

Incorporating Quality Assurance and Quality Control in Halal Beverage SMEs in Malaysia

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ABSTRACT

Quality assurance and quality control encompass a set of processes that aim to prevent and identify defects in products, ultimately improving product quality. Many halal SMEs struggle to adopt quality assurance and control due to limited expertise, funding, and specialised procedures. This article aims to recognise the quality assurance and quality control processes that the halal beverage SME implements. This study employed an exploratory approach using purposive sampling and in-depth interviews with MGV Industries Sdn. Bhd. as the selected SME. Thematic analysis was conducted using NVivo 14 to identify key themes and patterns. SMEs must implement quality assurance and quality control to manufacture export-grade products. This study incorporates firsthand information obtained from halal beverage SMEs in Malaysia, serving as a reference for similar businesses in the country. Measures of quality assurance and quality control in product manufacturing will ensure that SMEs can produce high-quality products, fulfil customer satisfaction, and effectively compete in challenging environments, including international markets. Although this study focuses on MGV Industries Sdn. Bhd. as an exploratory case, the findings provide practical insights into quality management practices that may inform other halal beverage SMEs. Future studies involving multiple halal beverage SMEs across different regions of Malaysia are recommended to enable cross-case comparisons and enhance the transferability of the findings.

Keywords: Halal, F&B, SME, Quality Assurance, Quality Control

1. INTRODUCTION

The food and beverage (F&B) industry is recognised as one of the most critical sectors of the global economy, catering to the fundamental human need for nourishment. It transcends geographical barriers and cultural differences, influencing how they nourish themselves, celebrate, interact with others, and experience various cuisines. In developing nations, the F&B sector holds great promise for significant economic growth [1]. In Malaysia, the F&B business was ranked as the third most crucial sector, according to the SME Corporation's 2021 report. The government has administered RM5 billion to entrepreneurship and development programs to aid more SMEs joining the F&B industry.

The F&B business relies on strict food safety procedures to sustain its reputation. Food safety has become a sensitive global issue in the international food sector [2]. Few consequences must be accepted if businesses do

not adhere to existing regulations. Regarding food safety standards, consumer safety is critical [3]. Food quality is the value attributed to F&B ingredients based on food safety guidelines, nutritional content, and trade standards [4]. Food quality is a condition where all aspects of a food item satisfy the requirements, including food safety guidelines [2]. F&B products must achieve strict quality requirements to be accepted by the market.

A growing worldwide population, more awareness of health and safety, and an increasing desire for transparency and sustainability have all contributed to the industry's drive for consistent and high-quality products. The quality of goods and services is now the most crucial component in guaranteeing economic competitiveness due to the business environment's rising diversity and the intensity of competition [5]. The notion of quality is emerging quickly due to the necessity to give considerably more thought to food safety, the environment, fair trade, and equity [6]. Failure to meet high food standards can result in additional food ingredients (e.g., MSG, emulsifier, food colouring), microbial contamination, chemical residuals, foodborne disease (e.g., foot-and-mouth disease), food growth by genetic laboratory process, and heavy metal pollutants [7].

According to [8], manufacturers must take action to ensure the food is produced safely, starting from production, processing, and distribution. They should initiate food safety assurance initiatives, whereas the government leads the implementation of food safety assurance. Quality Assurance (QA) techniques are critical for developing and sustaining standardised production processes that comply with halal guidelines while meeting consumers' high-quality expectations. These techniques cover all stages of production, from raw material sourcing to final packaging and distribution.

QA in terms of cuisine is defined as products in the entire chain of gaining, food manufacturing, and delivery to the consumer end; there are applied systems that ensure the food reaches the standard quality required, allowing the product to be obtained with expected parameters [9]. QA practise is measured by reviewing steps on new product design, design for manufacturing procedures, monitoring of product and work specifications and processes, and quality control (QC) actions across the value-added chain [10]. On the other hand, QC techniques are concerned with testing and verifying the finished product to ensure that it meets specified quality and halal requirements.

Manufacturing halal beverages in small and medium-sized enterprises (SMEs) has received significant attention in the present day due to an expanding global market for halal products and a greater emphasis on food safety and quality. In this setting, ensuring the manufacturing of halal beverages that adhere to stringent quality standards has become a primary concern for both manufacturers and consumers. "Halal" signifies obedience to Islamic dietary regulations and a commitment to quality and safety excellence. The purpose of this article is to explore the process and practises of QA and QC employed by a halal beverage SME in Malaysia, to identify the key measures and tools utilised by the SME to control product quality, to understand how QA and QC contribute to the SME's ability to produce competitive, export-worthy halal beverages, and to provide a reference model for other SMEs aiming to improve quality standards in the halal beverages sector.

2. Challenges And Opportunities of Smes Implementing Quality Measures

Today, SMEs face an enormous task, where the government demands that SMEs grow by putting a lot of effort towards SME growth to be more aggressive and inventive globally [11]. Government's notable efforts through the Trans-Pacific Partnership Agreement (TPPA), which would allow SMEs to participate in trade and regional integration when the rules were aligned with international standards [12]. As a result, SMEs must be prepared to compete on a global scale. The government is taking steps to help them improve their capabilities, business efficiency, enhance productivity and innovation, branding, and compliance with international standards through support agencies under various ministries such as the Ministry of Agriculture (MOA), Malaysia External Trade Development Corporation (MATRADE), and Ministry of Investment, Trade and Industry (MITI) [11].

However, the F&B SMEs in developing nations may need help to expand their domestic and international operations [1]. SMEs must successfully adhere to global standards for food quality [1]. Food quality regulation is crucial because failing to safeguard citizens from subpar food might lead to a public health emergency [13]. Domestically, poor food regulation can reduce consumer confidence and reduce demand [1]. From an export standpoint, developed nations, which are good targets for food exports due to their high-income levels, tend to

have very tight rules on food quality, as these nations have the resources for substantial high-quality food testing [1]. In contrast, most developing nations tend to have less stringent and developed food standards [1]. Various guidelines across countries require food companies to build proficiency in understanding various guideline frameworks, such as investing in new production procedures, adopting different storage and shipping guidelines, and learning how to appropriately position their products to meet local consumer quality expectations. These elements can lead to costs and risks that SMEs in developing nations may need help to absorb, which can stifle company and industry expansion [7].

There are several challenges in implementing quality practises in SMEs. According to [1], lack of regulation on the use of additives in food products and a lack of competency in the SMEs, access to high-quality labor, appropriate infrastructure, cultural and taste variances, regulatory variations, access to capital to acquire high technology machinery for improving production quality, and protectionist trade regulations to protect local market to support product certification are the challenges of SMEs implementing quality measures. According to [6], the primary justifications for SMEs not putting in place any QA programs were: the business was too small, lacked commercial benefits, there was no necessity or legal obligation to put in place any QA programs, the expense of creating and maintaining QA programs was expensive, not having enough time, lack of information, limitation of resources available, resistance of lower management and lower staff, and too much paperwork for documentation in applying QA.

However, there are several benefits of implementing quality practises in SMEs. According to [6], the food industry implemented one or more QA programs primarily to satisfy consumers' requirements and enhance trust in food safety, gain new consumers, pursue the highest standards of food safety and quality, lower legal liability, enhance business structure and culture which translate into staff awareness on quality, improving chances of exporting, enhance corporate image, motivated by competitors that receive certification, initiate a system of traceability that can measure hygiene and food safety standards, minimise waste and cost, and gain a competitive advantage over competitors are the benefits of SMEs implementing quality measures.

According to [14], for their products to be exported, SMEs must meet the requirements of both the buyers and the importing country. These requirements include having an import-export certification, adhering to food safety and quality standards, abiding by system equivalence assessments, risk analysis verification, and prioritising control measures. Most SMEs do not meet these requirements. Hence, most SMEs are not capable of exporting their goods. Their market is limited to the domestic market [6]. By incorporating firsthand data from a halal beverage SME in Malaysia, this study offers a practical reference model for other halal beverage SMEs aiming to strengthen their quality management practises.

3. RESEARCH METHODOLOGY

This study employed a qualitative methodology to collect and assess the data. The qualitative technique comprehensively explains a social phenomenon within its specific environment. This study used a semi-structured interview. A semi-structured interview allows the participant to provide adaptable responses that reflect their thoughts and experiences [15].

The case study method was employed as it was deemed the most effective approach to investigate complex, contemporary phenomena that had limited current knowledge [16]. An exploratory research design was chosen for this study to gain an in-depth understanding of how to incorporate QA and QC in halal beverage SME. The duration of the interview session was around an hour. An interview protocol was employed to provide guidance and coherence during the interview process. The interview protocol provides the interviewer with relevant questions to address all concerns [17]. Upon obtaining consent from the individual, the researcher recorded the interview session. The recording was transcribed for analysis purposes.

Thematic analysis was utilised to examine the data collected during the interview session. The five stages of thematic analysis include being acquainted with the data, coding the data, identifying a theme, evaluating the theme, and finally, constructing the theme. NVivo 14 Software was used to facilitate in data coding, classification, and visualisation. The researcher utilised "purposive sampling" to specifically choose respondents with the necessary features or qualities to fulfil the research purpose and ensure high-quality data acquisition. MG

Industries Sdn. Bhd. was the chosen SME entity in this study as it fits the requirements for this study, a Bumiputera SME that operates in the halal beverage industry. MGTV Industries Sdn. Bhd. has produced many beverage products, from fruit juice, carbonated drinks, and sparkling water. The respondent is the director of the company. The participant provided adequate information about this study.

3.1 Interview Procedure

The interview was conducted face-to-face at the company's production facility and lasted approximately 60 minutes. Prior to the interview, informed consent was obtained from the participant, who also agreed to audio recording. An interview protocol consisting of open-ended questions guided the discussion while allowing flexibility to explore emerging issues. Follow-up probing questions were used whenever clarification or further explanation was required. Following the interview, the recording was transcribed verbatim before analysis.

3.2 Coding and Data Analysis

Data analysis followed Braun and Clarke's thematic analysis procedure. First, the researchers familiarised themselves with the interview transcript through repeated reading. Second, meaningful statements related to quality assurance and quality control were assigned initial codes using NVivo 14. Third, similar codes were grouped into broader categories representing QA and QC practices. Fourth, themes were reviewed against the complete dataset to ensure internal consistency and distinctiveness. Finally, the themes were refined, labelled, and interpreted according to the study objectives.

3.3 Trustworthy of The Study

Several strategies were implemented to enhance the trustworthiness of the findings. Credibility was achieved through member checking, whereby the participant reviewed the interview transcript and confirmed the accuracy of the interpretations. Dependability was enhanced through the use of a structured interview protocol and systematic coding procedures. Confirmability was supported by maintaining an audit trail documenting coding decisions throughout the analysis. Transferability was facilitated through detailed descriptions of the research context, participant background, and organisational setting, enabling readers to determine the applicability of the findings to similar halal beverage SMEs.

4. FINDINGS

Three measures in QA were emphasised: choosing a raw material supplier, raw material handling, and the hygiene aspect of a product. For QC, two measures were overlooked: monitoring product issues during and after production, and observing the product's shelf-life. The researcher presented the project map in Figure 1, generated by NVivo 14, to picture the measures of QA & QC implemented by MGTV Industries Sdn. Bhd. to produce high-quality beverages.

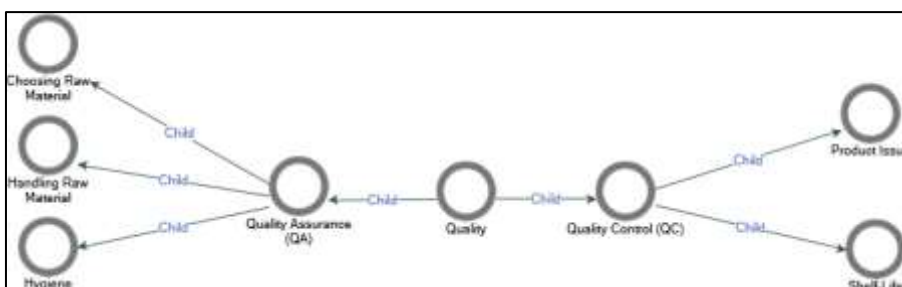


Figure 1: Project Map generated by NVivo 14

4.1 Quality Assurance (QA)

Quality assurance (QA) prevents defects by establishing and maintaining a robust system and procedures that ensure halal compliance from start to finish. From the interview session, the researcher recognised that choosing

a raw material supplier, handling raw material, and hygiene were the QA measures done by MGTV Industries Sdn. Bhd. to ensure a high-quality beverage is produced.

4.1.1 Choosing a Raw Material Supplier

The participant believed the best product quality correlated with the quality of raw material. Raw material equipped with halal certification is indicated as the highest quality standard, as he stated:

“Halal process is starting with the choosing of raw material from supplier and it must be certified with halal certification since it is trustworthy and has the highest quality standard. Raw material must follow Malaysia Food Law guideline and the preparation process also important. If we buy raw material from China, it must have halal certification from certain body.” (Participant)

Certification of Analysis (COA) is another criterion to look for before purchasing raw material. COA conveys the findings of a scientific test on a product, such as food or medication. The purpose of the COA is to guarantee that all significant rules are fulfilled and followed. It reveals a list of the chemicals used inside the product. It ensures the safety of consumers who have consumed the product:

“Our staff must ensure every raw material accepted from supplier must has Certificate of Analysis (COA) to ensure it is safe and consumable for our consumers.” (Participant)

Besides verifying halal certification and Certificates of Analysis (COA), incoming raw materials undergo visual inspection upon arrival. Production personnel verify packaging integrity, expiry dates, supplier documentation, and batch numbers before acceptance. Any damaged or non-conforming materials are isolated and rejected according to the company's standard operating procedures.

4.1.2 Raw Material Handling

The participant said the raw material should be handled and stored correctly to prevent deterioration of its quality. Raw material must be stored in appropriate conditions, avoiding exposure to humidity, and not placed directly on the floor. Here's the thought from the participant:

"Even if we do product process properly, wrong handling can affect the quality of a product. It is very important to avoid humid place to ensure there is no growth of mould on raw material. We also cannot place our raw material directly on the floor. We need to use wooden pallet and put raw material above it. The floor required to be epoxy to ensure it can be easily clean." (Participant)

Temperature and humidity conditions within the storage area are monitored regularly to minimise raw material deterioration. Stock rotation follows the First-In-First-Out (FIFO) principle to ensure older materials are utilised before newer stock, thereby reducing wastage and maintaining product consistency.

4.1.3 Hygiene Aspect of a Product

Food hygiene refers to the circumstances and procedures required to guarantee food safety and fitness for human consumption while being manufactured. To ensure product preparation in a hygienic environment, the staff must follow the strict procedure set by the company. To ensure MGTV Industries Sdn. Bhd. products meet the standards required, the quality inspector monitors the manufacturing process of the beverage:

“Quality inspector ensures our product preparation meet the required specification. Quality inspector ensures all the employee wear the right equipment before entering factory such as wearing gloves, facemask, goggle, boots, hair net and apron. All the employee must cut their fingernails and remove any jewellery from their body before entering factory.” (Participant)

Routine sanitation inspections are conducted before and after production activities. Cleaning records, sanitation schedules, and equipment maintenance logs are documented to demonstrate compliance with halal and food

safety requirements. Internal hygiene inspections are periodically reviewed by quality personnel to ensure continuous compliance.

4.2 Quality Control (QC)

Quality control (QC) tests and verifies the finished product to meet specified quality and halal requirements. From the interview session, product issues and shelf-life were the primary concerns related to the product. By addressing these issues, MGV Industries Sdn. Bhd. can produce high-quality products, reduce losses and maximise profits.

Product quality verification includes routine laboratory testing of selected production batches for pH, microbiological safety, carbonation stability, preservative concentration, and sensory attributes. Samples are retained for traceability purposes, allowing the company to investigate customer complaints or product deviations. Inspection results are documented systematically and reviewed by management before product release.

4.2.1 Monitoring Product Issues During and After Production

MGV Industries Sdn. Bhd. faced several issues. during and after beverage production: carbonated drinks have lost its fizzy properties, have an inconsistent taste, and have altered water pH. The participant shared his concerns during the production of the beverages:

Carbonated drinks have lost its fizzy properties (after production):

“5-6 months after the product launch, we conducted a random inspection on our carbonated drinks and found that the carbon dioxide had escaped from the product. This situation caused the carbonated drinks to loss its fizzy properties. Currently we are taking action by discussing with the bottle supplier and engaging with the laboratory to determine the issue.” (Participant)

Inconsistent changes in beverage taste (after production):

“During our collaboration with MARDI, we help the local farmers to commercialise salak and pineapple fruit as fruit juice which is an added value to their business. The taste is delicious. However, the variations of fruit taste even it is coming from the same family does affect the taste of fruit juice so we consider this project as a failure.” (Participant)

Inconsistency of water pH during the beverage production (during production):

“Beverage product requires pH meter to monitor water pH. There was an incident before when we checked the water pH in the morning, it meets our specification but during the afternoon, the water pH has changed. Changes in water pH can affect on how carbon dioxide behaves in the solution, potentially reducing carbonation and causing the drink to loss its fizzy properties. We exported one container of carbonated drinks to Indonesia and got complained due to loss its fizzy properties so we need to recall the product.” (Participant)

4.2.2 Observing the Product's Shelf-life

The value of preservatives varies according to each country. To export, the company must comply with the preservative concentration stated by the country's rules and regulations:

“According to Malaysia Food Regulation for preservative, 350 ppm is allowed for can drinks but in Singapore, only 160 ppm is allowed for can drinks to enter their market. Different country has different preservative concentration, so we need to comply with the requirements stated by the country or we cannot export our product over there.” (Participant)

According to Food Regulation 1985 (Malaysia) issued by Food Safety and Quality Section (BKRM), soft drinks for direct consumption allowed preservative (sodium benzoate) maximum value at 350 ppm [18] while according

to Sale of Food Act 1973 issued by Singapore Food Agency (SFA) only allowed maximum value at 160 ppm [19]. The lower concentration of the preservative will affect the product's shelf-life. However, MGV Industries Sdn. Bhd. managed to overcome this issue:

“For preservative, we concern about the product’s shelf-life. In this situation we need the R&D team to find an innovative solution to reduce preservative concentration without affecting product’s shelf-life. So far our product can lasts twelve to fifteen months after we reduce the preservative concentration from 350 ppm to 160 ppm. Right now, we use 160 ppm preservative concentration for Malaysia and international market.” (Participant)

4.2 Continuous Improvement

Beyond routine quality assurance and quality control activities, MGV Industries Sdn. Bhd. adopts continuous improvement practices by analysing production issues, customer complaints, and laboratory findings to identify root causes of quality deviations. Corrective and preventive actions (CAPA) are implemented collaboratively between production, quality assurance, and research and development personnel. Lessons learned from previous production issues are incorporated into revised standard operating procedures and employee training programmes to minimise recurrence.

5. DISCUSSIONS

QA and QC measures are critical to ensure SMEs produce high-quality products. Choosing a raw material suppliers, handling raw materials, and hygiene are the most crucial aspects of QA. Monitoring product issues during and after production and observing the product's shelf-life falls under QC jurisdiction.

To ensure the raw material from the supplier is high quality, MGV Industries Sdn. Bhd. ensures all the raw materials are equipped with halal certification and COA to ensure all the chemicals used to produce the raw materials are safely regulated. In addition, the researcher suggests implementing supplier evaluation to determine the best supplier. The criteria can be based on product quality, price, and delivery period [2]. Suppliers with promising results can be maintained, saving unnecessary costs for raw materials [2].

Next, auditing the suppliers. Audit results can be shared with the suppliers to improve performance. If the supplier still does not meet the predetermined standard, the company can discontinue the partnership with the supplier [2]. A capable quality inspector must handle the raw material properly and ensure its hygiene. The company should inspect using a computerised system to ensure the quality of raw material is determined quickly and consistently [2]. The synchronisation of raw material data between quality inspector personnel, warehouse personnel, and production personnel ensures raw material standards are maintained while receiving and storing raw materials.

For QC issues, MGV Industries Sdn. Bhd. successfully resolved the issue regarding inconsistent water pH during the beverage production. The company installed a pH meter that can monitor the water pH online. If there are anomalies regarding the water pH, the system will block the water from entering the primary tank. For the second issue of inconsistent changes in beverage taste due to variations in fruit taste, the decision was made to discontinue the project due to the absence of a viable solution to address this problem effectively. For the third issue regarding carbonated drinks losing its fizzy properties, MGV Industries Sdn. Bhd. has taken adequate measures by meeting with the bottle supplier and the laboratory to identify the cause and resolve the issue.

The shelf-life of beverages depends on the preservative concentration. The lower preservative concentration correlates with the lower product shelf-life. MGV Industries Sdn. Bhd. takes proactive measures by involving the R&D department in finding an innovative solution to maintain product stability and shelf-life while complying with lower preservative limits aligned with international standards. Lastly, training for enhancing skills and knowledge among quality inspectors, warehouse, and production personnel must be scheduled each year to update them with the latest knowledge regarding the QA and QC measures for maintaining the standard of beverage quality.

The findings indicate that quality management within halal beverage SMEs extends beyond regulatory compliance and functions as an organisational capability supporting operational excellence and export competitiveness. The integration of supplier verification, process monitoring, laboratory testing, documentation, and continuous improvement reflects the principles advocated by modern quality management systems such as HACCP, GMP, and ISO 22000. Although the present study focuses on a single organisation, these practices provide practical guidance for similar SMEs seeking to strengthen food safety and halal integrity.

6. CONCLUSION

This study successfully explored the QA and QC processes employed by MGTV Industries Sdn. Bhd., identified key quality control tools and measures and demonstrated how these practises support the production of competitive, export-ready halal beverages. The findings revealed that comprehensive QA through raw material selection, handling, and hygiene practises ensures product safety and halal compliance. At the same time, QC mechanisms address product consistency, shelf-life, and regulatory standards. These insights offer a valuable reference model for other SMEs in the halal beverage industry seeking to enhance their quality management practises. Overall, the integration of QA and QC practises ensures the production of safe and high-quality beverages and enhances the company's ability to meet domestic and international regulatory standards, reinforcing its competitiveness and consumer trust in a demanding F&B industry.

This exploratory case study was limited to one halal beverage SME and one key informant, which may restrict the transferability of the findings to other organisational settings. Future studies may also incorporate mixed-method approaches by combining qualitative interviews with quantitative quality performance indicators, including defect rates, customer complaints, production efficiency, and export performance. Such integration would provide stronger empirical evidence regarding the effectiveness of QA and QC implementation among Malaysian halal beverage SMEs.

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Conflict Of Interest Statement

The authors declare that they have no conflict of interest with respect to the publication of this paper and had no commercial, financial, or personal relationships that may have had inappropriately influenced them in the writing of this paper.

Declarations

All participants provided informed consent prior to their inclusion in the study. They were informed about the study's purpose, procedures, potential risks, and their right to withdraw at any time without consequence. Consent was obtained in accordance with the ethical standards of the responsible committee.

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