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Analysis of quality control on cassava *emping* "Super Telur Bu Siti" in Bantul Karang Yogyakarta

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ABSTRACT

Cassava *emping* is a snack made from mashed cassava mixed with eggs, red chilies, green onions, and celery leaves. This research aims to analyze the quality control of cassava *emping* products and efforts to improve the production process of "Super Telur Bu Siti" Cassava *Emping*. Data collection methods in this research are interviews, observation, and literature study. Several problems are caused by facts that need to conform to standards in similar food production processes. From the analysis using affinity diagrams, several factors cause quality problems, namely materials, machines, methods, humans, and the environment. The alternative tree diagram analysis results are efforts or actions to improve the quality of cassava chip products in "Super Telur Bu Siti" Cassava *Emping*. This research concludes that quality control is carried out based on aspects of raw materials, processes during processing, and final products. The Cassava *Emping* product "Super Telur Bu Siti" does not meet the quality standard criteria based on the National Standards and the Indonesian Food and Drug Supervisory Agency regarding Good Food Production Methods for Home Industries or CPPB-IRT 2012.

Keywords: Affinity diagrams, Alternative tree diagrams, Cassava *emping*, Quality

INTRODUCTION

In general, *emping* are snacks made from melinjo. However, the people in Bantul Karang made *emping* innovations made from cassava. Bantul Karang is known as a village of cassava-*emping* artisans. One of the most well-known and long-established cassava *emping* Micro Small and Medium Enterprises in Bantul Karang Village is the Cassava *Emping* "Super Telur Bu Siti." These MSMEs produce and offer raw cassava *emping* products, which are then marketed to traditional markets, traveling vendors, gift shops, and online marketing sites. High-quality products are one of the main factors consumers use when determining whether a product should be purchased. However, several constraints or problems can affect the quality of the product. This is caused by the condition of the quality of raw materials during the processing, including damage or loss of nutrients caused by treatment during the processing process. Quality control includes the supervision of the entire product production process. According to Alvionita (2018), there are three (3) stages in determining food quality control or supervision: Material Quality Control, Quality Control during the Processing Process, and Final Product Quality Control. In this case, the author researched Cassava *Emping*'s "Super Telur Bu Siti," which has been running its business since 2012. However, based on the results of the author's observations, Cassava *Emping*'s "Super Telur Bu Siti" has not shown high-quality standards in the processing of cassava *emping*. This research aims to determine quality control in the production process at Cassava *Emping* "Super Telur Bu Siti" and hopes that practical work reports.

RESEARCH METHOD

Materials

Machines and equipment used in the cassava *emping* processing process "Super Telur Bu Siti" is a gas stove, wooden spatula, kitchen knife, jumbo stainless steel pot, basin and as a container, wooden

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pestle, stone mortar and pestle, traditional scales, grinding machine, impulse sealer, polypropylene plastic packaging with a capacity of 250 g, 500 g, and 1000 g.

Methods

Data collection on cassava chip processing was carried out directly by observing the primary source and participating in helping workers in the cassava chip processing. The interview method is also used to obtain detailed information about things that still need to be understood.

The steps to make cassava chips:

1. Peeling and washing
   Cassava is peeled using a peeling knife to separate the pulp and skin. After that, the cassava is soaked in clean water for 15 minutes, then the remaining dirt and soil attached to the cassava flesh is cleaned.
2. Boiling
   Boiling cassava for approximately 2 hours. This process aims to soften the texture of the cassava so that it is easily crushed during the pounding process.
3. Pounding
   They were pounding aims to produce a smoother texture of cassava so that it is easy to mix with additional ingredients such as salt, spring onions, chilies, sugar, and celery leaves.
4. Separating cassava fiber
   Roots and fibers that are still attached are removed and cleaned using hands.
5. Mixing additional ingredients
   Mixing additional ingredients includes eggs, salt, sugar, chopped chilies, spring onions and celery leaves. Formulate the *emping* mixture in a bowl containing 15 kg of cassava with 4-5 eggs added, 250 g salt, 250 g sugar, 250 g chopped chilies, 250 g spring onions, and celery. After the additional ingredients are added to the *emping* mixture, the mixture is mixed using a wooden spatula until all the ingredients are mixed evenly.
6. Milling
   The *emping* dough is ground using an 8 PK Type 32 Diesel Meat Grinder with a capacity of 40 Kg/hour. The milling process aims to produce a smooth *emping* dough. This process also ensures that all the spices and additional ingredients in the dough are mixed evenly.
7. Cassava *emping* molding
   Molding cassava chips is still traditionally done by flattening the *emping* dough using a special hammer to make chips using human power. The *emping* dough is flattened into a round shape of the same size and then arranged on a clear plastic tarpaulin measuring 2 m x 2 m.
8. Drying
   Drying in direct sunlight. Drying chips cassava is done for two days during the day for approximately 3 hours.
9. Packaging
   Packaging of cassava chips is done manually one by one, one by hand, then sealed using a sealer machine and packaged using polypropylene plastic. The packaging variants Cassava *Emping* "Super Telur Bu Siti" offers include packages containing 250 grams, 500 grams, and 1 kilogram.

Data Analysis

Data analysis was obtained from observations and interviews and then linked to a literature review. Data analysis is presented in quality control tables, affinity diagrams, and alternative tree diagrams.

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RESULT AND DISCUSSION

Table 1. Quality Control on Cassava *Emping* Raw Materials.

No	Control Points	Standards	Facts	Problems
1.	Main Raw Materials			
	Cassava (BPOM RI, 2023)	Cassava is a tuber of *Manihot utilissima*, has a clean condition, is healthy, safe for consumption, and has not undergone a processing process.	Cassava, which comes from Wonosobo, is large, free of foreign odors, white, and has not been processed.	There are no problems with the use of cassava raw materials.
2.	Additional Raw Materials			
	Eggs (SNI 3926:2008) (BSN, 2008)	Normal shape: smooth, thick, whole, clean eggshell Thick egg white, free of blood spots or foreign objects The yolk is round in the middle, smells typical of eggs, and is clean	Some conditions of the eggshell include chicken feces	Chicken eggs are not cleaned of chicken feces attached to the shell of eggs
	Iodized Consumption Salt (SNI 01-4435-2000) (BSN, 2000)	Crystalline-shaped, normal odor, white in color, NaCl content of at least 94% over the dry weight limit.	The salt comes from the main distributor, the iodine salt brand. "DAUN" has been certified as halal and SNI.	There are no problems with the use of salt.
	Red Chilli (SNI 4480:2016) (BSN, 2016)	Free from damage from extreme temperatures, the whole, fresh, clean form, aroma, and taste do not deviate other than the typical chili.	Red chili that has been rotten is thrown away or distorted first.	There is no problem with the use of chili peppers.
	Leeks (SNI 01-6996-2004) (BSN, 2004)	Green color, straight shape with a length of ± 45 cm, no damage, normal smell, and no foreign bodies.	The leeks are fresh, and the part of the withered stalk is removed.	There are no problems with the use of leeks.
	Celery leaves (SNI 01-136-1981) (BSN, 1981)	Pest-free, spot-free, uniform size, and fresh	Some strands of celery leaves have brown spots	Lack of attention to the physical condition of celery leaves

Table 1 shows that the factors causing problems that can affect the quality of raw materials are found in chicken eggs and celery leaves. Used chicken eggs are not cleaned of chicken feces attached to the shell of eggs. The lack of washing processes for eggs to be processed also influences bacterial contamination. These factors cause a positive number of egg shells and egg yolks to be contaminated by *Salmonella sp* bacteria. The presence of *Salmonella sp*. on eggs is an indicator of food safety that the eggs have been contaminated by human or animal feces (Wahyuningsih et al., 2019). In addition, based on observations of the physical condition of several strands of celery leaves, it was found that there were brown spots. Septoria leaf spot on celery plants affects the selling value and taste of celery, which is not fresh. According to Sucanto et al. (2019), Septoria leaf spot disease on celery plants shows signs and symptoms on the leaves, which contain small brown spots with a 1.5 – 10 mm diameter. This

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disease is septoria leaf spot caused by the fungus *Septoria sp.*

Based on Table 2. it can be seen that the problem factors that can affect the quality of *emping* are found during the processing, such as peeling, washing, cooling, separation of cassava fibers, mashing, drying, and labeling. The peeling process that has been observed in the Cassava *Emping* "Super Telur Bu Siti" has not met the Standard Operating Procedures (SOP) because, in the peeling process, the peeling knife used has rusted and dulled, this will affect the quality control of cassava *emping* during the processing process. According to Agustina (2014), metal cases are signs of pollution caused by metal oxidation. The metal accumulates in the body's tissues and can cause human, plant, and animal poisoning if it exceeds the tolerance limit. Some metals have carcinogenic (cancer-causing) and teratogenic (metal-damaged) properties. Based on the facts in the washing process that have been observed in Cassava *emping* "Super Telur Bu Siti" has not met the requirements of raw material washing standards based on CPPB-IRT issued by Badan Pengawas Obat dan Makanan or BPOM RI (2012) due to the washing process, the water used in soaking and washing cassava is used many times, and there is no handling of soaking water that has been dirty or water has not been replaced with new clean water. This will decrease the quality control of cassava chips because it is not carried out during the processing process following the established procedures.

Table 2. Quality Control during the Cassava *Emping* Processing Process.

No	Control Point	Standards	Facts	Problems
1.	Peeling Process (Kementerian Pertanian RI, 2014)	Contamination-free peelers, such as rust-free ones, and blades are not clumped. After the cassava is peeled, put it immediately in a reservoir filled with water so that it does not oxidize.	The peeling process uses a peel knife that has been washed before use. However, the condition of the peel knife is rusty. After the cassava is peeled and then soaked in water	The use of a rusty peel knife
2.	The process of washing raw materials (BPOM RI, 2012)	Materials from outside should not pollute water used for washing / direct contact with foodstuffs; water used many times (recirculation) should be handled and maintained to remain safe for processed food.	Peeled cassava is carried out 15 minutes of soaking and one wash.	Water used in soaking and washing cassava has been used many times, and there needs to be handling of soaking water that has been dirty or not been replaced with new, clean water.
3.	Boiling process (SNI 8752:2019) (BSN, 2019b)	Boiling is carried out at 100°C using a metal pan should not be defective, such as holes, cracks, uneven surfaces, etc. Other surface defects	The boiling tool is clean Furthermore, loaded from stainless steel that has been certified by SNI. Boiling Performed at a temperature of 100˚C	No problems with the cassava boiling process
4.	Cooling Process (BPOM RI, 2012).	Materials and final products should be stored separately in a clean room, following storage temperature and pest-free	Cooling of cassava after boiling is carried out in an open room	Cassava that is being cooled is in direct contact with the air and sunlight, resulting in contamination of airborne bacteria
5.	Mash process (Kementerian	Clean mashing tool. The flesh of the tuber fruit is	Clean mashing tool. Cassava dough is ground	The mash process is carried out in an

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No	Control Point	Standards	Facts	Problems
	Pertanian RI, 2015)	crushed to a smooth state.	to khalis. Mashing is carried out in an open room.	open room.
6.	Kneading Process	Kneading tools using food kneading tools, clean and free from dirty	Kneading tools using basins and suites based on food-grade	There are no problems with the kneading Process
7.	Separation of cassava fibers (BPOM RI, 2012).	Employees must always wash their hands before starting food processing activities and after handling raw materials or/or materials that have been dirty.	Cassava fibers are separated manually using hands in direct contact with cassava *emping* dough.	Workers need to gainreness of the importance of always washing their hands every time they start a new activity. Workers were not wearing gloves.
8.	Mixing Additional Materials (BPOM RI, 2012)	Must use permitted food additives according to the maximum limit of their use, the use of food additives must have permission from BPOM RI and do not use hazardous materials that are prohibited for food.	Auxiliary raw materials/additives have been SNI certified. Mixing auxiliary materials involves a basin and a special food-grade sutil.	No problems with mixing additional ingredients.
9.	Grinding	Clean and wash the grinding container and knife before use; the machine should not be exposed to water. Unplug the socket after turning off the machine, and then the container and knife are cleaned again. Then close the machine with a wrapping	The grinding machine and knives are cleaned before and after use; the grinding machine is closed using protective plastic .	There are no problems with the grinding process.
10.	*Emping* Forming Process (BPOM RI, 2017).	Forming is carried out using a controlled method to produce a thin, slightly clear *emping* and uniform diameter.	The formation of *emping* is printed using a special hammer to print *emping*; the resulting *emping* is thin, uniformly round, and slightly clear.	There are problems with the process of *emping* formation.
11.	Drying (BSN RI, 2019a).	Drying is carried out at a certain temperature and time controlled to obtain the required moisture content	Drying is carried out by irradiation of direct sunlight and adjusting weather conditions. Maximum drying is carried out for two days	Improper drying or not being dried optimally caused by rainy weather conditions or humid temperatures will result in cassava *emping* becoming moldy.

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No	Control Point	Standards	Facts	Problems
12.	Packaging (BPOM RI, 2019)	Packaging must protect food quality from contamination, prevent damage, be stored and handled under hygienic conditions, and separate from raw materials and final products	Packaging using special polypropylene (PP) type food packaging separates packaging from raw materials and final products.	There are problems with the packaging process.
13.	Labeling (BPOM RI, 2020).	The element of completeness of the label on processed food in retail packaging contains the least information regarding product name, list of ingredients used, net weight, name and address of the producing party, required halal, date and production code, expired information, distribution permit number and food origin	The packaging label of cassava, *emping* displays elements of the product name, list of ingredients used, net weight, production information, address, and P-IRT code number.	The cassava *emping* packaging label does not accompany the required halal and expiration date information.

Based on the fact that the cooling and mash process on the Cassava *Emping* "Super Telur Bu Siti" has not met the standard requirements based on the CPPB-IRT issued by BPOM RI (2012) and the operational standards issued by the Kementerian Pertanian RI (2015). This is because the cooling and mashing process is carried out in an open room, cassava is cooled, and the ground is in direct contact with the air and sunlight. According to Arini (2017), biological food damage is generally caused by microbes that enter food through dust, air, hands, or other means. The influence of Aw (moisture content on foodstuffs) and pH supports the development of microorganisms. In addition, stored foodstuffs that support microbial growth, for example, at room temperature (28°C), so that microbial metabolic processes occur, such as removing toxins, which result in damage to harmful foodstuffs when consumed.

Based on the fact that the cassava fiber separation process in Cassava *Emping* "Super Telur Bu Siti" has not met the standard requirements based on the CPPB-IRT issued by BPOM RI (2012) because the separation of cassava fibers is done manually using hands in direct contact with cassava *emping* dough. According to Romanda et al. (2016), food handlers whose nails are not cut short when they touch food are the ones who cause the transfer of bacteria from the hands to direct food. Personal hygiene of food handlers is very important to influence the presence of *Escherichia coli*. Washing hands before processing foods effectively reduces the risk of contamination by pathogenic bacteria.

Based on observations made at Cassava *emping* "Super Telur Bu Siti," problems can affect the quality control of cassava *emping* products during the processing process, namely, drying is carried out by irradiating direct sunlight and adjusting weather conditions. Improper drying or not being dried optimally caused by rainy weather conditions or humid temperatures will make cassava chips moldy. The weakness of drying with sunlight is that case hardening occurs, which is a condition where the surface of the material is lumpy while the inside is still wet, lower quality than fresh food.

Based on the results of observations made on the packaging of the Cassava *emping* product label "Super Telur Bu Siti," it has not met the requirements of the processed food label guidelines based on BPOM RI. The cassava *emping* packaging label does not accompany the required halal and expiration date information. The time limit specified if the business actor violates the label provisions is three reprimands. If the violation still has beenneeds to be implemented to include the complete label requirements, then the administrative sanki is applied. This is stated in chapter 47 of Government Regulation number 28 year 2004 concerning Food Safety, Quality and Nutrition No. 28/2004 (Peraturan

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Pemerintah RI, 2004). Meanwhile, the provisions of criminal and civil sanctions related to violations of product labeling itself are not mentioned. Both sanctions are only possible if it has been proven that the food products produced are indeed endangering consumers' lives.

Table 3. Identity or Comparative Characteristics between *Emping* Melinjo and Cassava *emping* "Super Telur Bu Siti".

No	Product Characteristics	Melinjo *Emping*	Cassava *Emping* "Super Telur Bu Siti"
1.	Product Composition	Melinjo seeds	Cassava
2.	Weaving Methods	Drying by drying method	Drying by the method of drying sunlight
3.	Primary Packaging	Plastic pp 0.6 mm	Plastic pp
4.	Shelf Life (Product Expiration)	3 months	No description of the shelf life
5.	Storage-specific advice	Store in a cool and dry place	Store in a cool and dry place
6.	Distribution Methods and Conditions	2/4 wheeled vehicles, room temperature	2/4 wheeled vehicles, room temperature
7.	How to Store	Room Temperature	Room Temperature
8.	Suggested use	Fried before consumption	Fried before consumption

Source: BPOM RI (2017)

Based on Table 3. Problems that can affect the quality of the final product can be analyzed. Cassava Chips "Super Telur Bu Siti" does not include information on the product expiration date. According to Oktariyadi (2014), elements of the expiration date must be included on the label because information regarding the expiration date is interrelated with the suitability of the product being sold. Expiry date information is an element that cannot be separated from security and harmony for consumers. BPOM RI (2019), the final identification of the melinjo *emping* product has a shelf life of 3 months, while the final product of the Cassava Chips "Super Telur Bu Siti" does not have shelf life information; this will have an impact on reducing the quality of the Cassava Chips "Super Telur Bu Siti."

Table 4. Quality Control of Cassava *Emping* Final Products.

No	Control Point	Melinjo *Emping* (BPOM RI, 2017)	Cassava *Emping* "Super Telur Bu Siti"	Problems
1.	Smell	Distinctive Smell of Raw *Emping* Melinjo	Typical Cassava	There is no problem with the smell of cassava *emping* "Super Telur Bu Siti."
2.	Taste	Typical savory melinjo if fried	Typical savory cassava if fried	There is no problem with the taste of cassava *emping* "Super Telur Bu Siti"
3.	Color	White to yellowish	White to yellowish	There is no problem with the color of the cassava *emping* Super Egg "BU SITI
4.	Sightings	Compote, all seeds Melinjo attached Blends	Compote, all cassava attached Blends	Overall, the appearance of cassava *emping* is normal. However, sometimes it is found that the condition of cassava *emping* is moldy and the condition of cassava *emping* is not a deep round shape
5.	Texture	Hard but bendable	Hard but bendable	There is no problem with the texture of Cassava Chips

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Based on Table 4, there are no problems with the final product of *Cassava emping* "Super Telur Bu Siti" on the test criteria for taste, smell, aroma, and texture under normal circumstances. Meanwhile, based on the apparition test criteria, some problems can affect cassava *emping* quality; namely, overall, the appearance of cassava *emping* is normal. However, sometimes the condition of cassava *emping* is a little bit moldy, and the condition of cassava *emping* is not a whole round shape. This is influenced by the drying process of cassava, which does not dry evenly. The drying process could be more optimal due to rainy weather conditions or humid temperatures during storage, which will result in cassava chips becoming moldy. Quality degradation can be caused by treatment using poor process technology, such as using processing tools and imperfect drying processes, which will affect the high moisture content and provide opportunities for microorganisms such as fungi growth.

Affinity Diagram Analysis

The affinity diagram is presented by giving the categories (names) to each group and classifying each category's idea in the branch's parent relationship. The factors affecting the defective products in the Cassava *Emping* "Super Telur Bu Siti" are presented in Figure 1.

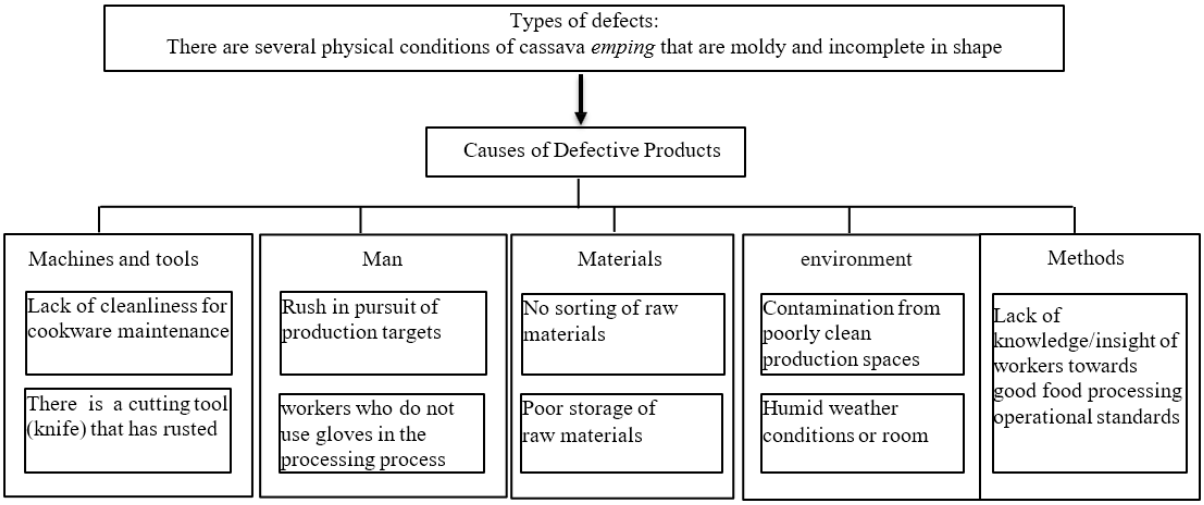

Figure 1. Affinity diagram of causes of defective products.

According to Prawirosentono (2002), the factors that influence product quality are as follows:

1. Machine

   Machines or equipment used to produce added value become *output*. Using machines as a supporting tool for producing a product or item allows for variations in various forms, quantities, and speed of the job evaluation process (Prawirosentono, 2002). Based on the results of observations at Cassava *emping* "Super Telur Bu Siti," machine and equipment factors influence product quality, namely the lack of cleanliness for maintenance of cooking utensils such as lack of sterilization of cooking utensils, use of cooking utensils periodically but not washed every time, and use of kitchen utensils simultaneously for different applications. This will affect the quality of cassava chip products.

   According to Tumelap (2011), the cleanliness of kitchen equipment is the most important thing influencing the quality of food and drinks. Kitchen equipment that needs to be washed clean can allow microorganisms or germs to multiply. All kitchen equipment that may come into direct contact with food must always be kept clean, and no food residue must be left in the appliance. If this is allowed, unwanted bacteria can multiply and spoil the food. The factor of machine and other equipment problems found in Cassava *Emping* "Super Telur Bu Siti" is the use of rusty cutting knives. According to Agustina (2014), the rusting of metals is a sign of contamination caused by metal oxidation processes. Metals accumulate in body tissues and can cause human, plant, and animal poisoning if they exceed tolerance limits. Some metals have carcinogenic (cancer-causing) and teratogenic (metal-damaging) properties.

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2. Man

   Man is the most important factor that enables the creation of added value (*added value*). Workers ' skills include performing tasks, skills, ability, training experience, and the potential for creativity to obtain results (Prawirosentono, 2002). Based on the results of observations at Cassava *Emping* "Super Telur Bu Siti," the man factor influences product quality, namely the rush to pursue production targets. Workers are in a rush to produce cassava chips, chasing production targets based on consumer demand and the physical condition of workers who are weakened when producing cassava *emping*. In addition, the negligence and neglect of workers regarding cleanliness cause some workers to sometimes need to remember to wash their hands, affecting the quality of cassava. According to Djarismawati et al. (2004), behavior and knowledge about sanitation and hygiene are very important for food processing workers in the kitchen as an effort to maintain the quality of the food produced and meet health requirements.

3. Material

   The raw materials processed in production produce added value *output*, which is very diverse. The diversity of raw materials used affects the various production values. Differences (types) of raw materials can also affect production (Prawirosentono, 2002). Based on the results of observations at Cassava *emping* "Super Telur Bu Siti," raw material factors that influence product quality, namely some raw materials such as celery that are not sorted first, such as brown spots and egg raw materials that are not cleaned first will result in a decrease in quality of cassava *emping*. Some of the damaged raw materials because they were not stored properly also decreased the quality of cassava *emping*. Based on the statement of Satar & Israndi (2019), the quality of raw materials has a positive and significant effect on product quality in manufacturing companies. Thus, the quality of raw materials has a positive influence that can determine the company's quality. The better the quality of the raw material, the better the quality of the product, and vice versa. Therefore, it is necessary to take control measures or improve raw materials in the processing of cassava *emping* so that a high-quality cassava *emping* product is produced.

4. Environment

   The environment where the production process is located affects the results or performance of the production process. Along with changes in the work environment, performance also changes; even external environmental factors can affect the five elements above, which can cause variations in work assignments. Several environmental factors decreased the quality of cassava *emping* products, namely the weather factor. The production of *emping* requires a drying process using the direct sunlight drying method. If drying is not done optimally due to rainy weather conditions and humid temperatures, mold will grow on cassava chips. This is following Muchtar et al. (2011). Several factors influence mold growth in foodstuffs: the moisture content of stored products, storage room temperature, storage time, number of foreign matter, and presence of pests and insects in warehouses. In addition, fungal growth is caused by physicochemical factors such as temperature, water activity (Aw), osmotic pressure, and oxidation-reduction potential. Fungal contamination of food not only causes a decrease in food quality but is also related to the ability of these fungi to produce mycotoxins and form conidia of pathogens or allergens, especially respiratory and lung diseases. In addition, the conditions of production sites need to be improved. Production sites close to cowsheds will result in cross-contamination by bacterial contamination of the food.

5. Method (*Methods*)

   This includes work procedures that require each worker to carry out work following the tasks assigned to each individual. This method must apply the best work procedures so that workers can carry out their duties effectively and efficiently. However, someone can interpret their assignments differently if the work can be completed according to plan (Prawirosentono, 2002). Based on the results of observations at Cassava *Emping* "Super Telur Bu Siti," the method factor can affect product quality, namely the lack of knowledge or insight of workers about processing operational standards (SOP) or CPPB-IRT according to chip processing. The lack of workers' knowledge about good processing standards is caused by limited information and a lack of teaching and training. Education is also one of the factors that influence workers' perceptions.

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Good food processing methods are important to meet the quality standards for food to create safe and quality products. Workers must control the food production process by determining raw material specifications, formulating and composing materials, establishing good production methods, and controlling the quality of the final product and specifications. According to Putra & Surachman (2020), through the BPOM RI (2012), the government set standards for MSMEs to produce food that guarantees food quality and safety. This standard is a CPPB-IRT is a guideline that contains requirements that domestic food producers must meet to produce high-quality, safe, and suitable food for consumption.

Alternative Tree Diagrams Analysis

Alternative tree diagrams, also known as decision tree diagrams, are used to solve a problem by interpreting the solution to the problem into detailed sub-components. The following is an alternative tree diagram related to alternative solutions to reduce product damage to the Cassava *emping* "Super Telur Bu Siti" presented in Figure 2.

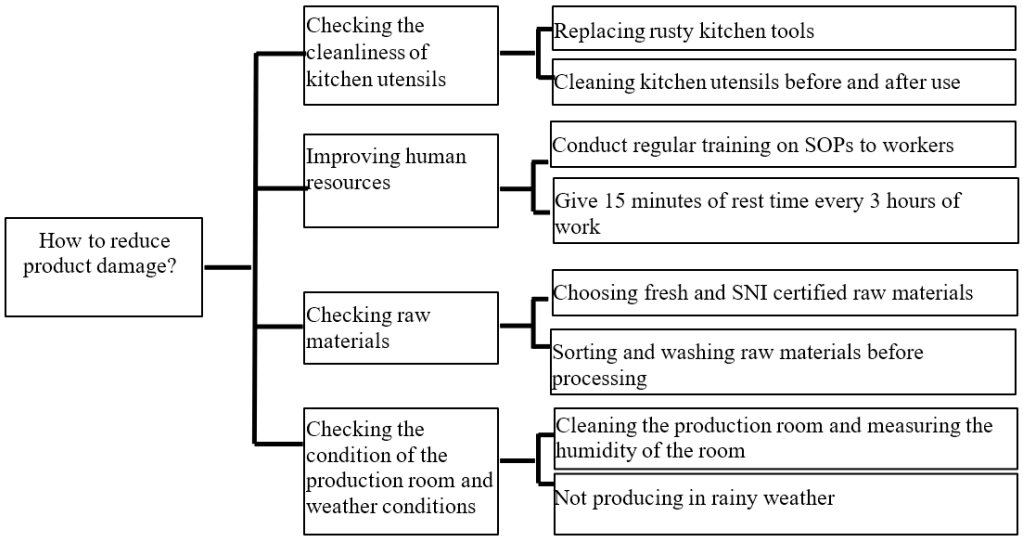

Figure 2. Alternative tree diagram of solution to reduce product damage.

Based on the alternative tree diagram presented in Figure 2., various efforts or solutions can be analyzed to reduce product damage to cassava chips, including:

1. Efforts to Improve Product Quality Based on Machine Factors

   The production process carried out by workers in the company needs to be given direction to operate production equipment properly. Directions need to be given to workers or employees, especially when using existing production machines and equipment, so that production machines and equipment have a long life or economic power (Ahyari, 1994). The requirements for production equipment are based on the BPOM RI (2012) concerning CPPB-IRT, namely:

   a. Production equipment should be made of strong, durable, non-toxic, easy-to-move, or disassembled materials and should also be installed to facilitate cleaning and maintenance, monitoring, and pest control.
   b. Surfaces in direct contact with food must be smooth, have no cracks or holes, no peeling, no rust, and do not absorb water.
   c. Equipment does not cause food environmental pollution caused by microorganisms, metal materials released by machines/equipment, lubricating oil, fuel, and other materials that pose a hazard, including food contact materials/food contact materials from food packaging that pose a hazard.

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2. Efforts to Improve Product Quality Based on Human Factors

Good food processing methods are important to meet the quality standards for food to create safe and quality products. Workers must control the food production process. Therefore, the government issued a Regulation of BPOM RI (2012) concerning Good Food Production Methods for the Home Industry; with these guidelines, a business actor can increase human resources workers by going through steps or directing regarding standard requirements of employees at the production site. The efforts to increase man based on the CPPB-IRT reference, namely:

a. Employees must always maintain personal hygiene.
b. Employees who handle food must wear clean clothes and wear aprons, head coverings, gloves, masks, and work shoes.
c. Employees must always wash their hands with soap before starting food processing activities.
d. Employees should not eat, drink, spit, sneeze, or cough into food to not contaminate food products. Employees in the food department should not wear jewelry such as earrings, rings, bracelets, necklaces, watches, or other objects that endanger the safety of processed food.

3. Efforts to Improve Product Quality Based on Environmental Factors

The growth of fungus in cassava *emping* is caused by the drying process, which is not optimal, so the water content in cassava *emping* is still high. Apart from that, other factors that affect the growth of mushrooms in cassava *emping* are due to the dirty production environment. As for efforts to prevent fungal contamination during the production process, according to Sardjono et al. (1995), controlling the condition of raw material storage warehouses is very important to inhibit the growth of fungi. Inspection and checking of raw materials is very important to do. Temperature and length of heating time are control criteria to minimize mold in foodstuffs. Strict control of the process room is important because air is the main medium for the risk of contamination by fungi, especially in rooms for temporary storage before products are packaged. In addition, efforts to improve the quality of cassava chip products are based on environmental factors based on the CPPB-IRT reference, including:

a. The location of the production or processing site must be kept clean from garbage, odors, smoke, dirt, and dust.
b. The environment must always be maintained clean by disposing of garbage, not accumulating waste, closing trash cans, and maintaining roads so they are not dusty and gutters function properly.

4. Efforts to Improve Product Quality Based on Method Factors

Efforts or actions that can improve the quality of the product are based on method factors, namely conducting directions and training to employees regarding Managerial Operational Standardization (Managerial Operational Standard). According to Ahyari (1994), managerial Operational Standardization is a guideline for the management of the company concerned in the framework of the company's operations, including production processes within the company with good processing methods.

5. Efforts to Improve Product Quality Based on Material Factors

Based on the observations, the factors that cause problems that can affect the quality of raw materials in the production of cassava *emping*, namely chicken eggs and celery leaves, are observed to be less clean and less fresh. The efforts to improve the quality of the final cassava chip *emping* are based on the 2012 CPPB-IRT guidelines, namely:

a. Raw materials should be stored separately in a clean room, according to the storage temperature, free of pests, and with sufficient lighting.
b. Materials that easily absorb water should be stored in a dry place; for example, salt, sugar, and ground spices.
c. The raw materials must be undamaged, not rotten, not contain hazardous materials, not harmful or harmful to health, and meet the quality standards or requirements.

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CONCLUSION

This research concludes that quality control based on aspects of raw materials, processes during processing, and the final product that has been carried out by the Cassava *Emping* product "Super Telur Bu Siti" does not meet the quality standard criteria based on the reference of the Indonesian National Standard and the BPOM RI regarding CPPB-IRT in 2012 due to machine and kitchen equipment factors, lack of knowledge of Human Resources, material factors, environmental factors and processing methods that were not included following the 2012 CPPB-IRT. Efforts or actions to improve the quality of cassava chips products at the Cassava *Emping* "Super Telur Bu Siti" UMKM by increasing employee knowledge or insight through training and supervision, paying attention to each employee's sanitary and hygienic conditions of cleanliness before starting production activities, and the need to take action to control the raw materials for processing cassava *emping* that meets quality

REFERENCES

Ahyari, A. (1987). *Manajemen produksi pengendalian produksi* (4th ed.). BPFE UGM.

Agustina, T. (2014). Kontaminasi logam berat pada makanan dan dampaknya pada kesehatan. *TEKNOBUGA*, *1*(1). https://doi.org/10.15294/teknobuga.v1i1.6405

Alvionita, V. (2018). *Analisis implementasi pengawasan mutu produk benang sutera pada Kelompok Tani Eka Sutera di Kecamatan Donri-Donri Kabupaten Soppeng* [Undergraduate Thesis]. Universitas Muhammadiyah Makassar.

Arini, L. D. D. (2017). Faktor-faktor penyebab dan karakteristik makanan kadaluarsa yang berdampak buruk pada kesehatan masyarakat. *Jurnal Teknologi Dan Industri Pangan*, *2*(1). https://doi.org/10.33061/jitipari.v2i1.1531

Badan Pengawas Obat dan Makanan Republik Indonesia. (2012). *Peraturan kepala badan pengawas obat dan makanan Republik Indonesia nomor HK.03.1.23.04.12.2206 tahun 2012 tentang cara produksi pangan yang baik untuk industri rumah tangga*. Badan Pengawas Obat dan Makanan Republik Indonesia.

Badan Pengawas Obat dan Makanan Republik Indonesia. (2017). *Produksi pangan untuk industri rumah tangga: Emping melinjo*. Badan Pengawas Obat dan Makanan Republik Indonesia.

Badan Pengawas Obat dan Makanan Republik Indonesia. (2019). *Peraturan badan pengawas obat dan makanan nomor 20 tahun 2019 tentang kemasan pangan*. Badan Pengawas Obat dan Makanan Republik Indonesia.

Badan Pengawas Obat dan Makanan Republik Indonesia. (2020). *Pedoman label pangan olahan*. Badan Pengawas Obat dan Makanan Republik Indonesia.

Badan Pengawas Obat dan Makanan Republik Indonesia. (2023). *Peraturan badan pengawas obat dan makanan nomor 13 tahun 2023 tentang kategori pangan*. Badan Pengawas Obat dan Makanan Republik Indonesia.

Badan Standardisasi Nasional. (1981). *Standar mutu daun seledri (SNI 01-136-1981)*. Badan Standardisasi Nasional.

Badan Standardisasi Nasional. (2000). *Standar mutu garam bahan baku untuk industri garam beryodium (SNI 01-4435-2000)*. Badan Standardisasi Nasional.

Badan Standardisasi Nasional. (2004). *Standar mutu daun bawang (SNI 01-6996-2004)*. Badan Standardisasi Nasional.

Badan Standardisasi Nasional. (2008). *Standar mutu telur ayam konsumsi (SNI 3926:2008)*. Badan Standardisasi Nasional.

Badan Standardisasi Nasional. (2016). *Standar mutu cabai merah (SNI 4480:2016)*. Badan Standardisasi Nasional.

Badan Standardisasi Nasional. (2019a). *Peraturan badan standardisasi nasional nomor 6 tahun 2019 tentang skema penilaian kesesuaian terhadap standar nasional indonesia sektor pangan*. Badan Standardisasi Nasional.

Badan Standardisasi Nasional. (2019b). Standar mutu peralatan masak (cookware) dari logam (SNI 8752:2019). Badan Standardisasi Nasional.

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E-ISSN: 2964-4909

Djarismawati, D., Sukana, B., & Sugiharti, S. (2004). Pengetahuan dan perilaku penjamah tentang sanitasi pengolahan makanan pada instalasi gizi rumah sakit di Jakarta. *Media Penelitian dan Pengembangan Kesehatan*, *14*(3), 31–37.

Kementerian Pertanian. (2014). *Standar prosedur operasional modified cassava flour (mocaf)(menuju penerapan persyaratan GMP)*. Kementerian Pertanian Republik Indonesia.

Kementerian Pertanian. (2015). *Aneka produk olahan berbasis sumber daya lokal*. Kementerian Pertanian Republik Indonesia.

Muchtar, H., Kamsina, K., & Anova, I. T. (2011). Pengaruh kondisi penyimpanan terhadap pertumbuhan jamur pada gambir. *Jurnal Dinamika Penelitian Industri*, *22*(1), 36–43. https://doi.org/10.28959/jdpi.v22i1.537

Oktariyadi, D. 2014. Implementasi peraturan pelabelan pangan pada industri rumah tangga pangan di Desa Pugeran Kecamatan Gondang Kabupaten Mojokerto. *NOVUM:Jurnal Hukum*, *1*(1), 118–128.

Peraturan Pemerintah Republik Indonesia. (2004). *Nomor 28 tahun 2004 (28/2004) tentang keamanan, mutu dan gizi pangan*. Presiden Republik Indonesia.

Prawirosentono, S. (2002). *Bahasan komprehensif strategi pengambilan keputusan bisnis*. Bumi Aksara.

Putra, B. D. S. & Surachman, S. (2020). Evaluasi penerapan cara produksi pangan yang baik untuk industri rumah tangga (CPPB-IRT) pada UMKM Mentari Bulan Malang. *Jurnal Ilmiah Mahasiswa FEB Universitas Brawijaya*, *8*(2), 1–18.

Romanda, F., Priyambodo, P., & Risanti, E. D. (2017). Hubungan personal hygiene dengan keberadaan *Escherichia coli* pada makanan di tempat pengolahan makanan (TPM) buffer area Bandara Adi Soemarmo Surakarta. *Biomedika*, *8*(1), 41–46. https://doi.org/10.23917/biomedika.v8i1.2899.

Sardjono, S., Rahayu, E. S., & Naruki, S. (1995). Mycroflora and aflatoxin in soybean and koji for kecap production. *BIOSAINS*. 1, 11-15.

Satar, M., & Israndi, A. (2020). Pengaruh kualitas bahan baku dan efisiensi biaya produksi terhadap kualitas produk pada CV. Granville. *AKURAT Jurnal Ilmiah Akuntansi*, *10*(3), 89–101.

Sucanto, E. T., & Abbas, M. (2019). Jenis, frekuensi kemunculan, dan persentase penyakit cendawan pada tanaman sayuran. *BIOSFERA*, *36*(1), 1-9. https://doi.org/10.20884/1.mib.2019.36.1.719.

Tumelap, H. J. (2011). Kondisi bakteriologik peralatan makan di rumah makan Jombang Tikala Manado. *Jurnal Kesehatan Lingkungan Poltekkes Kemenkes Manado*, *1*(1), 20–27. https://doi.org/10.47718/jkl.v1i1.288.

Wahyuningsih, E., Sulistiyawati, I., & Zaenuri, M. (2019). Identifikasi bakteri salmonella SP pada telur ayam ras yang dijual di Pasar Wage Purwokerto sebagai pengembangan bahan ajar mikrobiologi. *Bioedusiana: Jurnal Pendidikan Biologi*, *4*(2). https://doi.org/10.34289/292827.