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Implementation the Analysis of Hazard Analysis and Critical Control Points (HACCP) for Aljaya's Martabak at Rungkut Madya, Surabaya

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ABSTRACT

In Indonesia, the martabak food culture is modified into two forms, namely sweet martabak and egg martabak. Sweet martabak has a thicker texture than egg martabak. Martabak Aljaya's at Rungkut madya has a menu variant, namely egg martabak. Egg martabak is a culinary food made from eggs, wheat flour, ground beef with a combination of spices such as shallots and white onions, chilies, pepper, spring onions, and oil for sautéing. Egg martabak is a food that is processed by frying. The characteristics of the egg martabak are that it has a savory, salty and chewy taste. The egg martabak is packaged in a food box and topped with some green chilies and can be distributed directly to buyers/customers who will buy the product or delivered by vehicle on party orders (orders in large quantities) and provide recommendations to Analyzing Hazard and Critical Control Point (HACCP) on the Aljaya's egg martabak menu at Rungkut Madya, Surabaya.

Keywords: Aljaya's Martabak, Egg Martabak, HACCP

Introduction

Indonesia has a very diverse range of culinary which are rich in cultural heritage and very valuable. One of the most popular culinary found in Indonesia is street food. Mostly, common types of popular and high-demand street food are fried dishes (Kraig & Sen 2013), such as martabak. Acculturation is a process of cultural fusion in which a person or group from the original culture comes to adopt practices and values of the newly adopted culture, while still retaining their own distinct culture (Kittler et al., 2017). Martabak is a culinary result of cultural acculturation from India brought to Indonesia and other countries, such as Saudi Arabia and Malaysia. Savoury martabak with egg as its main ingredient is the original martabak from Indian culture (Kraig & Sen 2013).

HACCP is a tool used to assess hazard levels, predict risk estimates, and determine appropriate measures of control, with an emphasis on prevention and control of processes rather than testing of the final product which is usually carried out in traditional control methods (Rauf, 2013). The concept of quality assurance in HACCP guarantees starting from the supply of raw materials, during the process, materials that can endanger human safety, including points with a high probability of danger that will be identified and investigated to the processing stage until the product is ready for consumption. HACCP can be applied in the food production chain starting from the main producer of food raw materials (agriculture), handling, processing, distribution, and marketing to the end user. (Ramadhani, 2013). An organization must have a process business that supports existing business activities within

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the organization to achieve the vision and mission identified. The business process itself is a series of activities that work together within an organizational and technical environment together achieve business goals (Weske, 2012).

According to Harrington (1991), process business is a collection of activities coordinated inside organizations and environmental environment technical. these activities together achieve business goals. Every business process set by one organization (section), however, can interact with that process run by other organizations. Andersen (2007) states business processes can be divided into two namely the main process and the support process. The HACCP system can also be said to be a measuring or controlling device that focuses its attention on food safety assurance, particularly to eliminate the danger (hazard) originating from microbiological hazards (biology), chemistry, and physics; by preventing and anticipating before checking/inspecting. Meanwhile, the goals and objectives of HACCP are minimizing the possibility of contamination by pathogenic microbes and minimizing the potential for them to grow and develop. Therefore, individually each product and its processing systems in the food industry must consider HACCP development plan. Thus, every product in the industry the food it produces will have a concept of its HACCP implementation plan each adapted to its production system.

Previous research regarding the implementation of HACCP at the Rendang Padang Restaurant using survey and interview methods by Saputro et al. (2022) has the result that critical control points in the production process include receiving and preparing raw materials, preparing the tools used, cooking processes, storage, and distribution. Corrective actions such as returning raw materials and maintaining cleanliness are recommended. Bacterial testing on rendang meets food safety standard requirements. The process of making beef rendang menus involves several hazards, including natural microbes in meat such as E. coli, bacteria such as Salmonella and L. monocytogenes, chemical hazards such as formaldehyde, and physical hazards such as gravel. The cooking process is CCP where the meat is cooked at 74°C for 2 hours to kill bacteria.

Previous research conducted by Larasati et al. (2022) regarding the implementation of hazard analysis and critical control points (HACCP) in the traditional food processing process "Pudak Barokah" in MSMEs in Gresik. In this research, hazards were identified and minimized during the processing process, and provided suggestions for building a HACCP system. The results of this research show that there are 3 types of potential hazards, namely biological, physical, and chemical hazards. The critical control points (CCP) in the process are boiling the coconut milk, mixing the ingredients, and packaging the dough. Personal hygiene and sanitation are important to ensure the quality of food products.

Previous research by Puspitawati et al. (2022) regarding a case study of implementing HACCP at a Solo Serabi shop through observations and interviews has results that show that the shop needs to make improvements in meeting food safety management standards. Recommendations are given to improve cleanliness, use hygienic mixers and covers, ensure proper cooking processes, and sterilize packaging.

Previous research was conducted by Puspitawati et al. (2022) regarding the implementation of the HACCP system at Bunga Mawar Puti Bakery which aims to ensure the safety and quality of sausage pizza bread. In this research, potential hazards were identified and production process analysis was carried out to determine critical control points using survey methods and descriptive analysis. The results of this research are that there are potential physical, chemical, and biological hazards. Implementing HACCP can help meet quality requirements and increase consumer confidence. This research emphasizes the importance of increasing awareness of cleanliness in production areas, among employees, and during the production process to avoid danger. This research also highlights the importance of effective and efficient documentation in ensuring that critical limits are met and appropriate corrective actions are taken. Apart from that, there is the implementation of prerequisite programs including personal hygiene, control of foreign objects, control of transportation and distribution, and control of biological hazards. Critical control points (CCPs) are determined based on hazards identified and classified using a CCP determination chart.

Previous research on the implementation of HACCP in the Cu's Chicken Crispy production process to identify hazards related to production aspects and determine critical control points (CCP) by Sunarti et al. (2022) found that chicken meat is a potential danger in the raw material preparation stage. In addition, the soaking, frying, and packaging processes are CCPs in the production process. This research also highlights the need for control mechanisms for personal hygiene and biological and chemical programs in production processes.

Previous research conducted by Zhorif et al. (2022) regarding the HACCP system in the "Bite and Bite Cakes" industry in Sidoarjo aims to identify potential dangers in raw materials and the Japanese Cheesecake production process and determine critical control points (CCP) in ensuring food safety emphasizing the importance of quality control and risk analysis in the bakery industry to prevent disease and maintain consumer confidence. This research has the result that in this industry there is the potential for biological, physical, and chemical hazards. Apart from that, there are 3 critical control points (CC) in the cake production process, including receiving raw materials, baking, and packaging. Researchers suggest implementing a HACCP system in the industry.

Previous studies regarding the implementation of hazard analysis and critical control points in the chocolate wafer roll processing process in company X by analyzing various stages of the production process and identifying potential hazards were based on GMP and SSOP by Citraresmi and Putri (2019) explained that the risk analysis steps and critical control points in making chocolate wafer rolls were carried out by three groups, namely the risk analysis team, validation team, and verification team. They create product descriptions, identify product uses, and schematize production steps. The verification team then checks and confirms the step diagram. Quality testing shows that all wafer roll parameters comply with SNI quality standards. There were 15 series of procedures with 16 potential risks, of which two had a striking level of significance. Determination of the critical control point (CCP) is carried out at the stage of mixing the dough and cream using the magnetizing method, as well as the X-ray detection process. Critical limits are established as a measure to ensure product safety. Chocolate wafer rolls are in the medium-risk category. An identified critical point in the process is detection using X-rays, where the detection sensitivity and automatic stop function are regularly monitored. If there is a discrepancy in product quality, corrective action will be implemented by separating and marking unqualified products, this action will then be checked by quality control (QC).

Based on previous research by Ponda et al. (2020) regarding the application of HACCP in the production process of Mocachino Suclate and Choco Granule at PT. Mayora Indah Tbk. which aims to ensure the safety and quality of food products by identifying and controlling potential hazards has the result that in implementing HACCP, PT. Mayora Indah Tbk has carried out a series of actions, including identifying risks, establishing critical points, monitoring and controlling, as well as verifying and documenting. HACCP Team from PT. Mayora Indah Tbk has also prepared verification guidelines and regularly carries out corrective and inspection steps. In addition, this company has a special division that is responsible for supervising the entire production process.

The first approach to the HACCP concept is hazard analysis relating to all aspects of the product being manufactured. inspection or this hazard analysis should be carried out, as the main step for identifying all hazards that can occur when food products are consumed. Hazard analysis must be carried out thoroughly and realistically, from raw materials into the hands of consumers. Three types of hazards may be found in food hazard groups, namely:

1. Biological/Microbiological Hazards, caused by pathogenic bacteria, viruses, or parasites that can cause poisoning, infection, or disease infestations, for example, pathogenic *E. coli*, *Listeria monocytogenes*, *Bacillus sp.,Clostridium* sp., Hepatitis A virus, and others;
2. Chemical Hazard, due to the ingestion of natural toxins or other chemicals toxic, for example aflatoxin, histamine, mushroom toxin, shellfish toxin, alkaloids pyrrolizidine, pesticides, antibiotics, growth hormones, heavy metals (Pb, Zn, Ag, Hg, cyanide), preservatives (nitrite, sulfite), colorants (amaranth, rhodamine B,methanyl jelly), lubricant, sanitizer, and so on;

3. Physical Hazard, due to ingestion of foreign objects that should be should not be present in food, for example broken glass, pieces of wood, gravel, metal, insects, bits of bone, plastic, body parts (hair), scales, thorns, skin, and others. For this hazard analysis to achieve the results it can ensure all information regarding the hazard can be obtained, then hazard analysis must be carried out in a systematic and organized manner.

Material and Methods

This research is a qualitative research method, namely by describing or illustrating the application of HACCP in organizing food, especially at the Aljaya martabak which is in front of the UPN “Veteran" Jawa Timur campus. Furthermore, this research uses the interview method, namely by collecting data on food hygiene and sanitation behavior by martabak sellers through direct interviews. Interviews were conducted with one of Martabak Aljaya's employees.

This study uses the interview method, namely by collecting data regarding food hygiene and sanitation behavior by food sellers through direct interviews. Interviews were conducted with Aljaya’s martabak seller. A literature study by the Ministry of Health of the Republic of Indonesia (2006), that there are six principles of hygiene and food sanitation, namely the selection of food ingredients, storage of food ingredients, food processing, food transportation, storage of cooked food, and food serving.

This study uses the HACCP in Martabak Aljaya’s method which is divided into 2 stages, namely the Preliminary Step to Hazard Analysis and the HACCP. Preliminary Step to Hazard Analysis consists of:

1. Hazard Analysis
   The next step is to carry out a hazard analysis in the ongoing production process. Hazard is a factor that can affect consumer satisfaction and sales that will occur.
2. Identification of the CCP
   After conducting language analysis, the next step is to determine critical control points called CCPs. The aim is to be able to avoid these critical points so that the food products produced are safe.
3. Determination of Critical Limits
   The critical limit (CL) is the limit of whether or not the food product resulting from the production process is safe. CL is determined for each CCP that has been identified, determined based on applicable references and standards.
4. Monitoring CCPs
5. Next is the determination of the monitoring procedure for the CCP that has been determined. There are 5 ways to carry out monitoring, namely visual observation, and sensory, physical, chemical, and microbiological tests.
6. Corrective Action
   Corrective action is taken if there are abnormalities or deviations in the CCP. This depends on the level of risk of each food product that is produced.
7. Verification
   These are the methods, procedures, and tests used to determine whether the HACCP system is by the plan. With the principle of verification, it is hoped that the effectiveness of the HACCP system will be properly monitored.
8. Recording Or documentation
   Recording data includes all steps and stages according to the HACCP principle, starting from CCP, CL, monitoring, and correction. Every action in the HACCP system must be documented.

Results and Discussion

The ingredients needed to make Aljaya’s Martabak are located in front of UPN “Veteran” Jawa Timur.

Table. 1. Product description

Specification	Descriptions
Product name	Aljaya's Martabak
Raw materials	Flour, Egg, Beef, Leak, Pepper
Process	Fried
Packaging Type	Cardboard
Product Characteristics	Color: brown-red (spices, eggs, ground beef), white (flour, sugar, salt), green (vegetables)
Shelf Life	48 hours
Customer	everyone of any age

Receipt of food materials

Receipt of food ingredients is a continuation after ordering activities or purchasing groceries in this process a series is usually carried out the activities of researching, checking, and recording food materials received are appropriate with predetermined specifications. How to receive materials in a martabak business this egg is to make a self-purchase and then check and record accordingly the receipt/invoice provided.

Foodstuff storage (Either dry or wet)

Storage of dry raw materials is a critical control point, or CCP, that is which is because this stage is specifically designed to reduce risk risks that may arise up to the limits of the provisions that have been permitted. As for the storage of raw materials used such as flour, eggs, and Some of the vegetables used, there may be some potential dangers. besides that, there are also some dangers that might occur such as irregularities to the raw material specifications if the storage temperature of the raw material is not comply with existing conditions.

Frying on egg martabak

The process of frying egg martabak is done using This large skillet of hot oil is a CCP because this process is designed to reduce microbiological hazards that may contaminate egg martabak and tools frying at the right temperature and time. Microbiological hazards in the form of These pathogenic microbes can arise if the temperature and time used in the process of frying do not reach.

Acceptance of ingredients in this egg martabak includes receipt of eggs, wheat flour, oil, spices, and vegetables which are then grouped for storage according to the shelf life of the raw materials. Storage of dry raw materials is included in the critical control point (CCP) because this stage is specifically designed to reduce the hazard to the permissible limit and to prevent deviations from raw material specifications if the storage temperature does not meet the requirements. The eggs were selected and stored at 4-6ºC or refrigerator temperature. Storage at this temperature can increase the shelf life of eggs, which is around 21 days with good egg quality. If eggs are stored at room temperature 24-25ºC, so that the quality remains good, the shelf life of eggs only lasts up to 14 days.

Flour and oil are prepared, then mixed with good-quality eggs until a smooth dough is formed. Vegetables are washed and cut and then added with pepper, salt, and beef. The dough is cooked in a frying pan and then the additional ingredients are poured on it. A good frying temperature to use is >130C to less than 190C, with a frying time of 15-20 minutes in large quantities. Microbiological hazards in the form of pathogenic microbes can arise if the temperature and time used in the frying process are not reached. In addition to microbiological hazards, peroxide contamination due to excessive reuse and oil oxidation due to too high temperatures is also dangerous and can result in physical damage to martabak eggs (burnt) as well as the long-term effects of peroxide accumulation in the body.

After that, it is formed into a martabak rectangle and then drained. Martabak is sliced into eight parts and then packaged using packaging with a logo and added with sauce and pickles. Martabak is ready to be consumed and distributed.

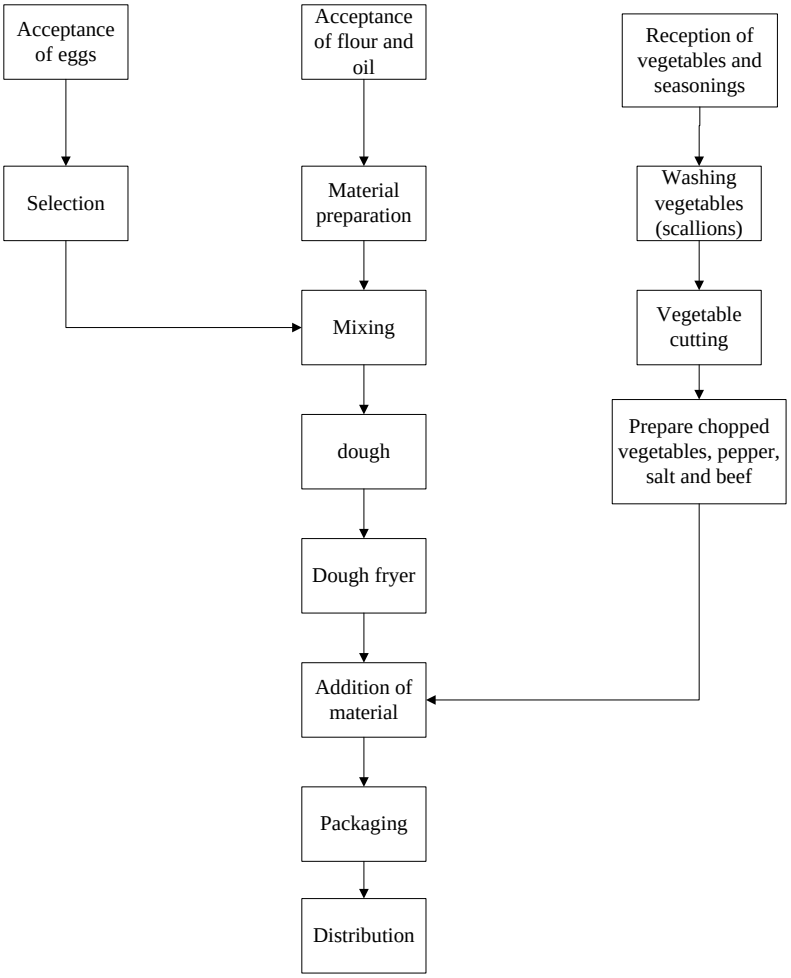

Figure 1. Flow Diagram of the Aljaya's Martabak Process

HACCP of Aljaya's Martabak

Table 2. HACCP based on Ingredient

No	Ingredient name	Storage Condition	Potential Hazard	Risk Assessment		Outcome	Significant risk	Explanation/ Reason/ Evidence/ Cause	Control mechanism
				Severity (S)	Probability (PO)				
1	Egg	Ambient	Physical	2	2	4	NO	Rotten, cracked with dirt	Sorting and cooking procedure
			Chemical	1	2	2	NO	Heavy metal contamination	Sorting and cooking procedure

To be continued…

			Biological	3	4	16	YES	Salmonella sp., E. Coli, S. Aureus	Proper storage and cooking
			Allergen	4	3	12	YES	Contain allergen	Labelling allergen product
			Radiation	1	1	1	NO	Not under process radiation	NA
			Halal	1	2	2	NO	Halal ingredient by source	NA
			Physical	2	2	4	NO	Dirt and flour lice	Choose white flour, clean odorless, not dry. And make sure it's not musty
			Chemical	3	5	15	YES	Stored with non-food product	Save in dry place, with other food product
2	Flour	Ambient	Biological	4	5	20	YES	Bacteria, fungi, mold	Dry in the sun, save in the fridge
			Allergen	3	2	6	NO	Contain allergen (gluten)	Most of Indonesian people don't have celiac disease
			Radiation	2	2	4	NO	Not under process radiation	NA
			Halal	1	2	2	NO	Halal ingredient by source	NA
			Physical	1	2	2	NO	Dust and dirt	Filtration
			Chemical	2	2	4	NO	Chlorine, heavy metals	Filtration
			Biological	2	5	10	YES	Salmonella sp. And E. Coli	Cooking
3	Water	Ambient	Allergen	1	1	1	NO	Didn't contain allergen	NA
			Radiation	1	1	1	NO	Not under process radiation	NA
			Halal	1	1	1	NO	Halal ingredient by source	NA
			Physical	2	2	4	NO	Slime and sand	Washing used water
4	Beef	Freezing	Chemical	3	4	12	YES	Preservative and formaline	Formalin test

To be continued…

			Biological	4	3	12	YES	Salmonella sp., E. Coli	Closing storage container
			Allergen	4	3	12	YES	Contain allergen	Labelling allergen product
			Radiation	2	1	2	NO	Not under process radiation	NA
			Halal	1	1	1	NO	Halal ingredient by source	NA
			Physical	2	5	10	YES	Dirt, sand, gravel	Sorting
			Chemical	1	2	2	NO	Metal ion contamination (Sulphure)	Sorting, metal detection
5	Salt	Ambient	Biological	1	1	1	NO	Helicobacter	Dry in the sun, save in the fridge
			Allergen	1	1	1	NO	Didn't contain allergen	NA
			Radiation	1	1	1	NO	Not under process radiation	NA
			Halal	1	1	1	NO	Halal ingredient by source	NA
			Physical	2	2	4	NO	Foreign object contamination	Sorting
			Chemical	3	5	15	YES	Pesticide	Washing with water
6	Onion	Ambient	Biological	3	4	12	YES	Spoilage, Salmonella sp.	Save in dry place, personal hygiene
			Allergen	1	1	1	NO	Didn't contain allergen	NA
			Radiation	1	2	2	NO	Not under process radiation	NA
			Halal	1	1	1	NO	Halal ingredient by source	NA
			Physical	2	5	10	YES	Cloudy, Black, Expired	Checking expired date
			Chemical	4	5	20	YES	Oxidation, excessive peroxide contamination	Oil changes maximum 3x used
7	Cooking Oil	Ambient	Biological	3	2	6	NO	clostridium botulinum	Save in dry place
			Allergen	1	2	2	NO	Didn't contain allergen	NA
			Radiation	1	2	2	NO	Not under process radiation	NA
			Halal	1	1	1	NO	Halal ingredient by source	NA
8	Seasoning	Ambient	Physical	3	3	9	NO	Foreign object contamination	Sorting

To be continued…

			Chemical	1	2	2	NO	Pesticide	Washing with water
			Biological	1	1	1	NO	Spoilage	Save in dry place, personal hygiene
			Allergen	1	1	1	NO	Didn't contain allergen	NA
			Radiation	1	1	1	NO	Not under process radiation	NA
			Halal	1	1	1	NO	Halal ingredient by source	NA
			Physical	2	2	4	NO	Foreign object contamination	Sorting
			Chemical	3	2	6	NO	Pesticide	Washing with water
9	Spring Onion	Ambient	Biological	4	4	16	YES	Salmonella sp., Caterpillar	Save in dry place, personal hygiene
			Allergen	1	1	1	NO	Didn't contain allergen	NA
			Radiation	1	2	2	NO	Not under process radiation	NA
			Halal	1	1	1	NO	Halal ingredient by source	NA

Table 3. HACCP based on Product Contact

No	Ingredient name	Storage condition	Potential Hazard	Risk Assessment		Outcome	Significant risk	Explanation/ Reason/ Evidence/ Cause	Control mechanism
				Severity (S)	Probability (PO)				
			Physical	2	3	6	NO	Quality not fulfill standard	Sorting
1	Cardboard	Ambient	Chemical	1	4	4	NO	packaging material	lamination
			Biological	1	2	2	NO	Bad storage and distribution	Ensure dry surface, check color

Table 4. HACCP based on Process

No	Process name	Potential Hazard	Risk Assessment		Out-come	Significant risk	Explanation/ Reason/ Evidence/ Cause	Control mechanism
			Severity (S)	Probability (PO)				
1	Receipt of food materials	Physical	3	5	15	YES	Food on material spoilage	Sanitation and hygiene
		Chemical	2	2	4	NO	Pesticide	washing with water
		Biological	2	4	8	NO	Bacteria	Save in dry storage
2	Storage	Physical	3	3	9	NO	Stale product	Save in dry storage
		Chemical	2	2	4	NO	inspection raw material	Check sanitation and spec.
		Biological	3	4	12	YES	Expired raw material	Check expired
3	Cutting and washing vegetables	Physical	3	3	9	NO	Contamination from distribution	Sanitation and hygiene
		Chemical	2	2	4	NO	Appropriate inspection raw material and equipment	Check sanitation and spec.
		Biological	2	3	6	NO	Caterpillar	Sorting
4	Cutting and washing meat	Physical	3	3	9	NO	Contamination from person	Sanitation and hygiene
		Chemical	2	2	4	NO	Raw material, chlorine	Check raw material and washing with water
		Biological	2	3	6	NO	Bacteria	Sorting
5	Martabak frying	Physical	2	3	6	NO	Cooking oil used is not worth using	Cooking oil changes maximum 3x used
		Chemical	3	4	12	YES	Cooking oil is oxidized	Cooking oilchanges maximum 3x used
		Biological	1	3	3	NO	Expired cooking oil	Check expired date ingredient
6	Packaging	Physical	3	4	12	NO	Contamination from distribution	Sanitation and hygiene
		Chemical	2	2	4	NO	Exposed cardboard with heat	Pad of paper
		Biological	2	3	6	NO	Damp	Save cardboard in dry place

Table 5. CCP

No	Process name	Potential Hazard	Risk Assessment		Total	Significant risk	Explanation/ Reason/ Evidence/ Cause	Control mechanism	Q 1	Q 2	Q 3	Q 4	PRP/ OPRP (SPP) or CCP
			Severity (S)	Probability (PO)									
1	Receipt of food materials	Physical	3	5	15	H	Food on material spoilage	Sanitation and hygiene	Y	Y	N	N	CCP
		Chemical	2	2	4	L	Pesticide	washing with water	Y	N	N	N	PRP
		Biological	2	4	8	M	Bacteria	Save in dry storage	Y	Y	N	N	PRP
2	Storage	Physical	3	3	9	M	Stale product	Save in dry storage	Y	Y	N	N	PRP
		Chemical	2	2	4	L	inspection raw material	Check sanitation and spec.	Y	Y	N	N	PRP
		Biological	3	4	12	H	Expired raw material	Check expired	Y	Y	Y	N	CCP
3	Martabak frying	Physical	2	3	6	M	Cooking oil used is not worth using	Cooking oil changes maximum 3x used	Y	Y	N	N	PRP
		Chemical	3	4	12	H	Cooking oil is oxidized	Cooking oil changes maximum 3x used	Y	Y	N	N	CCP
		Biological	1	3	3	L	Expired cooking oil	Check expired date ingredient	Y	Y	Y	N	PRP

Application of HACCP to aljaya's Martabak egg martabak menu at Rungkut Madya, Surabaya several CCP points was obtained in the process of receiving, storing, cutting, and washing (vegetables, spices, and meat), frying, and packaging before being given to consumers. Control over the hazards that may occur in each process from reception, and processing, to presentation has been properly implemented. The use of equipment made of metal such as knives that are not rusty and cleaned before being used for raw material preparation, storage is carried out properly except for eggs which are stored at room temperature, and fried at the appropriate temperature and time so that it is by the level of maturity, and packaging using boxes so that maintain hygiene.

Conclusion

HACCP is a quality assurance system that is based on awareness of hazards that will arise at various points or stages of production, but control can be exercised to control hazards. HACCP consists of 7 basic principles, namely hazard analysis (hazard analysis), determination of critical control points (CCP), determination of critical limits (critical limits), preparation of monitoring procedures (monitoring), implementing corrective actions, create procedures for recording and storing data in the HACCP documentation system, and establishing procedures for verifying the HACCP system. The application of HACCP aims tofood is not contaminated and can be ensured safe for consumption.

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