Application of HACCP in an Indonesian halal restaurant by incorporating halal dietary requirements

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Abstract

This study investigates the safety of ayam lalapan food processing in the catering service, and considers Halal dietary requirements due to the increasing demand for Halal food. Hazard and Haram Analysis Critical Control Point (HHACCP) proposed by Kohilavani et al. [1] is used to analyze the potential hazards as well as to improve the safety of food processing. By using this method, the presence of haram substance is analyzed aside from the regular hazard analysis, which consists of biological, chemical and physical hazards. Critical control points and Halal critical control points are identified to guarantee that the food processing of ayam lalapan meets Halal dietary requirements and is safe for human consumption. The total risk level after improvement can be reduced by 75.64% from 1.05 to 0.29 compared to before improvement.

Keywords: Catering Service; Halal Dietary Requirements; HHACCP; Presence of Haram Substance.

1. Introduction

As the final stage in the food chain, the catering service is a critical sector before the consumer consumes the product. One of the quality management systems to ensure food safety is Hazard Analysis and Critical Control Points (HACCP). HACCP is a method to eliminate or prevent hazards to maintain an acceptable level, by proposing several control measures through analyzing potential hazards at each process step. The increasing demand for Halal food led to increasing numbers of catering services providing Halal food. According to the Pew Research Center in 2015 [2], the Muslim population in 2010 was 23.2% of the world population and in 2050 will reach 29.7% of the world population, which shows an increase of 6.5%. This issue raises a new problem: since Halal food must meet certain criteria under Halal dietary requirements, special attention must be put to ensure that the served food does meet these requirements. Halal food is defined as raw materials used in the production process that are permitted under Sharia law, and meets six following conditions [3]. First, the food and its ingredients may not contain any parts or products of animals that are non-halal by Sharia law, or were not slaughtered according to Sharia law. The second condition is that the raw materials do not contain najs (an Arabic term which means “filth”) in any quantity. The third condition is that the food is safe for consumption, non-poisonous, non-intoxicating and non-hazardous to health. The fourth condition explains that the product should be prepared, processed or manufactured using equipment that is not contaminated with najs. The fifth condition states that the food may not contain any human parts or derivatives. The sixth condition is the need for full segregation from any other food and materials that do not meet the requirements stated in the first five conditions during its preparation, processing, handling, packaging, storage and distribution. Unfortunately, the classic HACCP was introduced to ensure food safety by only analyzing three main hazards: biological, chemical and physical hazard. In 2013, Kohilavani et al. [1] introduced Hazard and Haram Analysis Critical Control Point (HHACCP), a new approach of HACCP, by incorporating the presence of haram substances as part of hazard analysis to deal with the Halal dietary requirements problem. Many small businesses, like catering services, are not ready to implement HACCP methodology due to the lack of preparation or strong foundation of a prerequisite program. Mortimore and Wallace [4] explained that although we don’t have any prerequisite program, we can start from the first principle of the HACC, which is hazard analysis. It can provide us with some benefits by knowing the potential hazards in the process so that we can undertake some preventive actions to control incoming hazards. This paper will show the implementation of HACCP by considering Halal dietary requirements in the production process of Ayam Lalapan at an Indonesian Halal restaurant in Taipei.

2. Objectives

The objectives of this study are described as follows.

1) Fulfilling Halal dietary requirements in the food processing of ayam lalapan by incorporating Halal dietary requirements into Hazard Analysis and Critical Control Point (HACCP).

2) Using Hazard and Haram Analysis Critical Control Point to ensure that the delivered food is safe for consumption and also meet Halal dietary requirements.

3. Methods

Hazard and Haram Analysis Critical Control Point (HHACCP) proposed by Kohilavani et al. (2013) [1] is used to analyze the hazards at each process step of ayam lalapan processing. A modular process flow diagram is used to construct the process flow diagram. By using a modular approach, the process can be divided.
into different parts and looked at in detail [4]. The hazard evaluation model is derived from the original model proposed by the National Advisory Committee on Microbiological Criteria for Foods (NACMCF) [5]; some changes have been made in this study in order to assess the presence of haram substances and to accommodate catering service environments. In the proposed hazard characteristics, hazard characteristic A has been omitted because the food is not consumed by at-risk populations such as infants and the aged. Because in this study the consumers directly consume the food after processing, hazard characteristics B is also omitted since it considers any control step after packaging and distribution to the customers. In the proposed hazard characteristics, we also consider another hazard, which is the presence of haram substances. Proposed hazard characteristics for biological, chemical, physical hazard, and the presence of haram substances can be seen in Table 1. The risk level of each hazard is then calculated based on the results of the assessed hazard characteristics. Furthermore, we can classify the effect of hazards on each process by averaging the risk level of the associated hazards. The risk level based on the results of the assessed hazard characteristics. Furthermore, we can classify the effect of hazards on each process by averaging the associated risk levels on the process 1.1a then we get 1.25. Based on Table 3, we can interpret the risk level of process 1.1a as low risk because the value of risk level falls between 1.0-2.0. Furthermore, control measures are also identified to ensure that the potential hazards can be controlled, eliminated, or reduced to an acceptable level. Lacking a prerequisite program, the construction of HHACCP can be accommodated by including a personal

| Table 1: Proposed Hazard Characteristics for Potential Hazard (Biological, Chemical, and Physical Hazard) and Presence of Haram Substance |
|---|---|---|
| Hazard Characteristics | Potential Hazard (Biological, Chemical, And Physical Hazard) | Presence of Haram Substance |
| A | The product (raw material, work in process product, or finished product) contains potential hazard known as microbiological hazard, chemical hazard and physical hazard | The product (raw material, work in process product, or finished product) contains potential hazard known as Haram Substances |
| B | The process does not contain a controlled step that prevents, destroys or reduce potential hazard to an acceptable level | The process does not contain a controlled step that prevents, destroys or remove haram substances |
| C | There is possibility of contamination during the process | There is possibility of contamination during the process |
| D | There is possibility of mishandling the product during processing or distribution | There is possibility of mishandling the product during the distribution or processing |

| Table 2: Risk Level |
|---|---|
| Risk Level | Explanation |
| 4 | Any four hazard characteristics (any four of A, B, C, and D). |
| 3 | Any three hazard characteristics (any three of A, B, C, and D). |
| 2 | Any two hazard characteristics (any two of A, B, C, and D). |
| 1 | Any one hazard characteristics (any one of A, B, C, and D). |
| 0 | No identified hazard characteristics. |

| Table 3: Hazard Classification |
|---|---|
| Risk Level | Effect of Hazard |
| >3 | high risk |
| >2 - 3 | medium risk |
| >1 - 2 | low risk |
| 0-1 | very low risk |

4. Results and discussion

A verified modular process flow diagram of ayam lalapan is presented in Fig. 1. There are six modules in the process of making ayam lalapan. Module 1 is related to material reception and material storage of frozen, chilled and ambient products. Module 2 is related to the preparation of raw food. Module 3 is related to preparation of chilled food. Module 4 is related to preparation of chilled food. Module 5 is related to the cooking process. Lastly, module 6 is related to serving food.

![Fig. 1: Modular Process Flow Diagram of Ayam Lalapan.](image-url)

4.1. Hazard and haram analysis control chart

Hazard and haram analysis is performed to analyze biological, chemical and physical hazard, as well as the presence of haram substances that may occur in the process steps endangering the food. The presence of hazards depends on the nature of the process, since each process does not always involve all four hazard categories (biological, chemical and physical hazards, and the presence of haram substances). First, we analyze the hazards in each process; there are thirty-eight biological hazards, nine chemical hazards, six physical hazards and five presences of haram substances found in the food processing of ayam lalapan. The biological hazard is contributed by the possibility of proliferation of pathogen, cross contamination with other materials, and survival of pathogens caused by inadequate heat treatment. The chemical hazard is caused by some pesticides left on the vegetables. The physical hazard is caused by the possible presence of pests, and foreign materials such as plastic, debris, and human body parts. The presence of haram substances is caused by the possibility of the delivered products not meeting the Halal dietary requirements. Table 4 shows a summary of the process’s potential hazards.

| Table 4: Process Step and Its Associated Potential Hazard on the Process of Making Ayam Lalapan |
|---|---|
| Potential Hazard | Process Step |
| Biological Hazard | 1.1a, 1.1b, 1.1c, 1.1e, 1.1f, 1.2, 1.3, 1.4, 1.5a, 1.5b, 1.5c, 1.5d, 1.5e, 1.5f, 1.6, 1.7, 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 3.3, 3.4, 3.5, 3.5e, 3.7, 3.8, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 5.1, 5.2, 5.3, 5.4, 6.1, 6.2 |
| Chemical Hazard | 1.1b, 1.1c, 1.5a, 3.1, 3.2, 3.3, 3.4, 3.4, 4.5 |
| Physical Hazard | 1.7, 4.1, 4.2, 5.2, 5.2, 5.3 |
| Presence of Haram Substance | 1.1a, 1.1b, 1.1c, 1.1d, 1.1e |

After analyzing the hazards in each process, the next step is measuring the significance of the hazard by modifying the hazard characteristics proposed by NACMCF, to determine the significance of potential hazards. The risk level is calculated by calculating the number of hazard characteristics on each potential hazard. For example, the risk level of biological hazard in the process 1.1a is three because there are three hazard characteristics in this hazard. The guidance of the risk level scoring can be seen in Table 2. Similarly, the risk level for the presence of haram substance is two. Finally, we can calculate the risk level of the process step 1.1a by averaging the associated risk levels on the process 1.1a then we get 1.25. Based on Table 3, we can interpret the risk level of process 1.1a as low risk because the value of risk level falls between 1.0-2.0.
hygiene program and pest control program into the control measures. For example, the processes that involve direct contact with humans, such as transferring the goods, moving them to the clean container, peeling off the spices, and chopping are managed by personal hygiene program. The pest control program is to ensure that no pests can enter and spoil the food. A pest control program can be started by eliminating any standing water around the kitchen as well as any shelter where pests can breed and survive. Furthermore, we need to seal all openings, cracks and holes. Additional tools such as bug zapper or glue boards can be used to ensure the safety of the food.

These three analyses: hazard and haram analysis, hazard evaluation, and identification of control measures, are summarized in Table A.1, a hazard and haram analysis control chart.

4.2. Hazard and haram critical control point

Raw material CCPs (Critical Control Points) decision tree [6, 7] and a process step decision tree [8] are used to determine the critical control points in the process of making ayam lalapan. Mean-while, the raw material and process step HCCPs (Halal Critical Control Points) decision tree [1] is used to determine the Halal critical control points. The raw material and process HCCP decision tree, raw material CCP decision tree, and summary of the process step CCP decision tree can be seen in Table 5, Table 6, and Table 7, respectively.

Based on the process step decision tree, there are six CCPs have been found in the food processing of ayam lalapan. These CCPs are mainly caused by the possible proliferation of pathogens and survival of pathogens during the cooking process. Freezing and chilling at certain temperatures prevent the proliferation of pathogens and keep the products fresh. Cooking at certain temperature is suggested to kill the pathogens in the products. According to HCCPs decision tree, there is only one HCCP has been found in the process of making ayam lalapan. Vegetables, spices and tempe are Halal critical control points but unable to certify. Halal critical points and critical control points can be seen in Table 8.

| Process Step | Raw material | Q1. Do all product raw materials have halal certification? | Q2. Is there any possibility for cross contamination of haram substances? | Q3. Are the non-certified products are being used in the process? | Q4. Do the materials contain any haram substances? | Q5. Is there specific production line and storage area for certified and non-certified process and ingredients clearly dedicated? | Q6. Could the sanitation procedure able to eliminate the fat, smell, colour and taste (dibagh)? | Q7 : Is there any potential cross contamination of haram substances? | HCCP |
|--------------|--------------|---------------------------------------------------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|---------------------------------------------------|---------------------------------------------------|---------------------------------------------------|--------------|
| 1.1          | Meat and egg | Yes                                                     | No                                               | -                                                | -                                                | -                                                 | -                                                 | -                                                 | No           |
|              | Vegetables, spices, and tempe | No                                                      | -                                                | Yes (Unable to certify) | -                                                | -                                                 | -                                                 | -                                                 | Yes (Unable to certify) |
|              | Seasoning    | Yes                                                     | No                                               | -                                                | -                                                | -                                                 | -                                                 | -                                                 | No           |

| Raw material | Q1. Is there a significant hazard associated with this raw material? | Q2. Are you or the customer going to process this hazard out of the product? | Q3. Is there a cross-contamination risk to the facility or to other products which will not be controlled? | CCP |
|--------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|-------|
| Meat         | Yes                                              | Yes                                              | No                                               | No    |
| Presence of pathogens | Yes                                              | Yes                                              | No                                               | No    |
| Vegetables, Spices | Yes                                              | Yes                                              | No                                               | No    |
| Pesticide residual | Yes                                              | Yes                                              | No                                               | No    |
| Bacteria     | Yes                                              | Yes                                              | No                                               | No    |
| Tempe (Bacteria) | Yes                                              | Yes                                              | No                                               | No    |
| Egg (Salmonella Enteritidis) | Yes                                              | Yes                                              | No                                               | No    |

| Process Step | Q1. Is there a significant hazard at this process step | Q2. Do control measure(s) exist for the identified hazard? | Q2A. Is control necessary at this step for safety? | Q3. Is this step specifically designed to eliminate or reduce the likely occurrence of the hazard to an acceptable level? | Q4. Could contamination occur at, or increase, to unacceptable level(s)? | Q5. Will a subsequent step or action eliminate or reduce the hazard to an acceptable level? | CCP |
|--------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|-------|
| 1.3 Store frozen | Yes                                              | Yes                                              | -                                                | Yes                                              | -                                                | -                                                 | Yes    |
| 1.5a Store chilled (vegetables) | Yes                                              | Yes                                              | -                                                | Yes                                              | -                                                | -                                                 | Yes    |
| 1.5b Store chilled (tempe) | Yes                                              | Yes                                              | -                                                | Yes                                              | -                                                | -                                                 | Yes    |
| 1.5c Store chilled (chopped vegetables) | Yes                                              | Yes                                              | -                                                | Yes                                              | -                                                | -                                                 | Yes    |
| 1.5d Store chilled (cooked meat) | Yes                                              | Yes                                              | -                                                | Yes                                              | -                                                | -                                                 | Yes    |
| 5.4 Cook According to recipe | Yes                                              | Yes                                              | -                                                | Yes                                              | -                                                | -                                                 | Yes    |

4.3. Establish halal critical limits and critical limits

The identified Halal critical control points and critical control points are then analyzed to determine the associated critical limits. These limits are called critical limits and are used to differentiate between safe and unsafe operating conditions. Since Halal food must meet Halal dietary requirements, the Halal critical limits must be zero for any kind of haram substances. HCCP1 is the possible presence of haram substances on the vegetables, spices and tempe. Although all vegetables and spices do
not have the Halal logo, they are still permitted by Halal dietary requirements as long as the vegetables and spices are not poisonous, intoxicating or dangerous to health [3]. Tempe, as a derivative product from soybeans, is Halal too. So, we need to ensure that the suppliers only use vegetables and spices those are not contaminated with other products. Keeping a good relationship and good communication with suppliers is important to gain transparency from the supplier. Also, we need to encourage the supplier to do the Halal practice correctly. To ensure that both supplier and restaurant do the Halal practice, the availability of Halal food certification in our business can assure the consumer that all the served food meet Halal dietary requirements. In Taiwan, we can apply for Halal certification from external institution, such as in Taiwan Halal Integrity Development Association (THIDA) [9].

CCP 1 is keeping the food frozen. The freezer temperature must be at 00F (-17.80C). Keeping the products in a frozen state inhibits the proliferation of pathogens in the meat.

CCP 2, 3, 4 and 5 are related to the chilling process. The chiller temperature must be at 400F (4.40C) or below. Similar to keeping products in a frozen state, keeping products at chilled temperature inhibits the proliferation of pathogens in the vegetables, tempe, chopped vegetables and cooked meat.

CCP 6 is related to the cooking process. Cooking the products at a certain temperature is suggested to ensure that the food is safe and free of pathogens. The cooking process is a method to kill the surviving pathogens inside the product. Table 8 shows the critical limits on each HCCP and CCP.

4.4. Establish monitoring procedures and corrective actions

Monitoring procedures are established at every CCP and HCCP to ensure that the established critical limits are achieved and maintained. Corrective actions should also be determined to ensure that the established control measures are done, and to eliminate any deviations during the process. Table 8 shows the monitoring procedures and corrective actions which should be taken on each HCCP and CCP.

4.5. Documentation, verification procedures, and record keeping

Afterwards, the developed HHACCP control chart must be verified periodically or every time a process or method is changed. The first step of verification procedures is carried out by verifying the process flow diagram. Furthermore, verification of a comprehensive HHACCP system should also be performed annually. These verification activities are to ensure that both the methods and procedures are implemented accurately and effectively. Documentation and record keeping provide evidence that the constructed HHACCP plan is maintained and implemented according to the plan. Record keeping includes the CCP monitoring results, and the finding of losses or deviations and their associated corrective actions. Documentation includes the hazard and haram analysis control chart and HHACCP control chart.

4.6. Comparison between before and after improvement

In order to see the difference in risk level before and after improvement, the current condition at the restaurant is compared to the proposed control measures. For example, the risk level of the current condition in the process 1.1a is 1.25, but after the proposed control measures (e.g. freezing the product as soon as possible, cooking the product at a later step, checking the halal label, and frequently auditing the supplier) are conducted, the risk level on process 1.1a can be reduced to 0.25. Table 9 shows hazard and haram analysis of process 1.1a after the condition is improved.

In Table 9 we can see that process 1.1a is no longer has a presence of haram substance as a hazard. Since the restaurant has applied the proposed control measures, which is checking the Halal label and frequently auditing supplier, the hazard now has control step. Although preventive actions have been taken, there is still a chance of biological hazard occurrence since meat very easily becomes contaminated. Therefore, we assign “one” on the hazard characteristic A. The way to ensure that the hazard can be controlled is by frequently auditing the suppliers, and checking whether the suppliers have the proper conditions to prevent this biological hazard from proliferating. After receiving the meat, the way the restaurant can control the hazard is to inhibit the proliferation of biological hazards by cooking it at the later step. Then, the total risk level of ayam lalapan processing after the condition is improved can be calculated by averaging the risk level on each process step. As shown in Fig. 2, the total risk level of the current condition for ayam lalapan processing has been reduced by 75.64% to 0.29, which can be interpreted as very low risk.

Table 8: Hhaccp Control Chart

| No. | Process | Potential Hazard | Control Measure | Critical limits | Monitoring | Monitoring Frequency | Monitoring responsibility | Corrective Action | Corrective Action Responsibility |
|-----|---------|------------------|-----------------|-----------------|------------|----------------------|------------------------|------------------|----------------------------------|
| HCCP 1 | Check the incoming Ingredient: Vegetables, spices, and Tempe | Haram substances | - The supplier must be chosen correctly and frequently audited | Reject products if they do not meet the halal requirements | Check the supplier | 1 week | Chef / Restaurant owner | - Reject products | Chef / Restaurant owner |
| CCP 1 | 1.3 Store frozen | Possible proliferation of pathogens | Ensure one container is not loaded with too much meat so that all parts of the meat can stay frozen | Ensure the freezer temperature is at 0°F (−17.8 °C) | - Check the temperature using thermometer | 1 hour | Chef | - Frequently calibrate the thermometer | Chef |
| CCP 2 | 1.5a Store chilled (vegetables) | Possible proliferation of pathogens | Ensure one container is not loaded with too much vegetables so that all parts of the vegetables can stay | Ensure the chiller temperature is at 40°F (4.4 °C) or below | - Check the temperature using thermometer | 1 hour | Chef | - Frequently calibrate the thermometer | Chef |

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| CCP  | Procedure | Possible Proliferation of Pathogens | Stop Criteria | Repair Actions | Frequency |
|------|-----------|-------------------------------------|---------------|----------------|------------|
| CCP 3 | 1.5b Store chilled (tempe) | Ensure the chiller temperature is at 40 °F (4.4 °C) or below | Chef | Check the products and call repairman to fix the refrigerator | 1 month |
| CCP 4 | 1.5c Store chilled (chopped vegetables) | Ensure the chiller temperature is at 40 °F (4.4 °C) or below | Chef | Check the products and call repairman to fix the refrigerator | 1 month |
| CCP 5 | 1.5b Store chilled (cooked meat) | Ensure the chiller temperature is at 40 °F (4.4 °C) or below and eat within 3 to 4 days | Chef | Check the products and call repairman to fix the refrigerator | 1 month |
| CCP 6 | 5.3 Cook According to recipe | Cook until the products have the minimum permitted temperature | Each meat | Chef | Chef |

- Ensure one container is not loaded with too much tempe so that all parts of tempe can stay chilled.
- Separate container between cooked one with the unprocessed food.

- Ensure one container is not loaded with too much chopped vegetables so that all parts of the chopped vegetables can stay chilled.
- Separate container between cooked one with the unprocessed food.

- Ensure one container is not loaded with too much cooked meat so that all parts of the cooked meat can stay chilled.
- Separate container between cooked one with the unprocessed food.

- Chef Check the products and call repairman to fix the refrigerator.
- Chef Check the products and call repairman to fix the refrigerator.
- Chef Check the products and call repairman to fix the refrigerator.

- Chicken
  - The temperature of the innermost part of the thigh, innermost part of the wing and the thickest part of the breast must be greater than 165 °F
  - Egg
  - Cook the egg until it reaches certain temperature.
Table 9: Hazard and Haram Analysis of Process 1.1a (After Improvement)

| Process Step           | Potential Hazards                                                                 | Hazard Analysis | Hazard Characteristics | Risk levels |
|------------------------|-----------------------------------------------------------------------------------|-----------------|------------------------|-------------|
| 1.1a Meat receiving    | Biological hazard : Salmonella Enteritidis, Staphylococcus aureus, Campylobacter jejuni, Listeria monocytogenes, Escherichia coli (E. coli) Chemical hazard : chemical compound Physical Hazard : Damaged product Presence of haram substance : Non-Halal meat | 1               | 1                      | 1           |

5. Conclusion

This study found that Halal dietary requirements can be incorporated into the regular HACCP and used to analyze the process in catering service to ensure that the delivered food meets Halal dietary requirements. HHACCP methodology proposed by Kohilavani et al. (2013) had been implemented in the food processing of ayam lalapan at the Indonesian Halal Restaurant in Taipei, and we found that the risk level of the current condition is low, with the index of 1.05. The proposed control measures can reduce the risk level by 75.64% to 0.29, which is considered as very low risk.

References

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Appendix A

Hazard and haram analysis control chart

Table A.1: Hazard and Haram Analysis Control Chart

| Process Steps | Potential Hazards | Hazard Analysis | Hazard Characteristics | Risk Level | Control Measures |
|---------------|-------------------|-----------------|------------------------|------------|------------------|
|               |                   | A               | B                      |            |                  |
| Module 1 - Receipt and Storage |                   | Contain Hazard | No Control Step | Contamination during process | Mishandling the product |
| 1.1 Check the incoming raw materials | Biological hazard : Salmonella Enteritidis, Staphylococcus aureus, Campylobacter jejuni, Listeria monocytogenes, Escherichia coli (E. coli) | 1              | 1                      | 1           | 3                | - Freeze the product as soon as possible |
| a. Meat       | Chemical hazard : chemical compound Physical Hazard : Damaged product Presence of haram substance : Non-Halal meat | 1              | 1                      | 2           |                  | - Cooking the product in later step |
|               |                    |                 |                        |            |                  | - Frequently audit the supplier |
|               |                    |                 |                        |            |                  | - Check the halal label- Frequently audit the supplier |

Fig. 2: Risk Level Before and after Improvement.

Fig. 3: Risk Level Before and after Improvement.
| Category | Biological Hazard | Chemical Hazard | Physical Hazard | Presence of Haram Substance |
|----------|-------------------|-----------------|-----------------|-----------------------------|
| **b. Vegetables** | E.Coli | Pesticide residual | | Non-Halal products in the supplier |
| Chemical hazard | 1 | 1 | 0 | 0 |
| Physical hazard | Presence of haram substance : Cross contamination with non-Halal products in the supplier | 1 | 1 | 2 |
| Biological hazard | E.Coli | 1 | 1 | 3 |
| **c. Spices** | E.Coli | Pesticide residual | | Non-Halal seasoning |
| Chemical hazard | 1 | 1 | 0 | 0 |
| Physical hazard | Presence of haram substance : Cross contamination with non-Halal products in the supplier | 1 | 1 | 2 |
| Biological hazard | E.Coli | 1 | 1 | 3 |
| **d. Seasoning** | | | | Non-Halal seasoning |
| Presence of haram substance : Non-Halal seasoning | 1 | 1 | 0 | 0 |
| Biological hazard | 1 | 1 | 1 | 3 |
| **e. Tempe** | | | | Non-Halal seasoning |
| Chemical hazard | 0 | 0 | 0 | 0 |
| Physical hazard | 0 | 0 | 0 | 0 |
| Presence of haram substance : Non-Halal seasoning | 1 | 1 | 2 | 2 |
| Biological hazard | Salmonella Enteritidis | 1 | 1 | 3 |
| **f. Egg** | | | | |
| Chemical hazard | | | | 0 |

- Wash the product in latter step
- Separate the vegetables from other foods such as raw meat, poultry or seafood
- Cooking the product in later step
- Wash the product in latter step
- Frequently audit the supplier
- Ensure the origin of the products
- Frequently audit the supplier
- Wash the product in latter step
- Separate the vegetables from other foods such as raw meat, poultry or seafood
- Cooking the product in later step
- Wash the product in latter step
- Frequently audit the supplier
| Step | Activity | Physical Hazard | Presence of haram substance | Biological hazard : Possible growth of the pathogens | Chemical hazard | Physical Hazard | Presence of haram substance | Biological hazard : Possible growth of the pathogens |
|------|----------|----------------|-----------------------------|-------------------------------------------------|----------------|----------------|-----------------------------|-------------------------------------------------|
| 1.2  | Transfer to freezer | 1 | 0 | 1 | 3 | 0 | 0 | 0 | Managed by rapid transfer the incoming raw material to the freezer |
| 1.3  | Store frozen | 1 | 0 | 1 | 3 | 0 | 0 | 0 | Monitor the freezer temperature |
| 1.4  | Transfer to Chiller | 1 | 0 | 1 | 3 | 0 | 0 | 0 | Managed by rapid transfer the incoming raw material to the chiller |
| 1.5  | Store chilled | 1 | 0 | 1 | 3 | 0 | 0 | 0 | Monitor the chiller temperature |
| a.  | Vegetables | 1 | 2 | 1 | 3 | 0 | 0 | 0 | Wash the product in the latter step |
| b.  | Tempe | 1 | 0 | 1 | 3 | 0 | 0 | 0 | Monitor the chiller temperature |
| c.  | Chopped vegetables | 1 | 0 | 1 | 3 | 0 | 0 | 0 | Monitor the chiller temperature |
| d.  | Cooked meat | 1 | 0 | 1 | 3 | 0 | 0 | 0 | Proper handling to prevent damaged goods |
| 1.6  | Transfer to ambient store | 1 | 0 | 1 | 3 | 0 | 0 | 0 | Ensure the storage is dry to prevent the growing of mold |
| 1.7  | Store at ambient temperature | 1 | 0 | 1 | 3 | 0 | 0 | 0 | Check and document the expiration date of each product | Store at dry place | Pest control |
| Module 2 - Preparation (Frozen) |  |
|-------------------------------|--|
| **2.1 Transfer raw meat to the kitchen** | Biological hazard - Possible growth of the pathogens 1 1 |
| Chemical hazard 0 0 0 0 0 |
| Physical Hazard 0 0 0 0 0 |
| Presence of haram substance 0 0 0 0 0 |
| **2.2 Defrosting** | Biological hazard - Possible growth of the pathogens 1 1 1 3 |
| Chemical hazard 0 0 0 0 0 |
| Physical Hazard 0 0 0 0 0 |
| Presence of haram substance 0 0 0 0 0 |

| Module 3 - Preparation (Chilled) |  |
|-------------------------------|--|
| **3.1 Transfer vegetables to kitchen table** | Biological hazard - Possible growth of the pathogens 1 1 1 3 |
| Chemical hazard 0 0 0 0 0 |
| Physical Hazard 0 0 0 0 0 |
| Presence of haram substance 0 0 0 0 0 |
| **3.2 Chopping the vegetables (according to recipe)** | Biological hazard - Possible cross contamination with other materials 1 1 1 4 |
| Chemical hazard 0 0 0 0 0 |
| Physical Hazard 0 0 0 0 0 |
| Presence of haram substance 0 0 0 0 0 |
| Step | Activity | Biological Hazard | Physical Hazard | Chemical Hazard | Presence of Haram Substance |
|------|----------|-------------------|-----------------|----------------|----------------------------|
| 3.3 Wash the vegetables | Wash the vegetables by using flowing water | 1 | 1 | 2 | 0 |
| 3.3 Wash the vegetables | Ensure the container is clean and dry | | | | |
| 3.4 Move to clean container | Managed by personal hygiene program | | | 0 | 0 |
| 3.6 Chopping the tempe (according to recipe) | Segregation of cutting board and knives | | | | |
| 3.7 Wash the tempe | Wash the vegetables by using flowing water | 1 | 1 | 2 | 0 |
| 3.8 Move to clean container | Ensure the container is clean and dry | | | 0 | 0 |
| 4.1 De-box seasonings and transfer to kitchen table | Managed by personal hygiene program | 0 | | | |
| 4.2 Decant into containers | Managed by personal hygiene program | | | 0 | 0 |
| 4.3 Take some spices from storage (according to recipes) | Biological hazard : Cross contamination due to bad personal hygiene | 1 | 1 | 1 | 3 |
| | Chemical hazard : pesticide is left in the spices | 1 | 1 | 2 |
| | Physical Hazard presence of haram substance | 0 | 0 |
| | Biological hazard : Possible cross contamination with other materials | 1 | 1 | 1 | 1 | 4 |
| 4.4 Peel off the spices | Chemical hazard : pesticide is left in the spices | 1 | 1 | 2 |
| | Physical Hazard presence of haram substance | 0 | 0 |
| | Biological hazard : Some pathogens are left | 1 | 1 | 2 |
| 4.5 Wash the spices | Chemical hazard : pesticide is left in the spices | 1 | 1 | 2 |
| | Physical Hazard presence of haram substance | 0 | 0 |
| | Biological hazard : Possible cross contamination with other materials | 1 | 1 | 1 | 1 | 4 |
| 4.6 Chop (according to recipe) | Biological hazard : Cross contamination due to bad personal hygiene | 1 | 1 | 1 | 3 |
| | Chemical hazard | 0 | 0 |
| | Physical Hazard presence of haram substance | 0 | 0 |
| | Biological hazard : Cross contamination due to bad personal hygiene | 1 | 1 | 1 | 3 |
| Module 5 - Cook | Physical Hazard presence of haram substance | 1 | 1 | 1 | 3 |
| | Biological hazard | 1 | 1 | 1 | 1 | 4 |
| | Chemical hazard | 0 | 0 |
| 5.1 Seasoning the meat (according to recipe) | Biological hazard : Cross contamination due to bad personal hygiene | 1 | 1 | 1 | 3 |
| | Chemical hazard | 0 | 0 |
| | Physical Hazard presence of haram substance | 0 | 0 |
| | Biological hazard : Cross contamination due to bad personal hygiene | 1 | 1 | 1 | 3 |
| 5.2 Move to clean container | Physical Hazard presence of haram substance | 1 | 1 | 1 | 3 |
| | Biological hazard | 1 | 1 | 1 | 1 | 4 |
| | Chemical hazard | 0 | 0 |
| 5.3 Store at ambient temperature | Physical hazard : Presence of pests | 1 | 1 | 1 | 3 |
| | Biological hazard : Survival of pathogens caused by inadequate heat temperature | 1 | 1 | 1 | 4 |

- Managed by personal hygiene program
- Wash the spices by using flowing water
- Segregation of cutting board and knives
- Wash the spices by using flowing water
- Ensure the container is clean and dry
- Ensure the storage is dry and properly covered
- Ensure the container is properly covered to avoid pest ingress
- Pest Control program
- Ensure the cooking process achieve the standard time and approved temperature
- Managed by personal hygiene program
| Module 6 - Serve Meal |  |  |  |  |  |
|----------------------|----------------|----------------|----------------|----------------|----------------|
| Chemical hazard     | 0              | 0              | 0              | 0              | 0              |
| Physical Hazard     | 0              | 0              | 0              | 0              | 0              |
| Presence of haram substance | 0 | 0 | 0 | 0 | 0 |

| 6.1 Store at ambient temperature |  |  |  |  |  |
|----------------------------------|----------------|----------------|----------------|----------------|----------------|
| Biological hazard               | 1              | 1              | 1              | 1              | 4              |
| Chemical hazard                 | 0              | 0              | 0              | 0              | 0              |

| 6.2 Serve Meal (Plate or take-away container) |  |  |  |  |  |
|-----------------------------------------------|----------------|----------------|----------------|----------------|----------------|
| Physical hazard                              | 1              | 1              | 1              | 3              | 3              |
| Presence of pests                            | 0              | 0              | 0              | 0              | 0              |
| Biological Hazard - Cross contamination due to improper container (plate) | 0 | 0 | 0 | 0 | 0 |
| Chemical hazard                              | 0              | 0              | 0              | 0              | 0              |
| Presence of haram substance                  | 0              | 0              | 0              | 0              | 0              |

- Ensure the storage is dry and properly covered
- Ensure the container is properly covered to avoid pest ingress
- Pest Control program
- Managed by personal hygiene program