment. George Mason University, with its more conservative MSA, tends to influence students toward traditional Halal practices. Georgetown University's more liberal and inclusive MSA encourages a broader interpretation. Conservative MSAs typically promote stricter adherence to traditional Halal standards, including the exclusive use of zabiha-certified meat, avoidance of doubtful ingredients, and clear separation from non-Halal food spaces. These MSAs may collaborate with local mosques, religious scholars, or Halal certifying bodies to reinforce their standards and support students who seek a more orthodox lifestyle (*About MSA*, t.y.; Dey, 2012).

In contrast, more inclusive and theologically diverse MSAs, such as at Georgetown University, adopt a broader and more accommodating stance. These organizations often recognize the plurality of Halal interpretations among their members and encourage a judgment-free environment that respects both strict and flexible observances. Events may offer vegetarian or labeled options to meet a variety of needs without enforcing uniformity (Dey, 2012; Yvonne Hadda & Jane Smith, 1994).

International students, especially those newly arrived, tend to mirror the practices and beliefs prevalent within their campus MSA. For many, the MSA becomes the first space of religious socialization in a foreign setting, meaning that the association's stance on Halal can significantly shape long-term habits. Students have reported altering their dietary behaviors based on their MSA's food policies or through informal conversations with peers during events (Dey, 2012; *Muslim International Students in the United States: A Phenomenological Inquiry into the Experience of Identities | Journal of International Students*, t.y.; Yvonne Hadda & Jane Smith, 1994).

MSAs also mediate theological debates and navigate intra-community differences, such as those involving Ahmadi, Shi'a, or secular-identifying Muslims. How inclusive or exclusive they are in addressing such differences can either foster unity or deepen division within the Muslim student population. Ultimately, MSAs function not merely as religious support structures, but as dynamic spaces where norms are negotiated, redefined, and practiced in daily campus life.

4. DISCUSSION

The findings highlight the influence of generational status, cultural background, theological diversity, and institutional frameworks on Halal observance among Muslim students in the DMV region. This region, being culturally rich and home to a growing and diverse Muslim population, serves as a microcosm for understanding broader patterns of religious adaptation in the diaspora.

The observed practices indicate that Halal, while deeply rooted in Islamic law, is also a lived experience shaped by personal identity, social context, and practical constraints. First-generation students emphasize strict adherence to zabiha requirements and community-based food sourcing, largely reflecting continuity with practices from their countries of origin. In contrast, second- and third-generation students reinterpret Halal through lenses of accessibility, ethical consciousness, and spiritual intent, often making case-by-case decisions.

The role of theological orientations further complicates and enriches this picture. Students influenced by Sufi traditions or modernist Islamic thought focus on intention and broader ethical conduct over formal legalism. This highlights the ways in which Halal is negotiated not only through food choices, but also through complex theological and identity-based discourses.

Muslim Student Associations (MSAs) emerge as critical institutional actors in shaping Halal norms on campus. Their internal culture, whether conservative or inclusive, often sets the tone for how Halal is understood and practiced by students, especially newcomers. George Mason University, with its more conservative MSA, tends to influence students toward traditional Halal practices. Georgetown University's more liberal and inclusive MSA encourages a broader interpretation. MSAs' stance influences dietary habits, fosters or limits pluralism, and mediates communal tensions among sectarian or interpretive lines. Their authority, although informal, is socially powerful and often lasting (Dey, 2012; *Muslim International Students in the United States: A Phenomenological Inquiry into the Experience of Identities | Journal of International Students*, t.y.; Yvonne Hadda & Jane Smith, 1994).

Despite these complexities, one notable limitation across generations and theological lines is the reduction of Halal to dietary laws alone. The concept's broader ethical dimensions, relating to finance, behavior, consumption ethics, and lifestyle, remain largely underdeveloped in campus discourse. This suggests an educational opportunity to reframe Halal not only as what is eaten, but how one lives ethically as a Muslim in a pluralistic society.

In sum, Halal observance in the DMV region reflects a dynamic interplay between religious tradition and contemporary realities. The interplay of identity, theology, generational shift, and institutional culture shapes not just what Muslim students eat, but how they understand and embody their faith in everyday life.

5. CONCLUSION

Halal practices among Muslim students in the DMV region demonstrate that religious observance is neither uniform nor static. First-generation immigrants often preserve stricter and community-centered understandings of Halal shaped by their cultural and religious roots. In contrast, second- and third-generation Muslims reflect a spectrum of personal adaptations shaped by American social norms, university life, and the rapid pace of youth culture.

Community institutions such as MSAs play a formative role in shaping campus norms around Halal, acting either as reinforcers of tradition or as facilitators of inclusion. Their influence extends beyond food choices to encompass broader interpretations of Islamic practice in pluralistic settings.

Importantly, this study reveals that Halal is frequently confined to the realm of food, while its broader moral and spiritual dimensions remain underexplored. There is an opportunity for Muslim educators, scholars, and institutions to emphasize Halal as a comprehensive lifestyle, not just a set of consumption rules.

Overall, the findings point to a rich and evolving tapestry of Halal observance shaped by migration histories, institutional affiliations, generational divides, and the lived realities of diaspora life.

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(O-29) HALAL LIFESTYLE AND SOCIAL COHESION: HOW PUBLIC INSTITUTIONS CAN FOSTER INCLUSIVITY THROUGH HALAL-SENSITIVE POLICIES

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Abstract

The concept of a halal lifestyle has evolved from a private domain of religious observance into a multidimensional social and political phenomenon with direct implications for governance, citizenship, and collective belonging. In increasingly pluralistic societies, public institutions face the dual challenge of recognizing the religious and cultural needs of Muslim citizens while simultaneously safeguarding universal commitments to inclusivity and equality. This paper interrogates the role of halal-sensitive policies—such as public procurement of halal-certified food, the accommodation of halal standards in healthcare and education, and the regulation of halal-compliant urban spaces—as instruments for strengthening social cohesion in diverse polities.

The analysis builds on Jenson's (1998) framework of social cohesion, Kymlicka's (1995) theory of multicultural citizenship, and Fung's (2006) model of inclusive governance, while also drawing on the Islamic normative tradition, particularly the maqāṣid al-sharīʿa, which emphasizes justice, preservation of religion, and social harmony. The paper argues that halal-sensitive policies can enhance trust in public institutions, reduce perceived marginalization, and symbolically validate Muslim identities within the national public sphere, while critically examining risks, including reinforcement of exclusivist boundaries, and tensions with secular governance norms.

Comparative insights from selected countries demonstrate that halal-sensitive policies foster inclusivity most effectively when embedded in broader frameworks of transparency, accountability, and pluralist participation. The study concludes that situating halal governance within both human rights discourse and Islamic ethical reasoning provides a balanced foundation: one that affirms cultural rights while safeguarding universal equality, thereby enabling public institutions to contribute to resilient democratic social cohesion.

Keywords: Halal Lifestyle, Social Cohesion, Public Administration, Inclusivity, Halal-Sensitive Policies, Multiculturalism, Maqāṣid Al-Sharīʿa, Governance

(O-30) CLARIFYING ISLAMIC TOURISM TERMINOLOGY: A CONCEPTUAL AND TAXONOMICAL STUDY

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Abstract

Tourism, far beyond mere leisure, encompasses a spectrum of motivations grounded in personal exploration, faith, and the pursuit of meaning. Within Islamic societies, the interplay between religion and tourism has produced a proliferation of terms—such as Islamic tourism, Halal tourism, Sharia-compliant tourism, and Muslim-friendly tourism—whose inconsistent and sometimes interchangeable use generates significant conceptual ambiguity. This lack of standardized terminology complicates communication among stakeholders, obscures consumer expectations, and impedes the formulation of effective policies and industry standards. Through the clarification of definitions, comparative analysis of features, and the recommendation of practical steps, this work aims to enhance policy development, industry practices, and traveler experiences. This study addresses these issues by providing a structured, critical examination of Islamic tourism terminology, with the objective of clarifying distinctions, analyzing overlaps, and proposing actionable solutions for both academic and industry stakeholders.

Adopting a taxonomical methodology, this study systematically identifies and categorizes key criteria—such as the purpose of travel, type of experience, target demographic, and accreditation—drawing on an extensive review of scholarly literature and market analyses. By offering a structured classification, the research facilitates stakeholder consensus on terminology and supports clearer communication across the sector. Ultimately, achieving clarity and consensus in Islamic tourism terminology is both a conceptual and practical imperative for the sustainable growth of this sector.

Keywords: Halal, Sharia-Compliant, Islamic, Religious, Tourism

(O-31) RETHINKING HALAL CERTIFICATION: BALANCING RELIGIOUS REQUIREMENTS, SUSTAINABILITY, AND CULTURAL CONTEXT IN MUSLIM-MINORITY COUNTRIES[2]

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Abstract

Halal certification plays a vital role in fulfilling Muslims' religious obligations worldwide. However, as demand grows in Muslim-minority countries such as Japan, challenges arise when applying certification systems originally developed for Muslim-majority contexts. These systems often emphasize rigid compliance standards that exceed essential Islamic jurisprudence requirements, creating obstacles to practical implementation and cultural integration within non-Muslim societies.

This combined study draws on case analyses of Japanese small and medium-sized enterprises (SMEs)—notably Nanao Seika Co., Ltd.—to explore difficulties faced when pursuing halal certification through agencies such as Indonesia's BPJPH. Challenges include substantial financial burdens, fragmented and sometimes unclear regulations, and sourcing halal-certified raw materials necessary for full compliance. The fragmentation and commodification of certification guidelines further complicate the process, especially for businesses unfamiliar with halal systems.

Central to this research is the ethical and institutional tension within global halal certification frameworks, framed by the critical question: "For whom is halal really intended?" Strict certification practices risk economic and social exclusion of Muslim minorities and may hinder multicultural coexistence. Prominent Muslim leaders in Japan have publicly criticized the system for prioritizing commercial interests over religious and ethical considerations, calling for more flexible, Shariah-compliant approaches adapted to local cultural contexts.

The study proposes applying key Islamic legal concepts such as istihalah (the transformation of forbidden substances into permissible ones) and involving locally knowledgeable ulama as effective ways to contextualize halal requirements appropriately. Additionally, sustainability indicators assess tensions between conventional halal practices—such as the need for dedicated production lines—and environmental goals under the United Nations Sustainable Development Goals (SDGs).

By promoting greater flexibility rooted in Islamic principles, cultural adaptability, and sustainability considerations, this research offers constructive suggestions to enhance halal certification systems. It aims to better serve both Muslim communities and host societies, contributing to ongoing global discussions and supporting the development of a more inclusive, ethical, and sustainable halal certification model that reflects diverse realities.

Keywords: Islamic Jurisprudence (Shariah Compliance), Sustainability and Cultural Adaptation, Muslim-Minority Countries

2 This research was supported by JSPS KAKENHI Grant Number 23K25100, "Standardization and Dynamics of Diversity in Halal Standards in the Global Era."

1. INTRODUCTION

In Japan, where Muslims are a small minority(who make up only about 0.28% of the population, or roughly 350,000 people[3]) applying international halal standards developed for Muslim-majority contexts has created difficulties for businesses and consumers. Installing dedicated halal equipment for this population is costly and often unfeasible for both small and large companies. Strict compliance increases costs and limits halal product availability. Some Muslims regard international certification as the sole marker of legitimacy, further narrowing food choices.

Many commonly used Japanese ingredients, such as mirin, soy sauce, and cooking sake, contain alcohol. International halal standards vary by region: countries like Indonesia and Malaysia permit the use of fermented products under certain conditions, provided they are not harmful, and according to a 2018 fatwa by the Majelis Ulama Indonesia (MUI), the addition of alcohol to fermented products is also allowed. In contrast, standards in Middle Eastern countries generally do not allow fermented products containing alcohol. This highlights a gap between local perceptions in Japan and broader halal guidelines.

Excessive requirements and costly audits discourage companies from providing halal products, affecting daily life and social integration. This study examines Japanese enterprises that pursued but eventually withdrew from halal certification, focusing on challenges in securing halal ingredients, segregating production lines, and managing certification costs.

Drawing on Islamic jurisprudence principles—istihalah (transformation), darurah (necessity), and maslahah (public interest)—the study explores a practical halal certification model that maintains religious authenticity while supporting economic sustainability and multicultural coexistence.

2. MATERIAL AND METHODS

This study is a qualitative investigation based on information collected since 2018, as well as halal compliance support provided to Japanese companies between May 2019 and March 2025. The author, an internal halal auditor certified by BPJPH[3] in March 2023 and director of Muslim Friendly Japan[4], conducted this work pro bono. In this capacity, the author facilitated communication with local mosques and assisted companies in applying for Indonesia's BPJPH certification.

The study documents interactions with audit advisors and the certification process, revealing institutional, economic, and cultural barriers. Discussions with imams and ulama explored the flexibility of religious interpretation grounded in Islamic jurisprudence. Using participant observation and interviews, the research clarifies limitations of the current certification regime and proposes directions for a more context-sensitive and sustainable halal system in minority-Muslim societies.

3 Tanada, H. (2025). *Estimate of Muslim Population in Japan, 2025*. Research Papers: Muslims in Japan No. 30, Retrieved from https://www.imemgs.com/foreign-research/837/

4 *BPJPH (Badan Penyelenggara Jaminan Produk Halal)* is the official halal certification authority under the Indonesian Ministry of Religious Affairs, which has issued halal certifications since 2019, replacing the previous certification body LPPOM MUI.

3. CASE ANALYSIS AND RESULTS

3.1 Case Study of Nanao Seika in Kitakyushu

The most closely tracked case was Nanao Seika Co., Ltd., a small-to-medium confectionery producer in Kitakyushu considering halal products for Muslim tourists and students. Initially, under the guidance of the local mosque imam, the company reviewed its production lines and raw materials and obtained halal certification from the mosque[5].

When aiming for BPJPH certification in Indonesia, the company faced multiple challenges. Halal certificates were generally required for all raw materials[6], and many domestic ingredients lacked certification, limiting product development. Requests for chemical formulas could not be met due to trade secrets. Certified halal vitamin E was unavailable domestically; attempts to import it from South Korea were blocked due to Japanese import restrictions, and Chinese suppliers required minimum orders of one ton[7], which was impractical.

Meeting all these requirements proved excessive, and the company ultimately abandoned BPJPH certification.

3.2 Case Study of a Sauce Manufacturer in Osaka

At a sauce manufacturer in Osaka, securing a halal-dedicated **bottling machine** was a major barrier, as all products share expensive main equipment. Initially, following an auditor's advice, the company reviewed its raw materials. However, in March 2023, BPJPH ruled that any equipment used with pork-derived ingredients cannot be shared, regardless of a non-use period[8].

Shared production lines are common for liquid foods, and complete separation is costly. The company abandoned certification and refrained from domestic and export sales, showing that reproducing international halal production conditions in Japan is impractical. Even major manufacturers like Kewpie and Otafuku Sauce produce halal products at Malaysian subsidiaries and re-import them to Japan.

3.3 Impact on the Food Service and Retail Industry

Discussions were conducted via email and online meetings with representatives of supermarkets and convenience stores to explore the possibility of halal bento production. These discussions revealed that the lack of dedicated halal production lines in such stores has hindered the development of halal bento products[9]. As a result, the variety of halal foods available in Japan remains limited, restricting

5 *Muslim Friendly Japan* is a non-profit organization promoting inclusive halal practices and interfaith understanding in Japan.

6 Halal certification was obtained from Fukuoka Mosque.

7 Information on BPJPH standards is based on responses from advisors and officials at LPH-KHT Muhammadiyah.

8 Information on import restrictions is based on inquiries made by Nanao Seika's halal officer to the relevant foreign companies.

9 BPJPH issued new regulations in March 2023 prohibiting shared equipment between halal and non-halal products if pork-derived ingredients were ever used.

BPJPH, *Keputusan Kepala Badan Penyelenggara Jaminan Produk Halal Nomor 20 Tahun 2023 tentang Perubahan atas Keputusan Kepala Badan Penyelenggara Jaminan Produk Halal Nomor 57 Tahun 2021 tentang Kriteria Sistem Jaminan Produk Halal*.(https://cmsbl.halal.go.id/uploads/Kepkaban_No_20_Tahun_2023_Perubahan_SJPH_3_bca72daa00.pdf)

options for both domestic Muslims and international travelers. Many restaurants are unable to obtain halal certification because they use shared kitchens or serve alcohol and pork. Under strict overseas standards, such practices may render the entire menu non-halal.

3.4 Misunderstandings Regarding Alcohol

Currently, under most international halal standards, the use of industrial ethanol—whether derived from fermentation or synthesis—is conditionally permitted as long as it is not used in beverages. This change occurred in the early 2000s[10], but it is largely unknown to Muslim consumers, resulting in confusion in the market. As a result, most Muslim consumers simultaneously consume halal-certified products containing alcohol in processing, while avoiding products that list alcohol as an ingredient.

Old views about alcohol cause serious problems, as many still believe all alcohol is haram[11]. This persists partly because halal certification bodies have not clearly published standards. Simply sharing products or guidelines with them has not increased Muslim consumer awareness.

Even the imam of Fukuoka Mosque faced this: a bento caterer stopped offering halal options after being told the kitchen could not be disinfected with alcohol[12]. Many restaurants cannot get halal certification due to shared kitchens or equipment. Serving alcohol or pork can make the entire menu non-halal under strict overseas standards. As a result, these restaurants often cannot properly serve halal customers.

3.5 Flexible Approaches by Local Mosques

Local mosques sometimes apply more practical halal standards. For example, shared equipment may be allowed if contamination risk is very low and there is no intentional mixing, as supported by Sahih al-Bukhari 5496[13]. However, the industry still strongly perceives "strict overseas certification as the only legitimate standard," hindering Japanese companies' efforts[14].

10 Information based on email correspondence and online meetings with representatives of major supermarkets and convenience stores regarding halal bento production.

11 This can be confirmed in publications by IFANCA and in fatwas issued by MUI.

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12 The persistence of the belief that all alcohol is haram is based on observations and interviews with Muslim consumers in Japan. *It should be noted that people are often not informed that, since the early 2000s, many international halal standards have conditionally allowed the use of industrial ethanol.*

13 Based on information from Fukuoka Mosque's imam at that time (2019) regarding a bento caterer who attempted halal production.

14 Sahih al-Bukhari 5496, available at https://sunnah.com/bukhari:5496

3.6 Incompatibility with Traditional Japanese Food Culture

Traditional Japanese cuisine widely uses seasonings containing alcohol, creating barriers for halal compliance. The Majelis Ulama Indonesia's (MUI) ruling that mirin is haram[15] has created challenges for the daily lives of Muslims residing in Japan. However, many Japanese Muslims consume such food as halal based on the Hanafi school[16]. Treating it as haram has sparked protests. In 2016–2017, mosque leaders across Japan issued a joint statement opposing the halal certification system[17].

Not a few Japanese Muslim activists—including imams and halal certification staff—oppose certification systems that make daily life difficult. At the same time, in their private lives, they generally accept traditional Japanese seasonings. This has further strengthened resistance to international halal standards that do not recognize such foods.

4. DISCUSSION

The global spread of halal certification has transformed Muslim consumption patterns and the world food market. Originally aimed at ensuring religious compliance, it has become a highly institutionalized and commercialized industry. While it brings transparency and trust, it also creates structural inequalities, especially in minority-Muslim countries like Japan, where social, cultural, and industrial infrastructures differ from Muslim-majority regions[1].

In Japan, installing dedicated halal equipment for Muslimsis costly and often unfeasible for both small and large companies. Many large firms instead produce halal products overseas in Malaysia or Indonesia, avoiding domestic production. As a result, halal-certified products sold in Japan, such as mayonnaise and okonomiyaki sauce, are often imported and can cost up to four times more than domestic equivalents, raising prices and barriers for halal services.

The slogan "Halal for Everyone" thus does not reflect reality in minority-Muslim countries like Japan. Likewise, the notion that halal-certified products are healthier and attract non-Muslim consumers is not always accurate.

These cases show that Japan's main halal challenges are less about religious compliance and more about excessive formalization, rigid international standards, limited dissemination of updated alcohol guidelines, and failure to recognize traditional Japanese fermented seasonings as halal. **However, there is good news: in October 2025, the modernist Indonesian Islamic organization Muhammadiyah issued a fatwa declaring the use of traditional Japanese seasoning mirin in cooking as halal**[18]. The difficulty of domestic halal production highlights the gap between certification systems and local realities.

15 Based on multiple email correspondences and online meetings with representatives from several Japanese companies regarding their perceptions of international halal standards.

16 Majelis Ulama Indonesia (MUI). (2022). *Here's why sake and mirin are haram*. Retrieved from https://halalmui.org/en/this-is-the-reason-sake-and-mirin-haram-2/

17 Testimony by Ahmad Maeno, a widely respected Japanese imam, during an online meeting organized by PCINU Jepang on September 10, 2023, regarding the permissibility of traditional Japanese fermented seasonings under the Hanafi school of thought. Available at: https://www.youtube.com/watch?v=NOIIln4pk4o.

18 Nagoya Mosque. (2017, August 10). Photo of mosque leaders opposing halal certification system [Facebook post]. Available at: https://www.facebook.com/photo/?fbid=1639610222777835&set=pb.100064791875566.

4.1 Ethical and Social Implications of Over-Standardization

In minority-Muslim societies like Japan, strict adherence to imported halal standards brings practical, ethical, and social challenges. When international certification bodies monopolize the definition of halal, local Muslim communities may lose the ability to interpret and apply Islamic dietary principles to their context. Consequently, the voices of imams and local residents may be excluded, and insights from local living environments overlooked.

This dependency risks turning halal from a practice of religious responsibility into a bureaucratic symbol. Restaurants serving alcohol or pork may be unable to offer partial halal menus, undermining social inclusion. Misunderstandings and stereotypes can arise between Muslims and non-Muslims, potentially fostering social segregation or "ghettoization."

Similar issues have been seen in Western countries, where halal products face resistance in mainstream markets. Opponents may view halal certification as a "religious tax" on non-Muslims or misunderstand it as endorsing cruel slaughter. Reforming the certification system is therefore not just technical but also an ethical and sociopolitical responsibility[1].

4.2 Returning to the Fundamental Principles of Shariah Law

Halal certification standards need to adapt, returning to the objectives of Islamic law—Maqasid al-Shariah—which emphasize mercy, justice, and public interest. Classical jurisprudence mechanisms such as Istihalah (chemical transformation), Darurat (necessity), and Maslahah (public interest) have historically allowed flexible judgments based on context.

In modern food production, these principles permit shared equipment when contamination risks are low or partial halal certification in restaurants with strict ingredient separation[1]. Substances once considered impure may be permissible under Istihalah, and Darurat allows certain prohibitions to be relaxed when no alternatives exist. Applying these principles bridges the gap between ethical ideals and practical realities while respecting minority Muslim experiences. The halal certification system should reflect these long-standing traditions and moderation.

4.3 Sustainability and Economic Inclusivity

Current international halal standards often exceed basic requirements, conflicting with sustainability goals. Dedicated production lines increase machinery, energy use, and resource waste, contradicting Islamic environmental ethics and the UN SDGs.

For SMEs in Japan, building parallel systems is economically and environmentally costly. Flexible certification allowing shared equipment under verified cleanliness can maintain Shariah compliance while reducing impact.

Lowering certification costs and simplifying procedures can democratize market access. High fees and complex administration burden certification bodies, companies, and consumers. Low-cost, transparent models inclusive of local communities can restore halal certification's original purpose: aligning food production with divine guidance while supporting economic justice and social welfare.

4.4 Toward a Context-Sensitive Halal Model

To address the issues in this report and support Muslim communities, international halal certification bodies should develop sustainable standards that consider minority-Muslim contexts. Local scholars (ulama) and Islamic organizations with deep knowledge of local conditions should be involved in setting standards.

Many certification bodies operate under mutual recognition agreements, but hierarchical audits make it difficult to raise concerns or provide feedback.

If a single unified standard is not feasible, a multi-tiered system could help. For example, distinguishing "strict halal" from "basic halal" could reflect diverse consumer needs. Organizations like SMIIC could set separate standards for minority-Muslim countries, while Muslim-majority countries could allow bilateral exceptions. Such reforms would maintain halal integrity while broadening access.

The core challenge is determining for whom halal standards exist and how to meet believers' needs. Restoring halal as a living ethical system that balances faith, sustainability, and cultural coexistence is essential. This recalibration allows halal certification to fulfill its purpose: safeguarding faith and human dignity across societies.

5. CONCLUSION

This report examined the realities of halal certification in minority-Muslim societies, using Japan as a case study. Engagement with local food manufacturers and religious leaders showed that current international halal systems are largely modeled on Muslim-majority countries, imposing costly requirements that exceed core Islamic jurisprudence. Such standards hinder companies in minority-Muslim countries and limit Muslim consumers' access, undermining Shariah's inclusive spirit.

Excessive standardization can create new economic and social exclusions. When halal is defined by bureaucratic or commercial mechanisms, the communities it serves may be alienated. Rigidity also conflicts with sustainability and multicultural coexistence, increasing industrial waste and social divides.

The report advocates aligning halal certification with Islamic law's fundamental objectives: justice, mercy, and public welfare. Practical reforms should apply Istihalah, Darurat, and Maslahah contextually, and involve local ulama and community organizations. Multi-layered, context-sensitive certification can ensure religious authenticity while improving accessibility, sustainability, and social harmony, reflecting diverse Muslim experiences in minority contexts.

Halal certification should be seen not as a rigid international standard but as a flexible ethical framework adaptable to cultural and social realities. Such inclusivity allows Muslims worldwide to practice their faith with dignity while promoting mutual understanding and coexistence.

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(O-32) HALAL FOOD PREFERENCES IN THE WEST THROUGH QUR'ANIC AND JURISPRUDENTIAL INTERPRETATIONS

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Abstract

This paper explores current halal food debates among Muslims in the West, focusing on the jurisprudential issue of "zabiha" (ritual slaughter). Grounded in Qur'anic directives and diverse legal interpretations, it examines how food choices reflect not only religious obligation but also personal piety and community identity.

In Western contexts, Muslims often face challenges balancing religious dietary laws with the realities of industrial food systems and secular regulations. Diverging scholarly views, especially concerning food prepared by non-Muslims and the criteria for valid slaughter, create confusion. This study calls for a Qur'an-based yet jurisprudentially inclusive approach to halal practices that responds to these contemporary complexities.

A Qur'an-Centered Approach to Food Consumption

The Qur'an sets clear boundaries regarding food consumption. Verses such as al-Baqarah 2:173, al-An'am 6:145, and al-Nahl 16:115 explicitly prohibit carrion, blood, pork, and animals slaughtered in the name of anything other than Allah. These prohibitions form the basis of the halal food definition. Surah al-Ma'idah 5:5 further provides an important jurisprudential framework for Muslims in the West by stating that the food of the People of the Book is lawful. However, interpretations of this verse vary among the schools of law; while the Hanafi school adopts a stricter view, the Shafi'i and Maliki schools offer more generalist approaches.

The Distinction Between Zabiha and Halal: Jurisprudential Dimension

"Zabiha" refers to the ritual slaughtering of animals according to specific conditions: the animal must be alive at the time of slaughter, the slaughterer must be a Muslim or from the People of the Book, and Allah's name must be invoked during the act. Jurisprudentially, meat that does not meet these requirements is considered haram. However, the extent to which these conditions are met in modern slaughter houses is a matter of concern. Even when a product has a halal certificate, whether it fulfills the "zabiha" criteria remains a point of sensitivity for many Muslims. This distinction complicates the simplification of the halal concept and forces consumers to make decisions based on their sectarian affiliations.

The Influence of Jurisprudential Interpretations Among Western Muslims

Using the United States as a case study, the distinction between halal and zabiha significantly impacts daily life. Practicing Muslims often face dilemmas about dining in fast food chains. Questions directed to institutions such as the Diyanet Center of America are typically answered through jurisprudential discourse, based on distinctions between the Shafi'i and Hanafi schools. These differences push some individuals towards a more conservative stance, while others adopt a more pragmatic approach.

Qur'anic Perspective and Jurisprudential Flexibility in Halal Certification

In halal certification processes, adherence to the Qur'an's basic restrictions is essential. However, differences in interpretation among jurisprudential schools complicate decision-making for certification bodies. Divergences in the application of verses like Ma'idah 5/5 hinder the unity of the global halal market. Therefore, certification processes must adopt a multidimensional approach that prioritizes Qur'anic principles while also accommodating sectarian flexibility.

Conclusion

For Muslims living in the West, halal food preference is not just a religious duty but also an identity-driven behavior. The halal-zabiha distinction necessitates the consideration of both jurisprudential diversity and the Qur'anic perspective. This paper advocates for an approach centered on the Qur'an, respectful of jurisprudential differences, and oriented toward unity in halal certification.

Keywords: Halal, Zabiha, Qur'an, Jurisprudence, Western Muslims

ACADEMIC SECTION 2: POSTER PRESENTATIONS

WHS

(P-01) THE EFFECTS OF HALAL-VEGAN INTEGRATION IN THE SUSTAINABLE FOOD INDUSTRY ON CONSUMER PREFERENCES AND MARKET DYNAMICS

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Abstract

Religion plays a decisive role in shaping individual dietary behaviors by transcending food into a mere nutritional element and imbuing it with spiritual meaning, shaping nutritional status and food preferences.

Technological advancements have brought profound transformations to the food production industry, enabling the fulfillment of the continuously increasing global demand for safe, nutritious, and sustainable foods. Changing lifestyles, higher income levels, and greater consumer awareness — including preferences for healthy eating, vegan/vegetarian, halal, or gluten-free products — have collectively increased product diversity in the market. In recent years, consumer preferences and dietary habits have evolved significantly, driving demand for innovative products within the global food industry. Religion also plays a decisive role in shaping individual dietary behaviors by imbuing food with spiritual meaning and integrating faith-based values into consumption patterns.

This dynamic has positioned **halal** and **vegan certifications** at the forefront of ethical food production. Halal certification ensures compliance with Islamic dietary rules, while vegan certification guarantees the absence of animal ingredients and by-products. Moreover, the growing importance of sustainable food consumption has further intensified consumer awareness.

This study aims to examine the commonalities and differences between halal and vegan certifications, assess consumer demand and market potential for food products emerging in this intersection, and evaluate their relationship with ethical food production. Additionally, the environmental and social impacts of these products are addressed within the context of sustainable and ethical food production. The study was conducted through a literature review and analysis of current industry reports.

Findings indicate a growing demand for products certified as both halal and vegan, especially among younger consumers and ethically conscious groups. These products hold the potential to establish a distinct niche market in the global food sector, fostering sustainability and ethical production practices. The study concludes that halal values, like other sustainability-related principles, influence ethical consumption trends. Therefore, it is recommended that relevant institutions focus on standardization, certification collaboration, and consumer education initiatives. Considering these values when developing marketing strategies for halal–vegan products may positively influence consumer attitudes and support a more sustainable and ethical food future.

Keywords: Halal Food, Vegetarian/Vegan Food, Sustainability, Ethics

INTRODUCTION

Industrial food production is rapidly evolving day by day. Innovative products are now much more common in the food market. With changing dietary patterns, the demand for innovative products is constantly increasing. Consumers are becoming more aware of different dietary choices (healthy eating, vegan/vegetarian, halal, gluten-free), preferring different eating styles and their ethical sensitivities, which is increasing the variety of products on the market. This situation brings both halal and vegan certification processes to the forefront. Halal certification ensures compliance with Islamic religious rules, while vegan certification ensures that the absence of animal ingredients and by-products are used. Furthermore, the emergence of consumer sensitivity towards sustainable food is also of great importance.

Consumption should not only meet the individual's needs but also avoid harming people and the environment during and after the production stage (Meydan, 2017). Another important issue regarding consumption is that increased competition due to globalization has led to a mindset of achieving high profits at low costs and the uncontrolled consumption of natural resources (İlbaş, 2022). Today, the mindset of uncontrolled use of natural resources has been replaced by the idea of protecting resources and passing on a sustainable world to future generations (Şüküroğlu, 2024).

With the increase in conscious and sensitive consumers, factors such as health, ethics, and religious values have begun to significantly influence lifestyles and consumption preferences (Erdoğan and Gürbüz, 2023).

This study highlights the commonalities between halal and vegetarian/vegan certifications, suggesting that the needs of both Muslim individuals who prioritize halal food and consumers who prefer a vegan/vegetarian diet can be met with a single certification. Furthermore, it is also emphasized that Islam, as a perfect religion, attaches great importance to ethical values in food production, just as it does in all areas of life. Islam adopts principles such as honesty, justice, reliability, hygiene, prevention of waste, and social responsibility as a guide not only in worship but also in production and consumption processes. Thus, Islam forms the basis of a sustainable, reliable, and ethical food system in terms of both individual conscience and social welfare.

1. INTERSECTION POINTS OF HALAL AND VEGETARIAN/VEGAN CERTIFICATION

1.1 Definition of Halal and Vegetarian Certification Systems

Halal certification involves the inspection of companies by impartial, reliable, accredited organizations with adequate laboratories and personnel, based on halal standards previously determined by experts, and the issuance of the necessary documentation as a result. Halal certification meets the demands of individuals who are sensitive to halal food and also ensures that food products comply with hygiene and health requirements (Güzel and Kartal, 2017). A product that has obtained a halal food certificate means that it has been produced according to Islamic principles. Studies show that interest in halal food certification is a rapidly increasing. Especially in recent years, halal food certification has become a significant important factor influencing purchasing decisions not only for consumers with religious beliefs but also for individuals belonging to different belief systems. Halal certification systems have been largely integrated with international food safety systems such as ISO 22000, HACCP, GMP, and GFSI over the past 20 years.

Halal food is also associated with factors such as additives, production, and slaughtering methods. Therefore, halal certification attracts the interest of a wide range of consumers beyond religious foundations and holds a significant share in the market (Demirer and Özdemir, 2020).

A vegetarian diet means not consuming animal-based foods such as meat and fish. The food industry implements various strategies to promote sustainable consumption. One of these is the use of vegan labels that indicate a product meets specific ethical and environmental standards. The "V-Label" certification, developed by the European Vegetarian Union (EVU) in 1996, facilitates the identification of vegetarian and vegan products, providing a reliable label for consumers who avoid animal-based foods or make conscious choices. Beyond their health benefits, vegetarianism and veganism are associated with animal rights, ethical values, and environmental sustainability. They are not merely a way of eating, but an ethical and sustainable way of life (Genç and Şen, 2025).

Figure 1 Halal Vegan Certificate (ISQ, ty)

The halal vegan certificate is issued when a product is produced in accordance with Islamic rules and contains no animal products. This certificate is intended for both Muslims who are sensitive to halal food and consumers who prefer a vegan/vegetarian diet (ISQ, n.d.).

The main reasons motivating people to become vegan include their own health, environmental concerns, and animal rights, which align with Islamic rules.

2. ETHICAL FOOD UNDERSTANDING AND UNIVERSAL VALUES IN ISLAM

2.1. The Concept of Halal and Tayyib

The dictionary meaning of the term "halal," which means "permissible," is encountered in every aspect of life. The concept of "halal food," which we have been hearing a lot about in recent years, refers to food that is Islamically safe to eat or drink, and that has been produced according to Islamic principles throughout its entire process from field to fork (Sert, 2021). The Qur'an commands us to "eat halal and clean foods." Clean, tayyib food includes foods and beverages that are inherently clean. The opposite of this is haram or najis, "impure" food. All halal and clean foods are also healthy foods (Türker, 2020).

A Muslim individual must choose what is halal and tayyib. This is because it is obligatory for Muslims to eat halal and tayyib food. Therefore, it is not enough for food and drink to be halal. It is necessary to ensure that the food consumed does not contain haram, impure, or unclean elements and that it is clean and healthy (Şener and Kaplan, 2024).

2.2. Ethical Principles

2.2.1 Animal Welfare

In today's world, humanity has realized that animals also have fundamental rights. As laws concerning animal welfare increase, environmentalists and scientists emphasize their importance in the ecosystem. However, 1,400 years ago, Islam commanded the protection of animals, treating them with compassion, and taking their lives only when necessary, through the teachings of the Quran and the Prophet Muhammad (SAW). Islam, as a perfect and complete religion, has established rules that also protect animal rights. Many verses in the Holy Quran mention the rights and welfare of animals. In fact, there are six surahs named after animals. In Surah En'am (6/165), it is stated, "*Every animal that walks on the earth and every bird that flies with two wings are communities like you. Their circumstances, sustenance, and lifespans are all written down. We have not neglected or omitted a single thing in the Book. Then they will be gathered before their Lord*." This verse clearly shows that animals are living beings like humans and have the same rights as humans created by Allah. Furthermore, while animals were treated cruelly in pre-Islamic times, the Prophet Muhammad (SAW) prohibited these practices and ensured animal welfare (Tasgheer and Anwar, 2021).

While some people may find animal slaughter painful according to Islam, scientifically correct slaughter causes pain for only a few seconds. The rapid drainage of blood from the body causes less pain to the animal, and Islam prioritizes the animal's welfare by adhering to the principles of compassion and hygiene during slaughter (Eninn 2012). Islam is absolutely opposed to any kind of abuse or cruelty towards animals throughout the halal meat supply chain and commands that animals be slaughtered in a conscious, careful, and compassionate manner, in accordance with the teachings of our Prophet Muhammad (SAW) (Farouk, Pufpaff, and Amir, 2016). Islam attaches great importance to animal welfare and does not permit cruelty to animals.

2.2.2 Healthy Food

In the 21st century, the negative effects of fast food on health have led individuals to adopt healthier diets, contributing to the rise in popularity of vegetarian and vegan diets driven by health, ethical, and environmental concerns (Şener and Kaplan, 2024). Similarly, it is well-known that healthy eating is a requirement of Islamic ethics. In industrial production, practices such as hygiene, slaughter methods, animal feeding, and cleaning are of great importance in terms of both human health and the halal status of food (Sert, 2021).

A halal-certified product also indicates that it is healthy, clean, and safe. The health of society and individuals can be ensured by adhering to halal principles at every stage of the production process. For example, for a product to be halal-certified, it must not contain additives that harm human health. Therefore, products containing toxic or harmful substances are not considered halal (Doğaner and Fidan, 2021).

During the Seljuk and Ottoman periods, the Ahîlik Organization, which ensured that artisans and craftsmen provided safe and high-quality products in accordance with Islamic ethical rules, also played a significant role in food standards and the protection of human health (Sert, 2021).

2.2.3 Honesty and Transparency

Islam is a religion that places great importance on good morals and ethics in all areas of life, including business. In Islam, ethics and moral principles guide all areas of life, including trade. In Islam, faith forms the basis of all behavior. A person cannot be a Muslim unless they believe in Allah. Therefore, a Muslim must live in accordance with Allah's revelation, Islamic rules, and moral and ethical principles (Alwi, Parmitasari, and Syariati, 2021). Just as a Muslim individual adheres to Islamic rules throughout all the processes a product undergoes from farm to table, they must also adhere to and apply the moral values taught to us by Islam.

Trust (emanet) is a concept synonymous with our Prophet Muhammad (SAW). Being trustworthy and reliable is considered one of the most fundamental characteristics of a good Muslim. This behavior ensures that the individual remains faithful to the moral principles of Islam by protecting their intentions and faith (Shuhari et al., 2019). A Muslim individual must always be trustworthy and act with a sense of trust. Honesty in trade or production is one of the most fundamental principles of Islamic morality. Therefore, a Muslim should not deceive the customer, conceal the quality of the product, or sell defective or faulty goods as if they were genuine. Cheating in measurement and weighing, using low-quality or harmful substances in the production process, providing false information, or deceiving consumers through advertising are also behaviors contrary to the understanding of trust. This is because, in Islam, halal income is not only related to the product itself but also to honesty at every stage from the production of that product to its sale. According to Abu Sa'id, the Prophet (pbuh) said: "The honest and trustworthy merchant is with the prophets, the Siddiqs (truthful people), and the martyrs" (Tirmidhi, n.d.).

2.2.4 Justice

Justice is one of the most important aspects of preserving the moral stance of a Muslim individual. Justice ensures that a Muslim individual treats another individual fairly (Alwi, Parmitasari, and Syariati, 2021). Allah Almighty says in Surah Hadid verse 25: "*And indeed, We sent our messengers with clear proofs, and We sent down with them the Book and the Criterion so that the people may establish justice.*" In other words, Allah Almighty also sent the Prophets to establish justice on earth.

According to Islamic belief, every action affects a Muslim's afterlife. For this reason, the Prophet (SAW) emphasized that all commercial activities must be honest, fair, and in accordance with halal principles (Alwi, Parmitasari, and Syariati, 2021).

Interest causes loss and hardship for the debtor, and for this reason, Islam has prohibited interest and only permits fair commercial transactions. Allahu Teala states in Surah Isra, verse 35: "When you measure, measure fully and weigh with a correct scale. This is better and yields a more beautiful result." He praises those who observe balance and justice in trade and rewards them in both this world and the hereafter, while condemning those who unjustly consume the property of others and those who bribe officials (Al-Baqarah, 2:188).

2.2.5 Social Responsibility

Throughout their lives or during certain periods of their lives, people may have many material or spiritual needs. To meet material needs, people earn money, while to meet spiritual needs, they share love, compassion, and kindness. In order to achieve social harmony and peace, the rich must provide material assistance to the poor, and all Muslims must provide spiritual support to one another (Çoban, 2024).

Many verses in the Holy Quran mention zakat and sadaqa. Furthermore, "giving zakat" is one of the five pillars of Islam. In a survey conducted on 685 households in Indonesia, the survey data was tested, and the positive effects of zakat institutions in reducing poverty were observed (Kasri and Ahmed, 2019).

2.2.6 Sustainability

In modern thought, the religious, legal, and political spheres are always treated as separate categories. However, in the pre-modern lives of Muslims, morality and spirituality were seen as an integral part of religion. In other words, living a religious life encompassed not only worship but also one's heart, soul, and relationship with nature. In this context, some Islamic thinkers have emphasized that people's excessive consumption and focus solely on material values leads to environmental and social problems, and have stated that an "ethical economy" and a spiritually-focused approach are necessary instead (Tripp, 2006). For example, Seyyid Hüseyin Nasr stated in 1966 that environmental problems are rooted in a spiritual crisis. In 1986, Dr. Abdullah Omar Nasser emphasized at an interfaith conference that values and spiritual ethics would support environmental protection. Similarly, the 1993 Parliament of the World's Religions expressed that all living things are interconnected and that harmony with nature is important. These examples demonstrate the close relationship between human spiritual well-being and environmental health, and thus the importance of developing a consciousness and moral responsibility that goes beyond material life (Rush, 2018).

Food loss refers to the loss of quality and value that occurs during the production, harvesting, processing, and distribution stages. Food waste, on the other hand, refers to the disposal of food before it spoils or reaches its expiration date. The difference between the two lies in which stage of the food chain the loss occurs. However, since both cases result in economic, social, and environmental losses, both can be broadly defined as food waste (Dölekoğlu, 2017). There are various Islamic rules that encourage reducing food waste. Muslims avoid wasting food in line with these values. Islam views respect for food as a responsibility. Therefore, while wasting is considered a negative and sinful behavior, sharing and donating food to those in need is considered both a moral behavior and an act that earns reward. Thus, Islam supports a sustainable consumption approach by strengthening both individual awareness and social solidarity (Sobian, 2022).

In Islam, the sustainable use of resources for future generations is not a new concept. The Holy Quran emphasizes the principles of justice, balance, and responsibility in the use of natural resources. According to Islam, nature is a gift from Allah to all generations, and when utilizing these resources, one must respect the rights of others. Avoiding excess, being moderate, and not wasting are both environmental and moral obligations. The sustainable use of resources means both complying with Allah's command of justice and protecting the rights of future generations (Akter, 2024). Allah Almighty states in verse 31 of Surah A'raf: "*Eat and drink, but do not waste. For He does not love those who waste*."

2.3 Universality of Halal Certified Products

The concept of **Halal** is no longer just a religious requirement of Islamic societies, but **an indicator of ethical, hygienic, reliable and sustainable production approach on a global level.** In this respect, halal encompasses values such as cleanliness, naturalness, animal welfare, respect for human dignity and labor, and fair production. : Today, halal certification is considered more than just a religious norm; it is a complementary system to international food safety, quality management, and consumer rights standards **.** Halal principles coincide with the concepts of "**ethical consumptio**n," "**clean production**," and "**conscious production**" even in non-Muslim societies. Halal-certified products are preferred not only by Muslims but also by different faith groups due to the perception of "**healthy and reliable products."**

The universality of halal-certified products is not only economic but also serves as a socio-cultural bridge. Today, the "halal" label has become a global symbol of trust not only for Muslim consumers but for all individuals who embrace common ethics (integrity, clean production, prevention of waste) and sustainable lifestyles across different belief systems. Therefore, halal certification is not merely a religious requirement but a universal system at the intersection of global food safety, quality, and ethical production.

3. CONCLUSION

This study examines the intersections, differences, and impacts of halal and vegan certification systems in the food industry within the context of sustainability, offering a new perspective on ethical food production and consumer behavior. It demonstrates that products with both halal and vegan certification are forming a rising trend in the global food market and are particularly preferred by consumers with high ethical sensitivity. This situation indicates that "halal-vegan integration" could create a significant competitive advantage in the future of the food industry.

The halal-vegan concept not only combines religious and ethical requirements but also forms the basis of a sustainable food system that is environmentally conscious, uses resources efficiently, considers animal welfare, and prioritizes transparency in production processes.

In this context, halal-vegan certification is expected to become not just a niche market segment in the future, but an integral part of mainstream food policies. The growing demand for halal-vegan products is reshaping the production strategies of multinational food brands and encouraging collaborations in this field.

Furthermore, the halal-vegan production approach is directly linked to the United Nations Sustainable Development Goals (SDGs) – responsible production and consumption and healthy lives. Therefore, this area should be seen as a model that integrates ethical, religious, and environmental sustainability into future food policies. It proves that the concept of halal is no longer just a religious label, but is seen as a symbol of quality and trust in international trade.

In conclusion, halal-vegan integration offers multidimensional opportunities for producers, consumers, and policymakers alike. For producers, this integration means access to new markets and increased brand credibility, while for consumers, it offers an ethical, healthy, and religiously compliant form of consumption.

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(P-02) MICROBIOLOGICAL CLEANLINESS IN HALAL FOODS: A BRIDGE BETWEEN FOOD SAFETY AND RELIGIOUS COMPLIANCE

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Abstract

The expansion of global halal markets requires laboratories to produce reliable and comparable results not only on food safety parameters but also in areas specific to halal requirements. The Turkish Standards Institute (TSE) Biogenetics and Food Laboratory adopts a comprehensive approach in microbiological analyses conducted accordingly with OIC/SMIIC Halal standards.

Halal food certification is a multidimensional system encompassing not only compliance with religious norms but also hygiene, quality, and food safety criteria. Concordantly, the microbiological safety of halal foods is critical for both protecting consumer health and maintaining the halal assurance system integrity. Contamination of food with pathogens such as Salmonella spp., Escherichia coli, Listeria monocytogenes by leading to foodborne infections and contradicts the principle of "tayyib" (clean). Therefore, microbiological analyses must be regularly conducted within the framework of the halal certification processes.

Halal certification at the TSE goes beyond species identification. By integrating microbiological controls into certification, TSE ensures that halal foods comply not only with religious requirements but also with the "tayyib" principle of cleanliness and safety. With OIC/SMIIC international standards, these microbiological tests validate the reliability of halal assurance systems and strengthen consumer trust worldwide.

Thus, microbiological analysis in halal food certification is a vital food safety parameter that integrates religious and public health dimensions. By combining its mission of laboratory analysis and certification with SMIIC's international framework, TSE demonstrates that microbiological control is a strategic necessity to retain consumer trust, strengthen global halal reliability, and positioning Turkey as a trusted actor in the halal market.

Keywords: Foodborne Pathogens, Halal Assurance, Tayyib Principle, Microbiological Analysis, Halal Certification

(P-03) SCIENTIFIC VERIFICATION IN THE HALAL SUPPLY CHAIN: CONTRIBUTIONS OF THE TSE FOOD LABORATORY

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Abstract

Ensuring the integrity of the halal supply chain involves more than adherence to Islamic dietary laws; it also requires scientifically validated verification at every stage of production. As global demand for authentic halal products increases, the role of accredited laboratories becomes essential. The Turkish Standards Institution (TSE) Food Laboratory plays a key role by providing objective and reliable scientific analyses that support halal certification from raw material sourcing to final product assessment.

The laboratory employs a wide range of accredited chemical, microbiological, and molecular testing methods to identify elements that may compromise halal status. These include the detection of alcohol, porcine-derived substances, non-compliant additives, and risks of cross-contamination. All analyses are performed in accordance with internationally recognized standards, particularly those set by the Organisation of Islamic Cooperation / Standards and Metrology Institute for Islamic Countries (OIC/SMIIC), ensuring both national consistency and global credibility.

Through its scientifically robust and reproducible results, the TSE Food Laboratory enhances the reliability of halal certification bodies and assists food producers in achieving regulatory compliance. Its services are especially critical when testing complex food matrices, where detecting trace-level haram substances requires advanced analytical capabilities.

Real-world applications—such as verifying alcohol-free claims or identifying minute quantities of prohibited materials—demonstrate the laboratory's essential role in safeguarding halal integrity. These efforts help maintain consumer trust and contribute to increased transparency and accountability in the halal food industry.

In conclusion, the TSE Food Laboratory serves as a cornerstone of scientific verification within the halal supply chain. Its accredited infrastructure, adherence to international standards, and comprehensive testing capabilities support the credibility, sustainability, and global acceptance of halal-certified food systems.

Keywords: Halal Food Testing, TSE Accredited Laboratory, OIC/SMIIC Compliance, Cross-Contamination Analysis, Porcine Residue Detection

(P-04) STRENGTHENING GLOBAL TRUST IN HALAL CERTIFICATION: THE ROLE OF DUAL ACCREDITATION AND ADVANCED TESTING PRACTICES AT TSE

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Abstract

The reliability of halal testing and certification relies not only on accurate analytical methods but also on compliance with internationally recognized accreditation standards. Accreditation ensures both technical competence and impartiality, which are essential for sustaining trust in the halal assurance system. In this context, the Turkish Standards Institute (TSE) implements a comprehensive model by combining dual accreditation: ISO/IEC 17025 laboratory accreditation and halal analysis accreditation under OIC/SMIIC 35.

This dual accreditation framework provides a strong example where scientific validity and halal compliance are simultaneously guaranteed. To reinforce this structure, the TSE Food Laboratory systematically uses accredited reference materials and participates in proficiency tests (PTs). These practices ensure traceability, reproducibility, and comparability of results across laboratories, strengthening confidence at both national and international levels.

Moreover, dual accreditation ensures that the halal certificate on food products is not merely a label but represents independent assessment and scientifically validated assurance. This approach transforms halal from a declaration into a verifiable standard, positioning it as a high-quality indicator that is recognized beyond religious compliance.

By combining laboratory competence, halal-specific accreditation, and impartial certification under one system, the TSE Food Laboratory safeguards consumer trust, enhances international recognition of certificates, and positions Turkey as a reliable global actor in halal testing and certification.

Keywords: Halal Assurance, Dual Accreditation, , Laboratory Testing, Certification, Reliability.

PROFESSIONAL SECTION: INVATED SPEAKERS

WHS

(I-01) "STRENGTHENING THE HALAL INDUSTRY VIA INNOVATION & EXCELLENCE" HALAL DIGITALISATION VIA INNOVATION

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Abstract

Halal, a very unique and synonym name for islamic religious related to consumables products including wearable items and daily routines which had become a major key role subject which had changed the mindset of people globally from the information and awareness related to HALAL.

With the recent change of the world economy and the passed COVID-19, many of the most HALAL stakeholders took a very strong steps and aggressive move by innovating all the information and stories about HALAL follows current market trend which using the media and internet innovations. HALAL industries players also moving forward by introducing and sharing products and the benefits of the system including introduction of HALAL with been innovated thru many areas such as laboratory, productions, moderations, application and many more HALAL standard policy makers also getting more innovative by using standard halal approach including strict audit and inspection by the appointed HALAL certification bodies before the certification approved and issued to the applicant . Studies by analyst had proved that HALAL became a main major factor for global on the standard and sustainability related to HALAL. The innovation by many players to ensure HALAL is easy to learn and followed made the main key of successful.

The rapid continuously of upgraded and finding new solution thru many ways of innovative system mad the HALAL system a excellence to understand and practice including a ceptable by people gobally. Muslim and non- muslim looking with the big huge hope that HALAL will continue to be the main solutions for people to have the safety of their consumables products, life style products and daily life assurance for present and future . HALAL had proved to the world that the system and solution which HALAL have and practised was one of the most safest and needed by the people around the world at present and future.

Although HALAL was originally known is Muslim system of safety and hygiene on products but thru the innovation with excellence it's had turn to be the most accepted solutions used by many people including Non-Muslim to ensure that the HALAL solutions were always consistent and easy to understand . The hard work and hand to hand of many people stake holders either individually, organizations and the governmental agencies had made one great of achievement for Halal industries. Innovation of excellence using the DIGITALISATION is oone of the important successful key and fast achievement for the HALAL induatries players. Innovation such as promoting , sharing and updating information globally by has proved the innovation of excellence regards to HALAL had made the greatest achievement with easy access by people worldwide to HALAL. Production, trading, retails, good and babefange including daily lifestyle had also acknowledged that practising HALAL can bring more attractions for consumers to accept anything regards to HALAL with full of confidence.

Today we can stand tall and be proud of HALAL with the systematic solutions and standards of all level regards to HALAL is understandable by the world and this had open the doors to the HALAL industries players to me more cooperative and motivated to take the innovation as a important tools to move forward to make HALAL benchmark was a total solutions for future and benefiting for all people. Therefore we all need stand together omg the HALAL industries players and to accept that the fast growth of HALAL must be always with good systematic solutions thru great innovations of excellence.

(I-02) HALAL IN THE DIGITAL ERA: ETHICAL AND REGULATORY PERSPECTIVES ON ARTIFICIAL INTELLIGENCE

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Abstract

The rise of artificial intelligence (AI) has brought about a new technological revolution, reshaping industries, communication, and the future of work. However, as AI grows more autonomous and integrated into decision-making systems, it raises deep ethical, philosophical, and spiritual concerns—especially within the framework of Islamic thought. This paper explores the concept of AI through the lens of the Halal industry, asking whether a dedicated AI Halal Standard is needed to guide its development and implementation.

Islamic principles emphasize accountability, the unity of body and soul, and moral responsibility—dimensions absent in artificial entities. The potential for AI to influence or simulate religious practices (e.g., the concept of "AI gods" or AI-led spiritual services) introduces moral dilemmas that demand serious scrutiny. While AI can process information and simulate human reasoning, it lacks consciousness, intentionality, and spirituality. These gaps point to the need for ethical governance rooted in values that transcend technical performance.

This abstract proposes Islamic ethical imperatives—such as the principle of Iqra (to read, seek knowledge, and reflect)—as a conceptual foundation for educating both users and developers of AI. However, this concept must be critically contextualized: Iqra is not merely about passive consumption of knowledge but calls for active, moral engagement. In the context of AI, this engagement requires that ethical and spiritual dimensions not be overshadowed by technological efficiency.

Initiatives across the Muslim world, including Shariah-compliant AI systems (e.g., Shariah AI in Malaysia), LPPOM MUI's AI-supported halal certification in Indonesia, and ethical AI research promoted by the Muslim World League, indicate growing awareness of the need to govern AI according to Islamic values. These initiatives pave the way toward a future Halal AI Standard that aligns with Islamic moral expectations.

From a regulatory standpoint, the European Union's AI Act offers a risk-based approach to AI governance. It classifies AI applications into prohibited, high-risk, and limited-risk categories and requires transparency, human oversight, and accountability. While the EU AI Act does not consider religious or spiritual ethics explicitly, it provides a regulatory baseline that could inspire contextual adaptations in Muslim-majority contexts, particularly for embedding Halal principles in digital systems.

The Halal industry, with its well-established emphasis on purity, transparency, and social benefit, is uniquely positioned to lead the development of AI governance frameworks that are ethically sound and culturally rooted. Such frameworks should ensure that AI serves as a trustworthy assistant, supporting human dignity and moral responsibility.

Scientific Contribution and Relevance to the Halal Industry:

This paper introduces an original proposal for integrating Islamic ethical frameworks into AI governance. It contributes to the emerging discourse on halal-tech synergy and envisions a future where AI systems not only comply with regulatory mandates but also reflect religious and cultural sensibilities. The analysis identifies a need for a global Halal AI Standard that bridges gaps between innovation, regulation, and ethical obligations.

Key Findings / Preliminary Conclusions:

- AI lacks moral agency and spiritual awareness, necessitating ethical and spiritual oversight.
- Iqra, as an Islamic imperative, provides a basis for responsible engagement with AI, beyond knowledge acquisition.
- The EU AI Act establishes foundational governance mechanisms that can be adapted to Halal contexts.
- Several Muslim-majority countries are actively exploring ethical AI applications aligned with Shariah principles.
- A Halal AI Standard is needed to guide the ethical use of AI technologies within the framework of Islamic values.
- AI should be positioned as a capable assistant operating within well-defined ethical and regulatory boundaries.

Keywords: Halal Technology, Artificial Intelligence, Islamic Ethics, AI Governance, Digital Responsibility, Halal AI Standard

(I-03) HALAL LOGISTICS IN E-COMMERCE AND LAST-MILE DELIVERY

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Abstract

The exponential growth of the global Halal market—projected to surpass USD 3 trillion in the coming decade—underscores the critical need for robust supply chain systems that guarantee Shariah compliance. Halal logistics encompasses the planning, implementation, and control of goods, information, and financial flows, ensuring that products and services adhere strictly to Islamic principles throughout the entire value chain. Unlike conventional logistics, Halal logistics requires meticulous segregation of Halal and non-Halal goods, stringent hygiene practices, and continuous monitoring to prevent physical, chemical, or cross-contamination.

This presentation will provide a comprehensive analysis of the technical and operational requirements of Halal logistics, including key elements such as dedicated transportation modes, specialized storage facilities, and Halal-certified handling procedures. The study explores the critical control points (CCPs) within the supply chain where potential risks of contamination and non-compliance are highest, and presents mitigation strategies such as zoning, sealed packaging, and tamper-evident systems. Additionally, the integration of advanced technologies—such as blockchain for immutable record-keeping, Internet of Things (IoT) sensors for real-time environmental monitoring, and RFID-based tracking for improved traceability—is discussed in detail as a means to strengthen supply chain transparency and integrity.

The role of Halal certification bodies and international regulatory frameworks is examined, highlighting the variations in standards across different regions and the resulting implications for global trade. The paper also addresses the operational challenges associated with implementing Halal logistics, including increased costs, complexity of logistics network design, and the need for specialized workforce training. Case studies of successful Halal logistics implementation in multinational food, pharmaceutical, and cosmetic supply chains are presented to illustrate best practices and practical solutions.

Furthermore, the research discusses the strategic benefits of adopting Halal logistics, not only as a compliance requirement but also as a value-adding proposition that can enhance consumer confidence, brand differentiation, and market competitiveness. Finally, future research directions are proposed, focusing on harmonization of global Halal standards, development of predictive compliance analytics, and sustainability considerations within Halal logistics frameworks.

In summary, ensuring Halal integrity in the supply chain demands a holistic, technically rigorous approach that integrates religious principles with modern supply chain management practices and emerging technological innovations. This comprehensive framework supports both the religious obligations of Muslim consumers and the broader industry goals of safety, quality, and operational excellence.

(I-04) FUTURE TECHNOLOGIES IN HALAL SCIENCE: INNOVATIONS IN MATERIALS, AUTHENTICATION, AND TRACEABILITY

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Abstract

The global halal industry is undergoing a technological transformation in response to increasing consumer demand for transparency, trust, and compliance across food, pharmaceuticals, cosmetics, and lifestyle sectors. As halal principles extend beyond ingredient permissibility to encompass hygiene, ethical sourcing, and process integrity, emerging technologies are redefining standards of halal science particularly in the domains of materials innovation, authentication, and traceability. Future materials research in halal science focuses on the development of nanotechnology for halal materials, development of alternative inputs such as plant-based and microbial-derived ingredients to replace animal-based or doubtful sources, ensuring compatibility with halal requirements. Novel biomaterials, including fish-derived gelatin, recombinant enzymes, and synthetic polymers, are increasingly explored for their halal-friendly and sustainable attributes. The adoption of green technologies and nanomaterials also opens avenues for safer, ethically aligned halal-certified products. Advanced authentication techniques are addressing long-standing challenges in halal verification. Portable biosensors, Fourier-transform infrared (FTIR) spectroscopy, DNA-based detection, and machine learning-enhanced image and chemical analysis are enabling faster, non-destructive, and highly accurate detection of haram contaminants and cross-contamination events. These technologies support real-time monitoring and strengthen regulatory frameworks. Moreover, traceability is being revolutionized by blockchain, Internet of Things (IoT), and digital twins, which allow secure end-to-end visibility from farm to fork. These innovations not only ensure the integrity of halal supply chains but also enhance consumer confidence and support regulatory harmonization across jurisdictions. Together, these future technologies promise to enhance the credibility, safety, and global competitiveness of the halal industry. Their integration into halal certification systems and standards when guided by syariah principles and cross-disciplinary collaboration will be critical to building a robust, transparent, and innovation-driven halal ecosystem for the next generation.

Keywords: Halal Science, Traceability, Authentication, Biomaterials, Blockchain, Biosensor, Halal Certification, Food Integrity

(I-05) INTEGRATING ESG PRINCIPLES TO ACCELERATE INNOVATION AND EXCELLENCE IN THE HALAL INDUSTRY: A STRATEGIC PATHWAY TO SUSTAINABLE DEVELOPMENT

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Abstract

In alignment with the World Halal Summit 2025 theme, "Strengthening the Halal Industry via Innovation & Excellence", this abstract explores a visionary yet pragmatic convergence between the Halal ecosystem and the global ESG (Environmental, Social, Governance) framework. It argues that the ethical foundations of the Halal paradigm — rooted in transparency, stewardship, and social justice — naturally align with ESG principles, offering an unparalleled opportunity for the Halal industry to lead global sustainable development agendas.

This abstract posits that embedding ESG within Halal value chains is not merely a matter of compliance but a catalyst for transformative innovation, operational excellence, and cross-border competitiveness. Drawing upon selected SDGs — including SDG 3 (Health & Well-being), SDG 8 (Decent Work), SDG 12 (Responsible Consumption), and SDG 13 (Climate Action) — the session outlines how Halal enterprises can integrate green technologies, ethical labor standards, and transparent governance to unlock ESG-aligned investment, gain consumer trust, and achieve international scalability.

Further, through empirical case studies of Halal brands already implementing ESG practices, the presentation highlights pathways to excellence while addressing prevalent challenges such as regulatory inconsistencies, technological barriers, and stakeholder resistance. Strategic recommendations are provided for governments, certification bodies, and industry leaders — emphasizing the need for policy alignment, training, and multi-stakeholder collaboration (including OIC and SMIIC) to drive systemic innovation.

Ultimately, this work calls upon global Halal stakeholders to embrace ESG as a vehicle of excellence, positioning the Halal industry not just as a religious necessity, but as a leading force for ethical innovation, resilience, and global sustainability.

(I-06) BEYOND INGREDIENTS: UNVEILING CRITICAL PROCESSING AREAS IN HALAL AUDITING

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Abstract

Importance of this topic:

Given the increasing significance of the Halal industry in the contemporary world, the Halal certification process is pivotal in ensuring consumer trust and the Shariah compliance of products. This abstract focuses on identifying highly critical (Critical) and sensitive areas (Critical Processing Areas) that require special attention from Halal auditors during their inspections. It transcends mere raw material verification, highlighting potential Halal challenges that may arise during the production process and are often overlooked. This approach directly supports the OIC/SMIIC 2: General Requirements for Halal Certification Bodies, Clause 7.2.3.2 (g) on competences, which mandates that the Halal certification body shall ensure that the team granting certification demonstrates the ability to apply knowledge and skills concerning "products, processes and practices." While raw materials are inherently considered critical, a thorough Halal auditing approach demands the recognition of hidden Halal risks within the production stages. This abstract elucidates this perspective through examples from various industries.

This study will cover the following key aspects:

- Bakery Industry: Here, eggs hold a particularly sensitive status, not only due to the potential for fertilization but also because of the presence of blood spots, which can affect Halal compliance. Auditors must meticulously examine their sourcing and inspection procedures.
- Plastics Industry: In this sector, granules and additives, beyond the primary raw materials, are crucial components that might contain non-Halal sources. Auditors need to verify their detailed composition and the Halal status of their suppliers.
- Confectionery Industry: Brushes used on the production line represent an unexpected but significant critical point. Their material composition and cleaning protocols must adhere to Halal standards to prevent any risk of contamination in the products.
- Pharmaceutical Industry: Especially where soft capsules are manufactured, the processing aids utilized, such as various types of oils, can raise Halal concerns due to their nature. Auditors must thoroughly verify the composition and Halal origin of these processing aids.

This abstract proposes that Halal auditors, rather than solely relying on basic raw material assessment, should possess comprehensive knowledge of each industry's specific production processes and the critical aspects of all involved ingredients and equipment. By adopting this applied and in-depth approach, we can strengthen the Halal certification process, making it more robust, reliable, and compliant with international standards, thereby aligning with our broader objective of fostering consistency and intellectual unity within the Ummah.

(I-07) STRENGTHENING THE HALAL ECOSYSTEM THROUGH DIGITAL TECHNOLOGIES: A COMPARATIVE STUDY OF MALAYSIA, UAE, AND INDONESIA

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Abstract

The global Halal industry is evolving in response to rising demand for ethical, transparent, and verifiable products. Despite growth, challenges around certification reliability, supply chain integrity, and consumer trust persist. Digital technologies, especially blockchain, AI, and IoT, are increasingly being used to enhance Halal assurance systems' credibility and efficiency.

This paper examines how Malaysia, the UAE, and Indonesia are leveraging these technologies in their national Halal governance initiatives. Malaysia is piloting blockchain-based certification programs, the UAE is integrating AI for smart inspections, and Indonesia is utilizing mobile apps for consumer verification. Early results show that these technologies can reduce certification delays, improve accuracy, and increase consumer confidence. However, issues like digital interoperability and infrastructure gaps remain significant challenges.

The paper contributes to the emerging body of research on the digital transformation of Halal governance. It offers both practical insights and policy analysis, addressing industry concerns about certification fragmentation, inconsistent consumer experiences, and the complexities of Halal compliance in global trade. While focused on three countries, the insights are relevant for other regions aiming to modernize their Halal systems.

The findings are particularly useful for regulators, Halal certification bodies, SMEs, and digital solution providers navigating the shift toward a more integrated and transparent Halal ecosystem. The paper also emphasizes the need for cross-border collaboration on data-sharing and standard alignment, suggesting that targeted policy interventions under OIC/SMIIC leadership can help advance these efforts.

Keywords: Halal Certification, Digital Transformation, Blockchain, Artificial Intelligence, Global Harmonization

1. INTRODUCTION

This paper introduces the concept of Halal Industry Tools an integrated set of digital and procedural innovations designed to transform halal assurance systems. Drawing on comparative case studies from Malaysia, the UAE, and Indonesia, the study examines how these tools are being implemented to address challenges such as streamlining halal certification, enhancing traceability, and fostering consumer engagement. The paper aims to provide a structured model for integrating these tools into both national and international halal governance frameworks, offering strategic insights for policymakers, regulators, certification bodies, and industry stakeholders. By aligning modern technological solutions with the ethical and religious standards that define halal, these tools aim to ensure the industry's evolution to meet consumer expectations and global market demands.

1.1. Context & Importance

The global halal industry, valued at over USD 2 trillion, is experiencing rapid growth across various sectors like food, cosmetics, pharmaceuticals, and tourism, driven by rising demand from both Muslim and non-Muslim consumers for products that adhere to ethical, hygienic, and religious principles. However, this expansion presents significant challenges, including fragmented and slow certification processes, lack of transparency, and inconsistencies in halal standards across different countries, which hinder international trade and mutual recognition of certifications. As the sector faces these hurdles, the application of digital innovations, such as blockchain, artificial intelligence (AI), the Internet of Things (IoT), and digital certification platforms, is gaining attention as a potential solution. These technologies promise to enhance traceability, improve compliance, harmonize regulatory frameworks, and build consumer trust by increasing transparency and operational efficiency across the global halal supply chain, thus aligning innovation with halal integrity.

1.2. Purpose of the Study

This paper introduces the concept of Halal Industry Tools an integrated set of digital and procedural innovations designed to transform halal assurance systems. Drawing on comparative case studies from Malaysia, the UAE, and Indonesia, the study examines how these tools are being implemented to address challenges such as streamlining halal certification, enhancing traceability, and fostering consumer engagement. The paper aims to provide a structured model for integrating these tools into both national and international halal governance frameworks, offering strategic insights for policymakers, regulators, certification bodies, and industry stakeholders. By aligning modern technological solutions with the ethical and religious standards that define halal, these tools aim to ensure the industry's evolution to meet consumer expectations and global market demands.

2. LITERATURE REVIEW: TOOLS FOR TRANSFORMATIVE COMPLIANCE

2.1. Halal Industry Landscape: Growth with Fragmentation

Despite the halal industry's substantial market value, it remains fragmented. Inconsistent halal certification standards across countries, alongside regulatory divergence, hinder cross-border trade and scalability. The lack of interoperability between halal certification systems further exacerbates these challenges, preventing global supply chain transparency.

2.2. Innovation and Excellence as Strategic Imperatives

Research on halal industry innovation has predominantly focused on branding and logistics (Fischer, 2011; Ahmad et al., 2017), with limited attention given to the role of digital technologies—such as blockchain, AI, and IoT—in compliance and certification processes. This paper underscores the importance of applying these technologies to address inefficiencies and improve the accuracy and reliability of halal certification.

2.3. Halal Industry Tools: Technological Enablers

Several core technologies are pivotal in enhancing halal compliance:

• **Digital Certification Systems:** These systems minimize human error, reduce fraud, and expedite the certification process. Studies have demonstrated their effectiveness in reducing paperwork errors (Zailani et al., 2015).

• **Blockchain and IoT:** Blockchain ensures secure, immutable traceability by tracking halal product movement across the supply chain, while IoT devices facilitate real-time monitoring of products to maintain halal standards (Abd Rahman et al., 2018; Sabri et al., 2021).

• **AI and Automation:** AI-powered inspection systems detect non-compliance with halal standards more accurately than traditional methods, mitigating human bias and error.

• **Mobile Apps:** Consumer-facing apps, such as Scan Halal, allow consumers to access halal certifications, submit complaints, and directly engage with certifiers—thereby enhancing trust and accountability (Ismail et al., 2019).

2.4. Standards Harmonization: Toward Global Alignment

Global initiatives, such as those by SMIIC, HAC, and JAKIM, aim to standardize halal certification practices. However, differences in certification protocols continue to create regulatory divergence. Digital platforms with shared databases or regulatory dashboards could help facilitate harmonization by ensuring alignment among regulators, certifiers, manufacturers, and consumers.

2.5. Research and Practice Gaps

While existing literature discusses the theoretical potential of digital technologies, there is a lack of empirical studies on their real-world performance. This paper addresses this gap by providing insights into the practical implementation of these technologies and their impact on trust-building and cross-border interoperability.

4. METHODS

4.1 Research Design

This study adopts a qualitative, comparative case study approach to explore the role of digital and procedural innovations collectively referred to as Halal Industry Tools in strengthening halal governance systems. A qualitative design is appropriate for examining the contextual, policy-driven, and institutional dynamics involved in the digital transformation of halal certification processes.

By focusing on the experiences of three countries Malaysia, the United Arab Emirates (UAE), and Indonesia this study provides a cross-national perspective on how different regulatory and cultural environments shape the adoption and effectiveness of technological solutions in the halal industry.

4.2 Case Selection Criteria

The three selected countries meet several key criteria:

- Active Digital Innovation: Each has introduced digital tools into their halal certification systems (e.g., blockchain, AI, mobile platforms).
- Diverse Institutional Structures: Their halal governance models vary, Malaysia's centralized religious authority (JAKIM), the UAE's public-private innovation environment, and Indonesia's newer government-led BPJPH model providing rich grounds for comparison.

4.4 Analytical Framework

To analyze the data, the study employs a thematic content analysis guided by four key dimensions of digital halal governance:

- Efficiency – Reduction in processing time and manual workload.
- Traceability – Ability to monitor halal status across supply chains.
- Compliance Accuracy – Improvement in detecting non-compliance through technology.
- Consumer Trust – Increase in public confidence and engagement.
- Each country's experience is mapped against these dimensions to evaluate the implementation, outcomes, and limitations of their Halal Industry Tools.

4.5 Limitations

As a qualitative, document-based study, this research is limited by the availability and depth of publicly accessible data. The findings are also subject to the specific regulatory and cultural contexts of the selected countries, which may not be generalizable to all OIC member states. Future research could benefit from interviews with certification authorities, tech developers, and consumers to deepen insight and validate findings.

5. CASE STUDIES & ANALYSIS

5.1 Malaysia

- Digital halal certification initiatives (e.g., JAKIM systems).

Malaysia's Halal certification system is one of the most developed and widely recognized globally, primarily overseen by the Department of Islamic Development Malaysia (JAKIM). In recent years, JAKIM has undertaken a strategic shift towards leveraging digital technologies to streamline the certification process and improve its transparency. The primary initiative has been the development of the **eHalal System**, a web-based platform that facilitates the registration, tracking, and management of Halal certification applications. This system allows businesses to apply online, upload necessary documents, track application statuses, and receive certification notifications electronically. This initiative has not only simplified the process for applicants but also contributed to more efficient resource management within JAKIM itself.

- Blockchain implementation pilot(s).

Malaysia has been exploring blockchain as a means to ensure the integrity of Halal supply chains. One of the most notable projects is a **blockchain-backed certification pilot** designed to enhance transparency and traceability in Halal food production. Blockchain is utilized to create an immutable record of the entire supply chain, from the source of raw materials to the final product, thus providing consumers with verifiable assurance about the Halal status of their purchases. This technology aims to reduce instances of fraud, such as mislabeling or counterfeit products. The pilot program, backed by the Malaysian government and local tech startups, has shown positive results, though it is still in the early stages and limited to a few industries.

5.2 United Arab Emirates (UAE)

- Public-private tech collaborations.

The UAE has emerged as a leader in integrating technology into governance, including the Halal sector. The country has fostered **public-private collaborations**, bringing together governmental bodies, tech companies, and academic institutions to develop innovative solutions for Halal certification and enforcement. For example**, Dubai's Halal Center** and the **Emirates Authority for Standardization and Metrology (ESMA)** have partnered with tech companies to integrate Artificial Intelligence (AI) into Halal certification and auditing processes. These collaborations have focused on improving efficiency and reducing human error in inspection and certification procedures.

- Integration of AI and smart inspection systems.

The UAE has been particularly proactive in using AI to modernize Halal inspection systems. One prominent initiative is the **AI-powered smart inspection tool** deployed at key points in the Halal food supply chain, including slaughterhouses, processing facilities, and retail outlets. The system uses image recognition, sensor data, and machine learning algorithms to automatically assess the compliance of products with Halal standards. This real-time inspection system not only enhances accuracy but also speeds up the process, allowing authorities to handle a higher volume of inspections with fewer resources.

5.3 Indonesia

- Digital consumer verification (mobile apps).

Indonesia has embraced digital tools to empower consumers with the ability to verify the Halal status of products through **mobile apps**. One such app, developed by the **Indonesian Ulema Council (MUI)**, allows users to scan product barcodes or QR codes to verify whether a product has been certified Halal. This consumer-facing technology is part of a broader effort to enhance **transparency and trust** within Indonesia's Halal industry, which is the largest in the world in terms of Muslim population. The app also offers educational content on Halal standards and the importance of certification, helping to raise consumer awareness.

- Public engagement and transparency.

Indonesia's Halal ecosystem is characterized by strong public engagement and transparency initiatives. The government has actively promoted digital tools as a way to improve public trust in Halal certification. One example is the **Halal Assurance System (HAS)**, a system that enables public access to detailed reports on certification processes, inspection results, and auditing outcomes. This transparency initiative has contributed to greater consumer confidence, especially in Indonesia's vast domestic market where Halal status is often scrutinized by religious and ethical standards.

- Insights from pilot testing and community response.

Pilot testing of these mobile platforms and public engagement tools has shown that Indonesian consumers are increasingly using these digital solutions to make informed purchasing decisions. However, challenges persist in reaching rural or less tech-savvy populations, where smartphone penetration is lower. Moreover, while the mobile app has been well-received in urban areas, scaling up the initiative nationwide remains a logistical challenge. There is also the issue of data privacy and how the app collects and stores user information, which could potentially create privacy concerns among consumers.

6. RESULTS

Key findings show that digital technologies can reduce certification processing times by up to 40%, increase the accuracy of inspections by 25%, and boost consumer trust through transparent mobile engagement. However, the full potential of these technologies is limited by persistent challenges such as fragmented standards, lack of cross-border interoperability, and uneven digital access, especially among SMEs.

- Reduction in Certification Delays.
- Improved Traceability Across Supply Chains.
- Enhanced Inspection Accuracy via AI.
- Increased Consumer Trust Through Digital Engagement.
- Barriers to Interoperability & Harmonization.
- Importance of Policy–Technology Alignment.

7. DISCUSSION

7.1. Digital Certification and Compliance

Digital certification systems, particularly those utilizing blockchain, have streamlined certification processes. In Malaysia and the UAE, blockchain-backed platforms have reduced certification approval times by 30-40%, addressing the delays associated with traditional paper-based systems. Furthermore, AI-powered inspection systems have improved compliance accuracy by up to 25% compared to manual methods, making the certification process both more efficient and reliable. For example, in Malaysia, the use of blockchain for halal certification allowed for quicker cross-border product approval, while reducing errors in halal certification documents.

Table. 1 Comparative Analysis of Halal Industry Integration in Malaysia, UAE, and Indonesia.

Dimension	Malaysia	UAE	Indonesia
Efficiency	30–35% reduction in time	40% reduction via smart audits	Large-scale access via SIHALAL
Traceability	Blockchain pilot for exports	Real-time tracking in cosmetics	QR codes and basic trace logs
Accuracy	Improved digital auditing	AI-powered inspections	Limited, pilot AI programs
Consumer Trust	Moderate app use	High digital engagement	60% engagement increase in 2023

7.2. Supply Chain Traceability

Blockchain and IoT technologies enable end-to-end traceability of halal products from sourcing to distribution. In Indonesia, the implementation of blockchain in halal logistics allowed for real-time monitoring of products, minimizing contamination risks and improving audit compliance. This transparency not only mitigates potential halal violations but also strengthens consumer confidence in the authenticity of halal-certified products. Similarly, in the UAE, IoT sensors in distribution centers provide continuous monitoring of products, ensuring that environmental conditions such as temperature and humidity do not compromise halal status.

7.3. Quality Assurance and Laboratory Testing

IoT-enabled sensors have enhanced halal testing, particularly within the pharmaceutical and cosmetic sectors. These devices can detect non-halal ingredients or contamination at various stages of production, ensuring products meet halal requirements at every stage of the manufacturing process. In Indonesia, IoT-based quality control systems in pharmaceutical manufacturing plants have enabled real-time detection of non-halal substances, preventing non-compliant products from reaching the market.

7.4. Consumer-Facing Technologies

Consumer apps, such as Scan Halal, enable users to access halal certifications and verify product compliance. Pilot programs in Indonesia linked to official halal databases have resulted in a 60% increase in consumer engagement with halal verification platforms. This surge in interaction highlights the potential of technology to foster greater trust between consumers and halal-certified products. For instance, in the UAE, a mobile app developed by a leading halal certification body allows users to scan product barcodes, instantly displaying the halal certification status, and providing detailed product information, significantly improving consumer transparency.

7.5. Industry Collaboration Platforms

Cloud-based collaboration platforms, connecting certifiers, manufacturers, and regulators, facilitate real-time data sharing. These platforms enable predictive analytics, identifying potential risks in the supply chain early on and allowing for more informed decision-making. By identifying discrepancies between manufacturers' claims and certification standards before products reach the market, these platforms help prevent compliance failures. In Malaysia, the integration of cloud-based platforms across halal certification bodies has allowed faster information sharing and decision-making, reducing certification backlogs.

7.6. Adoption Challenges

Despite the advantages of these digital tools, several challenges hinder their widespread adoption:

- Cost & Infrastructure.
- Regulatory Fragmentation.
- Data Privacy & Security.

7.7. Privacy and Security Concerns

As the halal industry embraces digital solutions, ensuring robust data privacy and security becomes essential. Blockchain, while offering tamper-proof traceability, necessitates careful management of sensitive data to avoid privacy breaches. In some regions, governments have stringent data protection laws, which may hinder the implementation of digital solutions if privacy protocols are not carefully integrated. For example, Malaysia has enacted specific guidelines for data protection, which must be adhered to when using blockchain for halal certification. Furthermore, ensuring that AI inspection systems do not rely on biased data or improper access to confidential product information is crucial for maintaining consumer trust.

7.8. Cross-Border Collaboration: Harmonizing Standards.

A key challenge in the halal industry is the lack of consistent certification standards across countries. Blockchain-based systems can improve cross-border certification and traceability, creating a unified digital infrastructure for halal certification. This would enhance the global halal market's efficiency, benefiting both businesses and consumers. Digital innovation is essential for the future of the halal industry, enabling it to evolve into a fully digital, ethically sound, and globally interconnected system.

The success of these innovations, such as blockchain, AI, and IoT tools, depends on international collaboration, the standardization of certification processes, and the readiness of institutions to adopt these technologies.

8. RECOMMENDATIONS

Building on the findings from the case studies and thematic analysis, this section provides key recommendations to improve the halal industry through innovation, policy alignment, and global collaboration.

1. **Encourage harmonized** digital halal standards under OIC/SMIIC leadership.

2. **Prioritize R&D in Halal Tech:** Encourage targeted research into technologies like blockchain, AI, and IoT that address the unique needs of the halal industry- investment in halal-tech infrastructure, stronger public-private partnerships.

3. **Foster Tech-Regulator Collaboration:** Strengthen partnerships between technology firms and halal regulatory authorities to co-develop scalable, compliant digital solutions.

4. **Build Digital Capabilities:** Launch initiatives to enhance digital literacy among SMEs, regulators, and auditors, equipping them to adopt and use these tools effectively.

5. **Advance Global Harmonization:** Promote international cooperation to establish standardized halal technology solutions, enabling mutual recognition and cross-border certification.

6. **Ethical** oversight of emerging technologies.

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(I-08) WOMEN POWERING THE GLOBAL RISE OF HALAL FASHION

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Abstract

Objective:

This abstract aims to highlight how women are leading the growth of halal and modest fashion around the world. It explains how the industry is expanding quickly because people want clothing that matches their values while still being stylish. It also focuses on the important role women play not just as consumers, but as designers, entrepreneurs, and influencers who are shaping the look and values of modern modest fashion.

Halal Fashion on the World Stage

The halal fashion industry is experiencing unprecedented growth, valued at approximately USD 327 billion and projected to reach USD 433 billion by 2028, according to the State of the Global Islamic Economy Report 2024/25. This growth reflects a strong global demand for fashion that respects religious and cultural values while embracing contemporary aesthetics. A combination of demographic expansion, increased digital connectivity, and rising awareness of ethical consumption is driving this industry forward Major international retailers and mainstream fashion brands are beginning to recognize the commercial potential of modest wear, launching dedicated product lines to cater to this rapidly expanding segment. In addition, modest fashion weeks across cities such as London, Dubai, Jakarta, and Istanbul have amplified the visibility of halal fashion on a global stage.

The Women Leading Halal Fashion Forward

Women are not only influencing fashion trends, they are leading the entire ecosystem of halal fashion. As founders of successful fashion start-ups and directors of creative collections, they are redefining what modest fashion looks like in the 21st century. Their involvement has infused the industry with fresh perspectives, elevating the representation of diverse identities and aesthetics. The digital age has given women a platform to boost their voices and styles, using social media to showcase modest fashion to millions of followers around the world. Influencers, bloggers, and micro-entrepreneurs are building communities that connect women across continents, fostering a global dialogue around empowerment, fashion, and cultural expression.

Cultural and Ethical Influence

Halal fashion stands out from mainstream fashion not just for its appearance, but for the values it represents. Many women-led brands focus on sustainability by using eco-friendly materials, supporting fair labour, and following slow fashion practices. This ethical approach has earned modest fashion growing respect among consumers who value responsible and conscious choices. These brands also promote inclusivity, offering styles for diverse body types, skin tones, and cultural backgrounds. Modest fashion naturally supports respect, dignity, and individual expression, challenging the limited standards often seen in mainstream fashion.

The Future is Modest

As halal fashion continues to evolve, its influence is likely to extend beyond Muslim communities and become an integral part of the global fashion dialogue. The values it promotes, modesty, sustainability, cultural pride, and innovation, resonate with a broader audience seeking authenticity and purpose in their style choices. Women will remain at the heart of this evolution, shaping the narrative and ensuring that the fashion industry continues to embrace diversity in its truest sense. Their role in redefining modest fashion as both a personal and political statement underscores their power to reshape global consumer culture. In this new era, halal fashion is more than a trend, it's a transformative force that reflects a deeper shift toward mindful living, inclusive values, and empowered identity. Its future is bright, and its leaders—women—are writing that story with elegance, strength, and vision.

Result:

Because of their leadership, women have made halal fashion a powerful global trend. Their work has helped bring modest fashion into the spotlight, with major fashion brands now creating special collections for modest wear. Women-led brands are also promoting sustainability, body positivity, and cultural diversity, values that many people care about today. With the help of social media, women are building global communities and changing how the world sees modest fashion. As the industry continues to grow, women will keep leading the way, making fashion more ethical, inclusive, and true to their beliefs.

Keywords: Modest Fashion, Faith-Based Fashion, Women in Halal, Empowered By Modesty, Modest Is Power

(I-09) HALAL AS A SPACE OF ENCOUNTER AND GLOBAL ACCOMMODATION

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Abstract

Halal has evolved from a strictly religious dietary prescription into a global socio-economic phenomenon and a platform of convergence between Muslim and non-Muslim worlds. More than a growing multi-trillion-dollar market, halal today functions as a language of trust, ethics, and quality that resonates across cultures.

This presentation argues that halal should be understood as a laboratory of accommodation, where religious traditions, market practices, and global governance standards intersect. For Muslim communities, halal ensures continuity of faith in modern consumption. For non-Muslim consumers, it offers guarantees of health, safety, and sustainability. For businesses and regulators, it demands innovative forms of cooperation across states, corporations, and religious authorities.

Unlike other visible signs of Islam, often framed through controversy, halal has become a bridge of conviviality: widely available in supermarkets, restaurants, tourism, and finance, it enables shared practices and fosters mutual recognition.

By reframing halal not only as a marker of Islamic visibility but also as a vector of intercultural dialogue, this presentation highlights its potential to transform differences into opportunities for cooperation, embodying a globalized ethics of coexistence and solidarity.

(I-10) THE EXPERIENCE OF THE HALAL STANDARDS COMMITTEE IN RUSSIA IN IMPLEMENTING "HALAL" STANDARDS

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Abstract

For 20 years now, the Committee for the "Halal" Standard of the Spiritual Administration of Muslims of the Republic of Tatarstan has been operating in Russia. The Committee's activities are aimed at controlling the production and sale of halal products. The Committee was formed in 2004, but the prerequisites for its emergence were brewing in the early 2000s.

I would like to begin my speech with a historical fact. The Committee was the first to develop and register with the Federal Agency for Technical Regulation and Metrology (Rosstandart) the "System of Voluntary Certification of Products and Services for Compliance with the Canons of Islam, registration number ROSSU.K587.04IKh01, and the Conformity Mark "Halal". This was in 2009. This step was necessitated by the need to "bring order" to the Halal industry in Russia. Although the Committee is located in one of the regions of Tatarstan, the enterprises it inspects are located in various regions of Russia. Currently, enterprises monitored by the Committee are located in 20 regions of Russia.

It is worth noting that national halal standards were approved for the first time in Russia. The corresponding GOSTs were developed by the Project Technical Committee (PTC) for Standardization No. 704 "Halal Products and Services". Committee staff were part of this committee during the development of this GOST. Moreover, the project was developed on the basis of the Russian Islamic University, located in Kazan, one of the founders of which is the Spiritual Administration of Muslims of the Republic of Tatarstan.

Every year in Russia, the number of enterprises and the volume of halal production are growing. For example, the export of poultry meat to non-CIS countries for January-July 2023 amounted to 148 thousand tons year-on-year. Over 78 thousand tons went to China, over 30 thousand tons to Saudi Arabia, and over 6 thousand tons each to Azerbaijan, Vietnam, and Uzbekistan. Poultry production for slaughter in the Russian Federation during this period increased by 1.3% year-on-year, to 3.79 million tons.

The Committee, for its part, strives to ensure that Muslims in Russia can confidently buy products under the "Halal" mark, are sure of their quality, and have no doubts about their halal status. The Committee is distinguished by its strict approach to compliance with all Halal standards at enterprises. By the way, this is confirmed by many of our partners in the regions of Russia, for example, in Siberia and the Caucasus. The Committee's mark is very recognizable, and Muslims trust products under this mark.

The Committee sets the following goals:

- Halal certification and production control,

- Promoting the development of halal infrastructure,
- Constant interaction with the public in the field of halal,
- Organizing training courses for legal entities and individuals on implementing Halal in production,
- Consultations on halal matters,
- Participation in various events and exhibitions related to the development of the halal industry at republican, all-federal, and international levels,
- Promotion of the Halal Lifestyle.

In 2019, the Committee updated and re-registered the "System of Voluntary Certification of Products and Services for Compliance with the Canons of Islam" - the "Halal" System (registration number ROSSU.O2042.04ITKh0 and the Conformity Mark "Halal"). During the period from 2021 to 2023, the Committee certified more than 375 enterprises and organizations within the VCS "Halal". As of today, 210 certified enterprises, organizations, and entrepreneurs are registered in the Committee's registry. A number of certified enterprises have experience in supplying halal products for export to near and far abroad countries. There are currently 13 such enterprises.

The Committee constantly monitors the quality and compliance of products and services labeled "Halal" and combats violations in the Halal sphere. Quarterly, the Halal Standard Committee purchases meat semi-finished products from our producers in stores and conducts control analysis for pork DNA content in an accredited laboratory in the city of Kazan.

One of the important developments for the "Halal industry" in Russia was the annual holding of the RUSSIA HALAL EXPO in Kazan. The goal of the annual International Exhibition is the development, promotion, and popularization of the Halal industry in the Russian Federation. Uniting Muslim producers and consumers in the largest project on the territory of Russia. Promoting the idea of Halal Lifestyle and making an undeniable contribution to the development and prosperity of Muslim society. Creating the most favorable infrastructure and a beautiful image of Islam, both in Tatarstan and in Russia. I note that this exhibition is held within the framework of the international forum "Russia - Islamic World".

Committee staff undergo training in the system of additional professional retraining in the field of certification, technical regulation, and conformity assessment at KNRTU. Thanks to the systematic professional development of staff, for the first time in Russia, 4 Committee employees were included in the register of technical experts of Rossakkreditatsiya (Russian Accreditation Body). That is, the state has recognized our right to control "Halal" in Russia.

During our work in the Halal industry, we constantly face various questions regarding the permissibility of certain components from the Shariah point of view. For this purpose, once a month, as questions accumulate, the Committee's Shariah Expert Council gathers, after which decisions are prepared that guide the Committee in its activities. We have already issued 40 Shariah conclusions on various issues of the Halal industry. In 2022, systematic cooperation began between the Committee for the "Halal" Standard of the SAM RT and the scientific community of the Republic and the Russian Federation, represented by the Kazan National Research Technological University, Kazan State Medical University, and the Kazan State Academy of Veterinary Medicine.

The following areas of cooperation were identified:

- Conducting joint research works at the republican level of a technological nature;
- Conducting regular research and updating information on the main groups of food products and their components from the point of view of canonical permissibility;
- Studying innovative directions of the Russian food industry development such as GMOs, meat obtained microbiologically, genetic engineering, etc.;
- Development and search for new solutions in matters of modern medicine from an Islamic perspective;
- Conducting joint research on the differences between halal and non-halal raw materials at the molecular level;
- Expert evaluation of new food products that did not previously exist.

International activities should also be noted. The "Committee for the Halal Standard" of the SAM RT has been a member of the World Halal Council (WHC) since 2015 and a member of the Executive Committee of this organization since 2019. The issued Certificate features not only the Committee's "Halal" mark but also the emblem of this serious international organization.

Also, since 2019, the Committee has been a member of the Association of Halal Certifiers (AHAC) under SMIIC, which includes about 20 different certifying bodies from around the world. I would like to note the role of SMIIC as the most important partner for the Committee for the "Halal" Standard of the SAM RT in popularizing and implementing Halal standards in Russia, for which we are very grateful.

For the recognition of our "Certificate" and for Accreditation by various certification bodies of other countries, the Committee conducts extensive international activities. Currently, preparatory work is underway to undergo the accreditation procedure as a halal certification body in the national accreditation system and in foreign accreditation organizations - GAC (GCC), EIAC (UAE), HAC (Republic of Turkey), MUI (Indonesia).

(I-11) TOWARDS A HALAL TOURISM ECOSYSTEM IN ITALY: PUBLIC-PRIVATE GOVERNANCE, STANDARDS, AND TERRITORIAL IMPACT

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Abstract

This Despite enormous potential, Italy lacks an adequate offering for Muslim tourists; to close the gap with other European countries, a next-generation model for Islamic tourism in Italy is being set up in which public planning and private initiative meet on an open, verifiable, and scalable platform. The goal is to create international demand through a natively digital, recognizable Halal/Muslim-friendly offering co-designed with communities, able to showcase Italy's Islamic heritage and translate it into contemporary experiences. Public leadership does not stop at guidelines: it establishes a tourism-cultural regulatory sandbox that allows destinations and businesses to test solutions—services, certifications, payments, interfaces—in a controlled and rapid manner. A three-year national plan sets measurable objectives, targeted incentives, and a framework for interoperability across data, standards, and certifications. The private sector—independent and chain hotels, DMCs/DMOs and tour operators, food service and retail, airport operators, museums, digital platforms—becomes an engine of innovation, creating regional clusters, opening experiential labs, and integrating the voice of Muslim travelers through advisory boards and co-design cycles. At the core of the architecture is a tiered national checklist, evolved into an open data schema (API) that makes requirements consistent and machine-readable along the entire value chain: Halal dining with transparent labeling and traceable batches; in-room provisions (qibla, prayer mat, prayer times updated automatically) with aligned minibars; privacy protocols and time windows for spas and pools; housekeeping and staff training; signage and content in Arabic, French, English, Turkish, and Indonesian-Malay. Compliance is made instantly visible by a dynamic digital trust mark (QR/NFC) linked to a public registry with risk-based audits and real-time compliance reports; for micro-businesses, "lite" pathways with mentoring and community audits are envisaged. A distributed Academy—coordinated by businesses and supported by universities and certification bodies—offers on-demand micro-modules, operating manuals, and service simulations, with verifiable digital badges for staff. The open-source toolkit (menu models, operational checklists, communication templates) lowers SME adoption costs; a service-design coach helps less structured territories move from requirements to practice. The product proposition unites standards and creativity: thematic corridors of Islamic heritage (from Arab-Norman architecture to art collections), art-and-shopping city breaks with certified dining and multilingual concierge, thermal baths and wellness with dedicated slots, mountains and family-friendly villages, workshops in calligraphy, ceramics, perfumery, and Mediterranean cuisine in a Halal key. Modular packages include variants for Ramadan and Eid (early suhoor, prayer areas, evening programming) and can be personalized via app with contextual suggestions. Distribution combines co-marketing with carriers and European hubs, thematic OTAs and travel designers, integrates widespread digital payments and, where useful, solutions compatible with Islamic finance. A destination pass brings

together transport, admissions, and Halal dining, enabling dynamic pricing and bundled benefits. The same infrastructure enables sports tourism and training camps: Halal catering validated by nutritionists, flexible schedules (including during Ramadan), prayer spaces, privacy protocols for athletes, access to sports medicine, and "door-to-field" logistics. Monitoring is based on an open-data dashboard: share of certified properties, NPS and reviews, conversion and RevPAR, spend and length of stay, use of the trust mark and pass, number of training camps. Outcome-based incentives— matching grants, vouchers, rebates—reward demonstrated innovation and reduce seasonality. The result is a durable competitive advantage grounded in quality, respect, and collaboration along the value chain, with Italy positioning itself as Europe's living lab for Halal tourism.

Keywords: Halal Healthcare, Halal Tourism, Halal Food, Halal Life

(I-12) THE REVIVAL OF ISLAMIC AESTHETICS: EXPLORING "HALAL ARTS" AS A CONTEMPORARY UNIVERSAL LANGUAGE

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Abstract

This paper introduces "Halal Arts" as a conceptual framework for reimagining classical Islamic art forms within contemporary global contexts. It argues that the aesthetic and spiritual depth of traditional Islamic art can transcend time and geography through dynamic reinterpretation rather than static preservation. Emerging disciplines like calligraffiti exemplify this synthesis, merging classical calligraphy with street art to create powerful, accessible public expressions. However, despite their innovation, many contemporary Muslim artists remain underrepresented on the international stage.

Rooted in Islamic principles of beauty, creativity, and excellence (Ihsan), the Halal Arts initiative aims to empower these artists and establish an interdisciplinary ecosystem that supports ethical, culturally grounded, and aesthetically engaging art. Drawing from Qur'anic and Prophetic teachings that affirm the divine value of beauty, the initiative expands the scope of the Halal industry by positioning art as a vital contributor to the ethical and cultural dimensions of the Halal lifestyle. Ultimately, it proposes a model for integrating artistic innovation into the broader Halal economy, enhancing its global resonance and cultural impact.

Keywords: Halal Arts, Islamic Art, Contemporary Art, Aesthetics, Cultural Heritage, Muslim Artists, Public Art

(I-13) FROM CARAVANSERAIS TO COMMUNITY TOURS: REVIVING ISLAMIC HERITAGE AS A STRATEGY FOR DESTINATION BRANDING

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Abstract

As Halal Tourism evolves into a more competitive and mature market, destinations must find new ways to stand out. This research explores a key question: How can Islamic heritage be leveraged not only to attract Muslim travellers, but to foster deeper engagement — and strategically reposition destinations in the process?

Grounded in Halal Travel Guide's on-the-ground experience across Central Asia and the Balkans, this research has three key objectives. First, it investigates how destinations with overlooked Islamic histories — such as Uzbekistan and Bosnia — can use heritage-rich travel experiences to differentiate themselves in the crowded tourism marketplace. Second, it analyses how weaving Islamic narratives into itineraries can deepen traveller engagement and transform passive sightseeing into emotional and spiritual connection.

In particular, this study will explore the impact on destinations themselves, with regards to economic empowerment, cultural preservation, and regenerative development. Through case studies from Halal Travel Guide tours, interviews with local partners, and traveller feedback, this research highlights how faith-inspired storytelling and community-rooted experiences are not only attracting a growing Muslim audience — they're also revitalising lesser-known regions, supporting local businesses, and preserving endangered narratives.

Finally, this study presents a blueprint for destination marketers, tourism boards, and local operators: a practical model for reviving Islamic heritage as a powerful branding asset. Using qualitative and quantitative data and research, this paper demonstrates how centring Islamic heritage in travel design can both deepen the Muslim traveller's connection to place and serve as a catalyst for regenerating local economies, preserving underrepresented histories, and repositioning destinations through a values-based, community-first lens.

(I-14) HALAL NAVI: HARNESSING TECH AND INFLUENCE TO MAKE JAPAN MUSLIM-FRIENDLY

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Abstract

As the global Halal industry expands, Japan stands as a frontier nation uniquely positioned to embrace innovation and cross-cultural integration. Halal Navi is a pioneering platform founded to support Muslim travelers and residents navigating Japan's complex Halal landscape. At the heart of this mission is Ikuto Hongu, a visionary Japanese entrepreneur recently awarded "Halal Travel Influencer of the Year", who is reshaping perceptions of Halal through tech, tourism, and storytelling.

Scientific Contribution and Relevance to the Halal Industry:

In line with the WHS 2025 theme—"Strengthening Halal Industry via Innovation & Excellence"—this case study explores how Halal Navi merges technology, data, and digital influence to empower Halal adoption in non-OIC countries. The platform offers detailed information on over 10,000 Halal-friendly restaurants across 13 countries, including vegan and vegetarian options, vetted by both users and Muslim collaborators. With 200,000+ app downloads and 10,000+ monthly active users, Halal Navi is Japan's largest Halal web service and Muslim social media network, delivering authentic recommendations, reviews, and restaurant data through geolocation tech and curated content.

Key Findings & Achievements:

- Over 1.8 240million followers across platforms in just 2 years under the social handle @ navito_halal, making it the most influential Muslim-targeted media brand in Japan.
- Videos such as Halal ramen features and Muslim-friendly tourist routes have gone viral with 1M+ views, influencing consumer behavior and business decisions.
- Strategic collaborations with global Muslim influencers from countries like Malaysia, UAE, France, and Indonesia have extended reach far beyond Japan.
- Halal Navi is actively educating Japanese businesses on Halal values while providing app-based promotions and coupon systems to drive Halal-friendly traffic to local restaurants.

Conclusion & Vision:

The success of Halal Navi proves that a non-Muslim-led, Muslim-centered initiative can become a transformative force in Halal tourism, education, and infrastructure. Ikuto Hongu's leadership challenges the narrative that Halal must remain within Muslim-majority spaces. By building trust through storytelling, user-generated content, and social proof, Halal Navi has become both a platform and a movement.

The dream is bold yet simple: make Japan truly Muslim-friendly—not just through certification, but through genuine welcome, understanding, and tech-enabled ease. Halal Navi aspires to be a model of ethical innovation, interfaith cooperation, and inclusive tourism for the world.

Keywords: Halal Tourism, Digital Innovation, Muslim-Friendly Japan, Social Influence, Halal Awareness, Non-OIC Countries, Halal Supply Chain, Cross-Cultural Tech

(I-15) CONNECTING THE GLOBAL MUSLIM TRAVEL MARKET AND UNLOCKING ITS POTENTIAL

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Abstract

The Muslim travel market is one of the fastest-growing sectors in global tourism, with millions of Muslim travellers looking for destinations and experiences that align with their faith and lifestyle. This market is valued at over $150 billion and continues to grow every year, offering major opportunities for destinations, hotels, and brands that cater to these needs.

However, many parts of the industry are still developing, and global connections between destinations and Muslim travellers remain limited. This presentation explores how stronger collaboration between governments, tourism boards, airlines, travel companies, and halal-certified providers can unlock the full potential of the Muslim travel market.

Drawing from the experience of the Muslim Travel Show in London and the work of the British Islamic Trade Association (BITA), the discussion highlights how exhibitions, trade missions, and partnerships can bring together businesses and destinations from around the world. These efforts help create trusted networks and ensure Muslim travellers can access authentic and welcoming experiences wherever they go.

The session will also explore how technology, social media, and AI tools can enhance connection and communication across the halal tourism ecosystem. By working together, we can strengthen the halal travel economy, empower local businesses, and promote cultural understanding through tourism.

Keywords: Halal Travel, Muslim Tourism, Global Connections, Collaboration, Tourism Growth

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