ISSN No:-2456-2165

Effort in Corrective Action and Improvement of Honey Product Quality Conforming to SNI 8664:2018 in the Micro And Small Enterprise (Case Study: CV XYZ)

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Abstract:- This study aims to improve the quality of honey products according to SNI 8664:2018 and the quality seen from the physical criteria (honey seeping, bottle bubbling, bottle bursting, crystallization, discoloration), and prepare for product certification. This research needs to be carried out to provide input and assist the companies in improving the quality of their products according to standards and fulfilling SNI quality requirements for honey product. The data used are 5 variant of honey products that produced. Samples were taken as many as 3 bottles of honey product measuring 200 ml from 2 type of honey were tested in the laboratory according to the quality requirements of SNI 8664:2018. The quality is seen from physical criteria by observing all honey that has been processed and becomes the final product. The analysis was carried out using histograms, pareto diagrams, fishbone diagrams, food safety hazard analysis and FMEA analysis. Problem fixes are carried out by applying literature studies and experiments to overcome the non-achievement of quality requirements according to SNI 8664:2018. To maintain process consistency by implementing management system standards. Then evaluate the success rate of implementing improvements and maintaining the consistency in achieving product quality. To overcome the problems that occur, it is necessary to pay attention to the water content, filtering, bottle filling and closing process, storage place and temperature, ensure cleanliness and hygiene, and handling product during distribution. From the result of the improvements, can be organized the company quality documentation consists of quality guidance, 9 procedures, 3 work instruction, 23 form, and 2 supporting documents. After repeated corrective action and testing, all parameters are meet quality requirements of SNI 8664:2018 and unconformity quality seen from physical criteria have been reduced 11.76%.

Keyword:- *FMEA, Food Safety, SNI 8664:2018, Quality, Standard.*

I. INTRODUCTION

Micro, Small, and Medium Enterprises have a significant role in supporting the national economy of Indonesia, which can contribute up to 60,5% of the Gross Domestic Product. Based on data from the State Minister for Cooperative and SMEs of the Republic Indonesia (2019) the number of Micro and SMEs in Indonesia has reached more than 65 million and the majority of the Micro and SMEs is engaged in the food industry.

Honey is one of the most widely food products that produced by Micro and SMEs in Indonesia. This is due to the abundant food sources for bees (almost all plants that produce flowers can be used as feed sources) both from forest plants, agricultural crops, and plantation crops (Setiawan, 2016). However, to maintain its quality, there are still very few amount of honey processing producers that apply SNI honey product or even get SNI honey product certification. Beside that, talking about the authenticity of honey product is still become a consumer question, whether the honey is pure, original honey without any mixture of ingredients such as sugar or syrup, which can actually cause health problems. To be able to give confidence to consumers regarding the quality of honey and as an effort to prevent honey counterfeiting, it can refer to the quality requirements set out in Indonesian National Standard (SNI) about honey product. Application of SNI Honey product is SNI that is applied voluntarily, which means producers may certify SNI for their honey products or not.

This research was conducted in a company that carries out its business activities in the food industry, especially animal husbandry and honey processing. The company manages Apis mellifera beekeeping and produces pure honey and mixed honey, namely honey mixed with royal jelly and bee pollen.

This research needs to be carried out to be able to provide input and assist companies in improving the quality of their products conforming to standards and fulfill the quality requirements of SNI honey product. This research is not only evaluates quality deviations and identifies their causes but also provides corrective actions and steps for companies to be able to fulfill all parameters of SNI Honey

quality requirements and prepare their products to be certified of SNI Honey product. In order to prepare their products to be SNI-certified honey products, companies must implement a management system standard and meet SNI Honey quality requirements (SNI 8664:2018). In terms of implementing the management system, the company will be directed to implement SNI ISO 9001 and Good Manufacturing Practices (GMP). The application of GMP is required as a basic requirement for the food processing industry so that their products can be certified.

Based on the results of laboratory tests, there are parameters that do not meet the quality requirements according to SNI Honey product, namely HMF content, water content, reducing sugar, and water insoluble solids. In addition, based on sales data for January - October 2021, there have been several returns due to honey seeping into the packaging bottles, bottles bulging, bottles exploding/breaking, crystallization, color changes, and old stock being sold at agents. This can be presented in Figure 1 below:

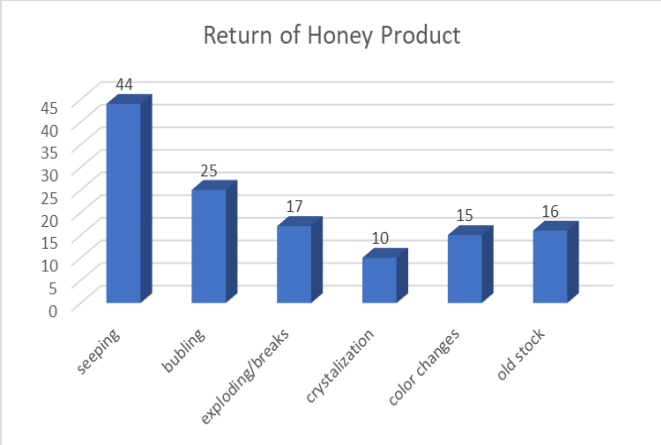

Fig 1:- Return of Honey Product

Based on the picture above, the problem of seeping honey is the most common of the total returns. In the company's efforts to develop and improve its business level, the company must manage better business production management and make various improvements.

II. LITERATUR REVIEW

A. Quality

Quality is an important indicator and factor for a company to be able to exist and compete in the industrial world. Quality means suitability for use (Montgomerry, 2013). Montgomerry (2013) also mentions that quality has become one of the most important consumer decision factors in choosing among competing products and services, so that understanding and improving quality is a key factor that leads to business success, growth, and increased competitiveness. In the context of discussing statistical process control, the term quality is defined as the consistency of increasing or improving and decreasing the variation in the characteristics of a product (goods and/or services) produced, in order to meet the requirements that have been required to increase internal and external customer satisfaction (Gasperz, 1998).

B. Quality Management System

According to Gasperz (2002) Quality Management System is a set of documented procedures and standard practices for system management that aims to ensure the conformity of a process and product (goods/services) to the needs or requirements determined or specified by the customer or organization. The Quality Management System manages the various interacting processes and the resources required to deliver value, as well as deliver results for relevant interested parties.

In SNI ISO 9000:2015 a management system is defined as a collection of organizational elements that are interrelated and interact to establish policies, objectives and processes to achieve these goals. While the quality management system is part of a management system related to quality.

The essence of the quality management system that will be implemented by the company is the existence of a quality policy, quality planning, quality objectives, work procedures, work instructions, and quality records. Besides that, there is also a commitment from top management that the quality management system is implemented, monitored, and improved (Sutawijaya et al, 2019)

C. SNI 8664:2018 Honey

Honey in Indonesia is very diverse which can be influenced by differences in regional origin, season, type of bee, type of plant the source of nectar, bee way of life (cultivated or wild), method of harvesting and post-harvest handling. With this diversity, the honey standard was developed into three categories, namely forest honey, cultivated honey and stingless bee honey (trigona). Indonesian National Standard (SNI) 8664:2018 with the title Honey is a revised SNI which is a combination of SNI 3545:2013 Honey and SNI 7899:2013 Management of honey so that SNI covers the whole range from post-harvest management to determining quality requirements and is expected to accommodate more wide variety of qualities of various honey in Indonesia, and can accommodate a wider variety of interests of all related parties.

The more industries that apply SNI Honey, it will guarantee the quality of honey in the market because the quality is standardized, protects consumers and producers from counterfeiting, and supports the export of honey product.

D. Good Manufacturing Practices

To be able to produce food products that have good quality and safe for health, it is not enough to just rely on final testing in the laboratory, but it is also necessary to implement a quality assurance system or implement a good food production system (GMP) as one of the basic requirements that must be met. Good Manufacturing Practices (GMP) is a food and beverage control system that aims to guarantee that the products produced are safe, legal, and meet existing standards (Wiley & Sons, 2018). In addition, according to Hermansyah et al (2013) Good Manufacturing Practices is one of the applications of quality control activities in order to

produce quality products by carrying out good and regular controls.

The implementation of GMP refers to Regulation of the Minister of Industry Number 75 year 2010 regarding Guidelines for Good Processed Food Production (CPPOB). The scope of the Guidelines for Good Processed Food Production Practices (CPPOB) covers the requirements stipulated in the food processing industry, namely location, buildings, sanitary facilities, machinery and equipment, materials, process control, final products, laboratories, employees, packers, labels and product descriptions, storage, maintenance and sanitation programs, transport, documentation and record keeping, training, product recalls, and implementation of guidelines. With the implementation of CPPOB, it is hoped that it can produce processed food that have high quality, safe for consumption, and in accordance with consumer demands so that it can increase industrial competitiveness.

E. FMEA

Failure Modes and Effect Analysis (FMEA) is a method used to identify risks that have the potential to arise, determine the effect of work accident risks, and identify actions to minimize these risks (Wawolumaja et al, 2013). The FMEA approach evaluates each risk and prioritizes each failure mode through the Risk Priority Number (RPN) (Wang et al, 2018).

The general steps in making an FMEA are:

- Identify processes or products.
- Make a list of problems that may arise.
- Scale problems according to complexity, likelihood of occurrence, or detectability, using a scale of 1-10.
- Calculates RPN (Risk Priority Number) and preferred action.
- Take action to reduce risk.

III. METHOD

A. Research design

This research is quantitative descriptive research type that is a case study. Research is carried out by seeking data and information from the phenomenon of problems that occur to be studied in depth with the aim of solving these problems. In conducting this research, field studies were carried out to gather information and identify initial conditions compared to fulfilling standard requirements. This research was carried out by identifying the production process to see variations in honey processing, testing honey quality according to SNI 8664:2018, evaluating factors causing quality deviations and providing recommendations for improvement. Honey quality control is carried out through statistical monitoring and the implementation of a quality management system.

B. Data collection technique

The population of this study were all types of honey products produced. The samples in this study were taken from 2 types of honey product variants, namely rambutan flower honey and rubber flower honey. To determine the quality of the honey content according to the quality requirements of SNI 8664: 2018, a sample of 400-600 ml was taken for each type of honey to be tested in the laboratory. While the quality is seen from the physical criteria (honey seeps, bottles bubble, bottles explode/break, crystallization, discoloration) by observing all honey that has been processed and becomes the final product. The parties interviewed to gather information were the Main Director as the business owner, Marketing Director, and production staff.

Primary data collection was carried out through survey and experimental methods, while secondary data collection was carried out using documentation methods, such as production data, bulk honey stock data and packaged honey, and return data.

C. Data Analysis Method

The data analysis method used is descriptive analysis method, namely analysis that aims to provide or describe a situation or phenomenon that is currently happening using scientific procedures to answer actual problems (Sugiyono, 2011). In this study, components that affect the quality of honey production were identified through direct observation of the honey processing process. The data analyzed are data from direct observation, interviews, and sample testing of two types of cultivated honey which represent all factors that affect quality (raw materials, equipment used, environment and production processes) to be used as indicators to see the implementation of SNI Honey and efforts corrections in the event of quality deviations.

The analysis is carried out by evaluating the factors that causing quality deviations and recommending improvements. To help visually display the sources of the causes of problems, fishbone diagram analysis is used to make it easier to identify the root causes of problems. Then carry out a hazard analysis of raw materials, packaging materials, and processes, and use FMEA analysis as a risk management tool to be able to find the effect or impact on the possibility of errors in a product or in the production process so as to reduce or eliminate the occurrence of problems.

Problem correction is carried out by applying literature studies and experiments to overcome the non-achievement of quality requirements conforming to SNI 8664:2018 parameters. In addition, to maintain process consistency by implementing standard management systems. Then an evaluation is carried out to determine the extent to which the success rate of implementing process improvements and maintaining consistency in terms of achieving product quality.

IV. RESULTS AND DISCUSSION

❖ *Result*

A. Pareto Charts

The Pareto chart shows the order of the most common problems that can seen in the following figure:

ISSN No:-2456-2165

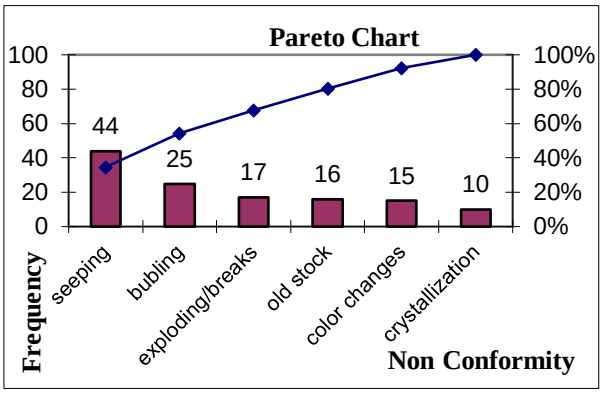

Fig 2. Pareto chart

From the problems in Figure 2, the seeping and bubling bottles are the most occur, then the root of the problem and solutions must be sought for improvement.

B. Fishbone Diagrams

This fishbone diagram analyzes the main problems that occur, namely bottles seeping, bubbling, and not fulfilling all parameters of quality requirements SNI 8664:2018.

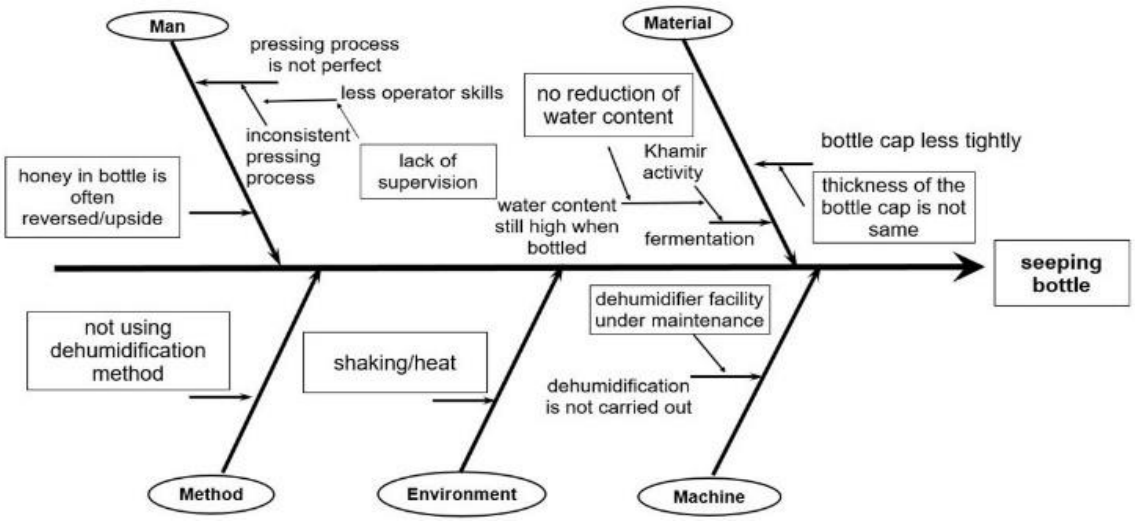

Fig 3 Fishbone seeping bottle

The problem with the bottle seeping can be caused by the process of pressing the bottle cap not tightly enough. However, these problems can be prevented if there is supervision and re-checking. When the bottle cap is not tightly closed, the position of the bottle which is often reversed when consumers see the product on the display and the delivery process can also cause honey to seep. In terms of material factors, it can be caused by honey undergoing fermentation. When honey is bottled when the water content is still high, it can cause fermentation so that it is necessary to reduce the water content. The occurrence of the fermentation process and then being exposed to shock/heat/high pressure, for example during the distribution process can also cause honey to seep. From a packaging material standpoint, A less tight of bottle cap can also be caused because the thickness of the bottle cap is not the same so it doesn't really lock and the bottle cap can still shift. Then from the machine/equipment factor, namely the dehumidifier facility is having problems/maintenance so that the water content is not reduced by dehumidification. Reducing the water content is only done naturally by the bees by slowing down the harvest time, but this is still not enough to reduce the water content to 17-18%.

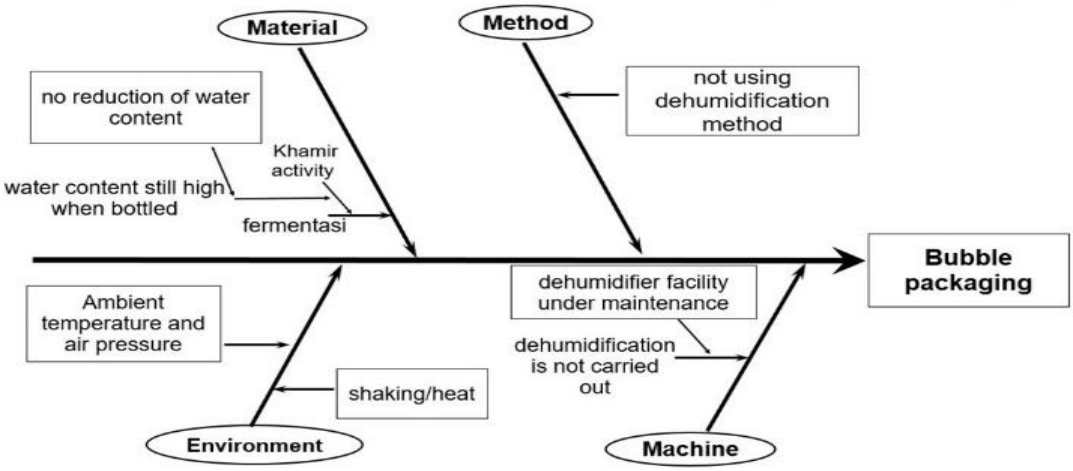

Fig 4. Fishbone Bubble Packaging

The problem with bubbled packaging can be caused by honey which is also fermenting, causing gas content in the honey bottle. When honey is bottled when the water content is still high, it can cause fermentation so that it is necessary to reduce the water content. The dehumidifier facility is having problems/maintenance as the reason for not reducing the water content by dehumidification. Reducing the water content is only done naturally by the bees by slowing down the harvest time, but this is still not enough to reduce the water content to 17-18%. The existence of a fermentation process that causes the gas content in the honey bottle coupled with the ambient temperature and high air pressure can cause the bottle to swell.

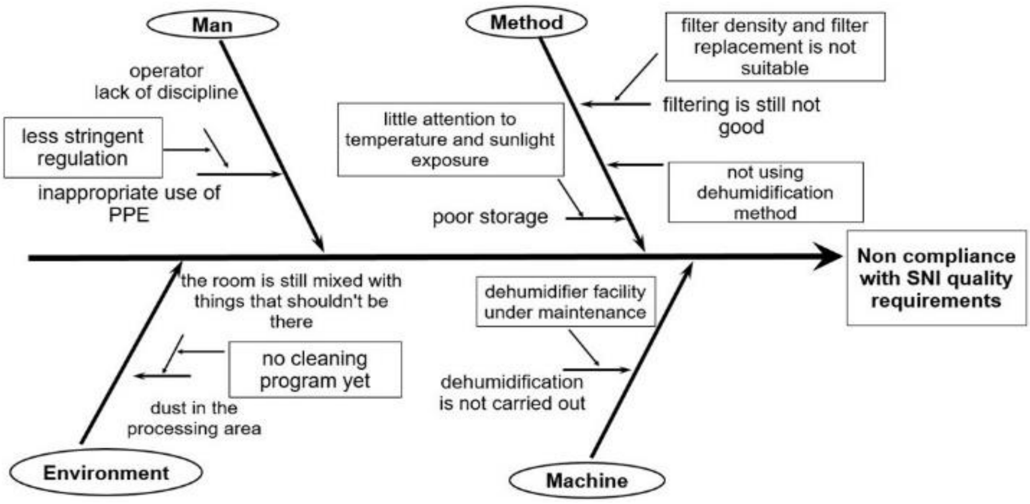

Fig 5 Fishbone SNI quality requirements

In maintaining hygiene and avoiding contamination of food products, it is necessary to pay attention to the cleanliness of the honey processing environment. Infrastructure facilities and cleaning programs need attention to avoid contamination. In addition, operators who work should be disciplined in using PPE such as head coverings, masks, disposable gloves for those who have direct contact with raw materials and products. While working, employees are prohibited from wearing jewelry, watches and long fingernails. Related to the relatively high water content, it can be caused by the machine/equipment factor, namely the dehumidifier facility is having problems/maintenance so that the water content is not reduced by dehumidification. Reduction of water content is only done naturally by bees by slowing harvest time, but it is still very risky that it can approach or even exceed the SNI quality requirements when testing in the laboratory. Related to water insoluble solids that exceed the quality requirements, can be evaluated from the side of the filtering method. The filter used should be tighter by changing the type of filter that has better density and replaced periodically to keep it clean. Then related to high HMF levels, it can be caused by poor storage methods that pay less attention to storage temperatures and exposure to direct sunlight, plus products that have been sold for a long time in poor storage can also affect HMF levels. Related to water insoluble solids that exceed the quality requirements, can be evaluated from the side of the filtering method. The filter used should be tighter by changing the type of filter that has better density and replaced periodically to keep it clean. Then related to high HMF levels, it can be caused by poor storage methods that pay less attention to storage temperatures and exposure to direct sunlight, plus products that have been sold for a long time in poor storage can also affect HMF levels. Related to water insoluble solids that exceed the quality requirements, can be evaluated from the side of the filtering method. The filter used should be tighter by changing the type of filter that has better density and replaced periodically to keep it clean. Then related to high HMF levels, it can be caused by poor storage methods that pay less attention to storage temperatures and exposure to direct sunlight, plus products that have been sold for a long time in poor storage can also affect HMF levels.

C. Food Safety Hazard Analysis

In this food safety hazard analysis by analyzing raw materials, packaging materials, and processes. The raw material in this case is pure honey taken from the harvest by extraction. Honey is removed from the hive by centrifugal technique using an extractor. From the identification of biological, physical and chemical hazards, honey raw materials are in the low risk category. This is because honey is a supersaturated solution of carbohydrates, so it is said to be a hyperosmotic medium. About 84% of the solids in honey are a mixture of monosaccharides, namely fructose and glucose. If a single-celled organism enters this hyperosmotic medium, the organism may die due to loss of body fluids due to the large difference in osmotic pressure (Food Engineering University of Muhammadiyah Semarang, 2013). Nevertheless, control still need to be carried out such as checking the quality of honey product (smell, taste, water content) and controlling the cleanliness of the room.

In the hazard analysis of packaging materials, it is still included in the low risk category. This packaging material is in the form of PET plastic bottles and glass bottles. The types of hazards that may exist are TPC, Coliform, and metal content. Control is carried out by ensuring that the plastic bottles are wrapped (in containers) and closed at the time of receipt and requesting complete migration test results from suppliers at least once a year.

ISSN No:-2456-2165

In the process hazard analysis, each stage of the process is still classified as low risk, but the critical point is during the process of pouring into containers (bottle filling). For this reason, it is necessary to control by ensuring the cleanliness of the environment and the condition of the container, ensuring the cleanliness of the equipment, ensuring the hygiene of employees at work.

D. FMEA

In FMEA, you can calculate the Risk Priority Number (RPN) to determine the highest failure rate (Kim & Zuo, 2018). RPN is a mathematical product of the seriousness of the effect (severity), the possibility of a cause causing failure related to the effect (occurrence), and the ability to detect failure before it occurs (detection) (Irianto, 2010). RPN can be shown in the following equation.

RPN = Severity x Occurrence x Detection.

A description of FMEA can be presented in table 1 below:

Table 1 Description of Failure Mode And Effect Analysis (FMEA)

Process	Failure Type	Potential Failure Effects	S	Process Failure Causes	O	Control	D	RPN
Receipt of raw materials	The thickness of the bottle cap is not the same	The packaging of the final product is not perfect	6	Incomplete inspection	6	Check and replace the type of bottle cap	5	**180**
	Characteristics of the honey product quality do not match	The quality of the final product does not meet the quality requirements	2	No filtering at harvest time	3	Post Harvest Process Procedures	5	**30**
Drum pouring	Equipment and worker contamination	Non-compliance with quality requirements	2	Workers do not use Personal Protecting Equipment, tools are less hygienic	3	Ensure cleanliness of equipment and workers	5	**30**
Filtering	Imperfect filtering	Water insoluble solids detected	3	The filter density is less, the old filter is replaced	6	Check filter condition and replace filter	5	**90**
Reduction of water content	Contamination from the environment	Ash content increases	2	Lack of attention to environmental cleanliness	3	Control of cleanliness of containers and rooms	4	**24**
Filling into bottles	equipment contamination	Non-compliance with quality requirements	2	Condition of equipment and packing materials	3	Control of cleanliness of containers, workers, and rooms	5	**30**
	The water content does not meet the quality requirements	It can cause the fermentation process, causing gas content which causes honey to seep, bottles to swell	7	Filling into the bottle when the water content is still high	6	Check the water content before putting it in the bottle	5	**210**
Bottle Closure	The bottle closure is not perfect, so it can still shift	The bottle seeps	6	The bottle cap is not tight enough, the thickness is not the same, the press is not perfect	7	Replacement bottle caps that have better density and the same thickness. Make sure the bottle caps doesn't slide easily	6	**252**
Storage	Old stock kept	High HMF levels	2	Lack of attention to long storage, temperature factors, and exposure to sunlight	3	The final product is stored in a cool place and not exposed to direct sunlight	6	**36**

Delivery	Items sent are damaged	Customer complaint	3	Lack of delivery control	2	Production procedures, Product Control and Withdrawal Procedures, Customer complaint handling procedures	4	**24**

Based on the FMEA description in table 1, the sequence of the largest RPN values is the type of failure in the imperfect closure of the bottle (252), the water content that does not meet quality requirements (210), the thickness of the bottle cap is not the same (180) which can cause the seeping bottle. Filling honey into the bottle when the water content is still high can cause fermentation which can also have an effect on the bottle seeping or even bubbling/breaking. The water content needs to be reduced to 17-18% so that there is no yeast activity that causes the honey to ferment (Siregar, 2012).

❖ *Discussion*

A. Product Incompatibility

From the results of product testing, there are still 4 parameters for the quality requirements of the Indonesian National Standard (SNI) which have not been met, which can be seen in table 2.

Table 2 Test Results That Do Not Meet SNI Requirement

No	**Test type**	**Unit**	**Results**		**Quality Requirements**
			rambutans (plastic bottles)	**Rubber** (glass bottle)	
B	**Laboratory test**				
1	Hydroxymethylfurfural (HMF)	mg/kg	32,4	68,58	Max 40
2	Water content	% b/b	22,3	18.40	Max 22
3	Reducing sugars (counted as glucose)	% b/b	64,9	71.53	Minimum 65
4	Solid insoluble in water	% b/b	0.55	0.12	Max 0.5
	NOTE *) This requirement is based on testing after honey is harvested				

Source: Laboratory testing result

In addition, the company's internal policy stipulates that within 6 months the product has been sold and not stored for long at the agent to avoid a decrease in product quality. Product returns due to old products being sold, seeping, bubbling, exploding/rupturing, crystallization, and discoloration are set at 1% of the total honey filling.

In the period from January to October 2021, there were a total of 127 product returns. When compared with the data for honey product filling in that period, the total product returns for the period January - October 2021 was 1.08% of the total filling for 5 types of honey products. This can be seen in table 3.

Table 3 Comparison of Production and Product Returns

	YEAR	JAN	FEB	MAR	APR	MEI	JUNI	JULI	AGS	SEP	OKT	TOTAL
Production (honey)	2021	1300	700	675	850	525	900	4413	1311	750	375	11799
Return		0	4	9	40	8	3	4	1	40	18	127
Percentage		0,00%	0,57%	1,33%	4,71%	0,95%	0,44%	0,09%	0,23%	5,33%	4,80%	1,08%

B. Recommendations for Improvement

After identifying and knowing the factors that cause product nonconformance problems, recommendations for corrective action can be proposed which can be seen in the following table.

Table 4 Proposed Corrective Actions for Honey Seeping

No	**Observed Factors**	**Causative factor**	**Proposed Corrective Actions**
1	Man	Employees are less thorough and lack supervision so that the lid is not tight and it is still easy to shift	Checking and monitoring procedures are carried out related to the packaging process
2	Material	the water content is still not within safe limits so that the fermentation process occurs, the thickness of the bottle cap is not the same	Reducing the water content by dehumidification, replacing bottle caps that have better density and the same thickness

3	Machines/Tools	dehumidifier facility is being damaged / maintenance	Repair of dehumidifier facilities
4	Method	the process of pressing/closing the bottle is not perfect, dehumidification method is not done	Make work instructions for the press process/bottle closure and reducing the water content using dehumidification method
5	Environment	Exposure to shock/heat triggers enzyme activity	provide space/distance between the honey and the bottle cap on each bottle of honey packaging

Prasetya and Andi (2014) explained that the high water content in honey will stimulate yeast activity to grow and develop in honey. Another cause is due to the activity of enzymes. Pure honey contains enzymes that are still active and will be more active when exposed to shock/heat. This condition is one of the causes of honey seeping. For this reason, it is necessary to provide space/distance between the honey and the bottle cap on each honey packaging bottle so that there is enough room for enzyme activation and to reduce excess pressure on the bottle. It is also necessary to pay attention to the product distribution process because too much shaking can cause gas. The use of bottles and bottles cap must be suitable, namely those that have good density and the same thickness to prevent seeping. If during the packaging process a bottle cap is found that does not lock completely and can still shift, the cap must be replaced with a new one.

Table 5 Proposed Corrective Actions for Bubbled Bottles

No	Observed Factors	Causative factor	Proposed Corrective Actions
1	Material	Fermentation process	Reducing the water content by means of dehumidification, giving space/distance between the honey and the bottle cap on each bottle of honey packaging
2	Machines/Tools	dehumidifier facility is being damaged / maintenance	Repair of dehumidifier facilities
3	Method	Not using the dehumidification method	Reducing the water content to 17-18% using the dehumidification method
4	Environment	Environmental temperature and air pressure, as well as experiencing shocks that trigger enzyme activity	Avoid shake / heat during delivery

The honey bottle swells due to gas escaping from the honey. The gas can come out because there are enzymes and fermenting sugar in it. The enzyme itself is the result of the salivary glands of the bees. Honey with a high water content is easily fermented by yeast that is resistant to high sugar concentrations, so it can live in honey. Yeast cells will degrade the sugar in honey into alcohol. To prevent this, the water content should be lowered to 17-18% so that there is no yeast activity that causes the honey to ferment and cause gas. This was revealed by the Food Engineering University of Muhammadiyah Semarang (2013) that mature and old honey contains a water content of 17.4% or lower. At this water content, honey is safe against yeast attack and fermentation.

Inflated honey bottles can also explode/break. This happens from the gas pressure that is too high from pure honey. To prevent honey from exploding during shipping, it can be coated with a layer that can absorb heat and shake, give space/distance between honey and bottle caps, and strengthen honey bottle caps.

Table 6 Proposed Corrective Actions for Non-compliance with SNI Quality Requirements

No	Observed Factors	Causative factor	Proposed Corrective Actions
1	Man	Operators are less disciplined because the rules are less strict	Created procedures and rules regarding hygiene
2	Machines/Tools	dehumidifier facility is being damaged / maintenance	Repair of dehumidifier facilities
3	Method	Not paying attention to temperature and sunlight exposure, not using the dehumidification method, filtering is still not good	Storage of the final product is stored in a cool place and not exposed to direct sunlight, and the honey stock to be sold should not be stored for too long, reducing the water content by the dehumidification method, increasing the density of the honey filter, adding one more filtering stage and changing the filter periodically
4	Environment	There is no cleaning program and 5S yet	Perform room arrangement and production layout

According to Wilczynska and Ruszkowska (2014), the water content on the surface of the material is affected by the relative humidity of the surrounding air. The water content of honey can also be affected by climatic factors, post-harvest handling, the type of nectar collected, and the maturity level of the honey. In addition, the factors that affect the high water content of pure honey are high rainfall.

The process of reducing the water content was previously carried out naturally by slowing down the harvest time. This is because the age of harvest can affect the composition of water in honey. The longer the honey is in the beehive, the more perfect the evaporation of the water content in the honey will be. To reduce the water content to 17-18% can be done by direct heating, indirect heating (dehydration), and evaporation (dehumidification). Among the three methods, the dehumidification method is safer because without heating that can affect the diastase enzyme and maintain the quality requirements for honey content.

HMF levels in honey product are an indicator of freshness and the heating process carried out on honey, as well as the length of storage. Honey stocks that have been stored for a long time and not paying attention to the temperature factor in the storage room can increase HMF levels. The longer the storage, the higher the honey HMF level, but the increase in HMF levels depends on the storage temperature. According to Chou, et al (2020) it is recommended to store honey in a place where the temperature is low and for less than one year. Considering the HMF content, honey should not be stored at temperatures above 35^0C. Regarding the reducing sugar content of honey, it can be influenced by several factors including water content, humidity, and harvest time (Siregar, 2002). Storage of honey at cold temperatures is more advisable than at room temperature, because at room temperature the humidity level is higher, making it easier to absorb water and cause fermentation. Cold temperature honey has better reducing sugar levels than room temperature honey (Wulandari, 2017). According to Chou's, et al (2024) research, 4^0C is the best storage temperature to maintain the conditions of most of the quality parameters, nutrition, and antioxidant function. For this reason, the final honey product should be stored in a cool place and not exposed to direct sunlight, and the existing honey stock will sell quickly/not be stored for too long.

C. Comparison Before and After Improvements

After improvements have been made, it is necessary to evaluate the extent to which the success rate of the improvements made is compared to the conditions before the improvements. During production for the January-October 2021 period, the company had not carried out the dehumidification method consistently to reduce the water content, so there were still problems caused by the water content still exceeding the quality requirements, such as yeast microbial activity which causes fermentation and causes gas content in honey. During the period January - May 2022 improvements have been made to the packaging, packaging methods, and reducing the water content which causes fermentation. The following is a comparison table between the January – May 2021 and 2022 periods.

Table 7 Non Conformity vs Total Production

Year	**2021**	**2022**
Production	4050	4068
Total Non Conformity	51	45
Total Percentage	1.26%	1.11%

When compared between conditions before and after improvements in the same period (January - May), there was a decrease in the number of non conformity by 11.76% and the total percentage comparison between production and the number of non conformity was 0.15%. Then based on the test results, there has been an improvement where all the parameters tested have met the quality requirements of SNI 8664:2018. The following is the data from honey product laboratory tests.

Table 8 Report on Laboratory Test Results of Rambutans and Rubber Honey

No	**Test type**	**Unit**	**Before rambutans**	**After rambutans**	**Before Rubber**	**After Rubber**	**Quality Requirements**
A	**Organoleptic Test**						
1	Smell	-	honey	honey	honey	honey	honey
2	Flavor	-	honey	honey	honey	honey	honey
B	**Laboratory test**						
1	Diastatic enzyme activity	DN	6,56	10.70	16,46	15.35	Minimum 3
2	Hydroxymethylfurfural (HMF)	mg/kg	32,4	0.02	68,58	38,42	Max 40
3	Water content	% b/b	22,3	18.73	18.40	17.80	Max 22
4	Reducing sugars (counted as glucose)	% b/b	64,9	70,57	71.53	72.45	Minimum 65
5	sucrose	% b/b	0	0.76	Not detected	0	Max 5
6	Acidity	mlNaOH/kg	29,3	41,578	28,29	27.58	Max 50
7	Solid insoluble in water	% b/b	0.55	0.04	0.12	0.14	Max 0.5
8	Ash Content	% b/b	0.01	0.04	0.26	0.23	Max 0.5
9	Metal contamination						
	9.1 Lead (Pb)	mg/kg	0.20	Not detected	Not detected	0.19	Max 1.0
	9.2 Cadmium (Cd)	mg/kg	< 0.007	Not detected	Not detected	< 0.007	Max 0.2

ISSN No:-2456-2165

No	Test type	Unit	Before	After	Before	After	Quality Requirements
			rambutans	rambutans	Rubber	Rubber	
	9.3 Mercury (Hg)	mg/kg	< 0.005	Not detected	Not detected	< 0.006	Max 0.03
10	Arsenic (As) contamination	mg/kg	< 0.013	Not detected	Not detected	< 0.014	Max 1.0
11	chloramphenicol	mg/kg		Not detected	Not detected	-	Not detected
NOTE *) This requirement is based on testing after honey is harvested							

Source: laboratory testing result

From the table above it can be seen the comparison of the test results between before and after the improvement. In rambutan honey, the water content, reducing sugar, and water-insoluble solids were previously not in accordance with the SNI quality requirements. After improvement and re-testing of the product, water content, reducing sugar, water-insoluble solids and all other parameters have met the quality requirements of SNI 8664:2018 for honey. Likewise for rubber honey, the levels of HMF previously exceeded the SNI quality requirements. After improvements and re-testing, HMF levels and all parameters met the quality requirements of SNI 8664:2018 for honey.

D. Quality Documentation

This quality documentation can be in any format and media and from any source. According to Putro & Santoso (2021) quality control can be carried out digitally which allows automation of reporting results of checking quality variables, including providing early warning if quality problems occur. Digitizing audit compliance makes it easy to convey findings live, and easily track corrective actions. With this quality documentation, it is hoped that the work carried out will be more systematic, organized and traceable, can be used as a tool for conducting production control so that the production process is more consistent in producing products according to the specified quality. From the results of the improvements, can be compiled the company's quality documentation which consists of quality guidelines, 9 procedures, 3 work instructions, 23 forms, and 2 supporting documents.

E. Product Certification Preparation

Companies that produce food products must pay attention to the hygiene of the production process to avoid contamination from the environment, equipment, personnel and pests. Some of the improvements that have been made are:

- Move the place of processing and storage of raw materials separate from the residence
- To avoid the potential for standing water caused by flooding, raw material storage is located on the ground floor, while the processing area is on the 2nd floor.
- Replacing the table for filling honey which was previously made of wood into stainless steel
- Separating, tidying, and cleaning items in the storage and processing area
- Tidy up the peeling wall paint and also the ceiling to prevent leaks
- The location of the toilet does not open directly to the treatment room and is always closed
- Provide hand washing and personal hygiene facilities.

After the process improvements and quality documentation have been implemented consistently for some period, an internal audit is carried out as preparation and evaluation before submitting an application for product certification. Findings from internal audit results must be followed up for improvement. Management must also conduct a management review to monitor and evaluate the extent to which the company's standard implementation has been successful and appropriate. The results of the management review meeting are used as material to improve company performance by issuing policies related to continuous improvement according to the PDCA (Plan Do Check Act) cycle.

For companies that wish to obtain recognition or certification, a certification stage will be carried out. Product certification is carried out by a Product Certification Body that has been accredited by the National Accreditation Committee which has the scope of honey products. The company registers for certification with the Product Certification Body and must meet all the specified requirements. The Product Certification Body will conduct an audit of document adequacy and then conduct a field audit afterwards. The Product Certification Body will also take product samples for testing according to SNI quality requirements. Findings from audit results must be immediately followed up in accordance with the specified time limit. Then these corrective actions are reviewed and reviewed by Product Certification Body until finally a certification decision is issued.

V. CONCLUSIONS AND SUGESSTION

❖ *Conclusion*

Based on the results of data analysis, the following conclusions can be drawn:

In finding the causes of possible non-conformances, identification of the factors that cause them and the root causes is carried out, then corrective and preventive actions are taken, as well as a commitment from the company to carry out continuous improvement.

From the analysis of food safety hazards in raw materials, packaging materials, and processes, the results show that the most potential food safety hazards occur in the process of pouring into containers/drums (physical hazard)

and pouring into containers/filling bottles (biological hazard) so that stricter control is needed on the process.

In supporting the achievement of product quality requirements conforming to SNI 8664:2018, SNI ISO 9001 and GMP can be implemented by carrying out several infrastructure improvements and compiling company quality documents consisting of quality guidelines, 9 procedures, 3 work instructions, 23 forms, and 2 supporting documents.

After improvements were made, all parameters of the SNI quality requirements were met and there was a decrease in the number of non-conformances by 11.76%. Thus, preparation for product certification can progress while continuing to improve infrastructure, implement quality documentation, and all that is required for product certification purposes.

❖ *Suggestion*

The following are the author's recommendations regarding people who intend to conduct similar study or continue this research:

It requires high commitment from the company to consistently implement standards and maintain product quality. By implementing this quality documentation consistently, it is expected that product quality can be maintained in conforming with predetermined quality requirement.

For further research, it is recommended that in terms of product testing, it is best to be able to test all variant of pure honey product that produced. Then calculating the costs incurred for quality improvement compared with benefit obtained, and how certification of SNI product can provide benefit for Micro and SMEs, especially for honey producers.

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