

**THE STUDY OF THE CAUSES OF IRREGULARITY OF CRACKERS QUALITY  
IN THE CRACKERS INDUSTRY IN JEMBER  
(Case Study in Crackers Industry in Mangli, Kalisat and Arjasa, Jember)**

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**Abstract**

Crackers is one of food product which is known for centuries in many forms. This is caused by the variety of flavors, and its simple processing. Generally, crackers is processed traditionally, so it is not surprising that some crackers producers simply process them. Crackers is a famous and popular snack for Indonesian. The purpose of this research is to know the most critical steps during the production and distribution process, identifying the factors that affecting product quality, and to know the best physical and chemical characteristic. The data of this research comes from questionnaire data and check lists of three crackers industry In three residents (Mangli, Kalisat, and Arjasa) in Jember. Organolepticness data and the chemical characteristic data come from the product of those regencies. The criterion of product flaw widely spread from the smallest to the biggest. They are thickness, crack, the ripeness and the color. The factors that affect the quality are raw materials, weather, employers, the engine, drying process, and cooking process. Based on the analysis of organolepticness, it shows that based on the flavor of the crackers, the most favorable crackers is produced in Mangli. Based on the color, the most favorable crackers is produced in Arjasa. Based on the crispness of the crackers, the most favorable crackers is produced in Mangli. While the chemical analysis shows the highest water content of the crackers is produced in Mangli because the high content of fiber, while the highest crackers ash content is produced in Arjasa.

Keywords: *Crackers, Irregularity, Quality*

**Introduction**

Crackers are popular snack and favored by all of social stratum in Indonesia, both in cities and remote villages and from parents to children under five (Suyitno, 1986). Crackers usually made from tapioca flour dough mixed with other ingredients such as fish or shrimp. For the upper middle class, crackers are known as snack, whereas among the middle to lower class, crackers are used to eat rice or as a side dish. Besides the price is very cheap, crackers have power of attraction, that is because it is crunchy when eaten. Crackers production volume in Jember can be seen in Table 1.1

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Table 1.1. Crackers Production Volume in Jember

Year	Total of Production (Kg)
2005	1105200
2006	1653000
2007	1960310

Source : Anonymous (2008)

The cracker industrial development continues to advance with many requests will make the company prefers a better customer service. So, the employer crackers need the specific strategies to make a proper planning by improving the quality of crackers. It is caused the quality of a product is an absolute requirement in food commodities. Therefore, it needs a quality control system that produced the products have good quality. One way to produce the good quality crackers is to minimize the presence of defects

The rise of crackers industry competition in the country, encourage efforts to improve the quality of crackers products which are produced. The efforts are the technology development and diversification of function, so that the crackers have a better economic competitive value. The crackers processing technology can be developed by improving its functionality, except as a side dish or snack.

## **Research Methodology**

### **Research Methods**

#### **Sampling Method**

In sampling conducted in Jember was done by using random sampling. In sampling method conducted in Jember was done by using random that contains 25 consumers who can represent the population that exists in the environment.

### Data Collection Method

Data collection methods used in this study are as follows:

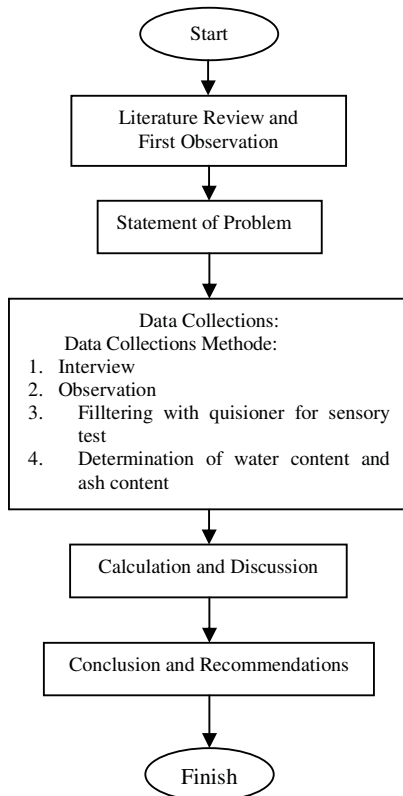


Figure 1. Chart of Research Step

### Data Analysis Method

Data analysis is done using pareto diagram, cause and effect diagram, and checking sheet to describe an error quality of the product.

#### – Pareto Diagram

The actual data were analyzed using pareto diagram, such as shape, weight, size, and colour.

#### – Checking Sheet

The form of a checking sheet is a form, in which the items to be inspected have been printed in that form, with the intention that the data can be collected easily and concisely.

– Fishbone Diagram

Fishbone diagram is a tool that uses the verbal data (*non-numerical*) or qualitative data in the presentation. The process of making a fishbone diagram explained in steps as below:

1. Identify the problem or the effect.
2. Identify the categories that may be a common cause.
3. Add branches supporting the diagram showing the specific causes.

– Passions Test

In the passion test, the panelists assess the sample based on its favorite spontaneously. Quality attributes assessed were colour (brightness), texture (crispness), and taste. Panelists were asked to give a score of 1-5 of the tested samples. The range of values that are used as follows:

1. Really do not like
2. Not like
3. Bit like
4. Like
5. Love it

– Chemical Characteristic Test

1. Water content (heating method, Sudarmadji, et al. 1997)

The determination of water content is conducted by using heating method and thermogravimetri that is by weighing the bottles weigh which is dried and cooled in eksikator (a g), then weighing the crackers that have been smoothed as much as  $\pm 2$  g together with a bottle weights (b g). Then the heating process is done at a temperature of 1000 C - 1050 C for 24 hours, then cooled in eksikator and weighed again. This treatment repeated until reach a constant weight (c g), if the difference of weighings is less than 0.2 mg or 0.0002 g.

Calculation:

$$\text{Water content (\%)} = \frac{(b - c)}{(b - a)} \times 100\%$$

2. Ash content (direct method, Sudarmadji, et al. 1997)

Weighing of porcelain crucible which has been heated in an oven at a temperature of  $100^{\circ}\text{C}$  for 15 minutes and cooled in eksikator (a g). Weighing about 10 g samples which have been smoothed and homogenized in the crucible (b g). Then anneal the crucible in a furnace until got a grayish-white ash. Making ash was conducted in two steps. Step I at a temperature of  $400^{\circ}\text{C}$  and the next step at a temperature of  $500^{\circ}\text{C}$ .

The next step is to cool the crucible and ash in a way to let stay in the Muffle until the temperature of furnace reaches the temperature of  $100^{\circ}\text{C}$ . Then move the crucible and ash into the eksikator for 30 minutes, when cool weighed them (g c).

Calculation:

$$\text{The ash content (\%)} = \frac{(c - a)}{(b - a)} \times 100\%$$

## Results and Discussion

### Crackers Industry in the District Mangli

#### Observations Based on Pareto Diagram

Based on the observation of the crackers industry product quality in the district Mangli which is conducted for seven days, there are four kind properties of product defect including thickness, maturity, broken and dull colours. The Pareto diagram for the factors that cause the defect of the crackers can be seen in diagram 3 .1.

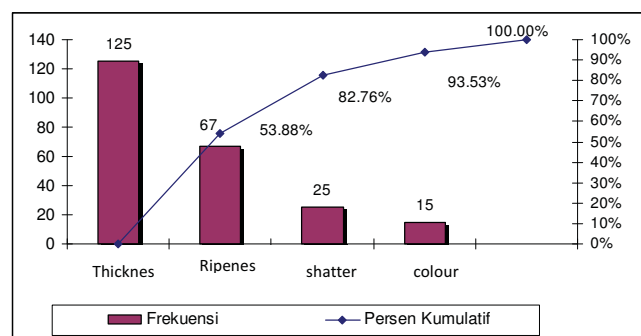


Diagram 1. The Pareto Diagram of Crackers Industry Product Defect in District Mangli

Based on that diagram can be seen that the highest levels of the defect is on the thickness and the second criterion is on the maturity that is 53.88% of product defects. The most cause of them is the instability of the moulding press pressure.

### Observation Based on Checking Sheet

For the seven days of observation in the crackers industry in Mangli, the properties were observed on the checking sheet are raw ingredients, moulding, drying and cooking.

### Observations Based on Fishbone Diagram

Based on the results of observations and the results of the Pareto diagram of the crackers quality in the District Mangli conducted for seven days found four types of defect types, these are thickness, maturity, broken and colour burst. The highest types of defects are thickness and maturity.

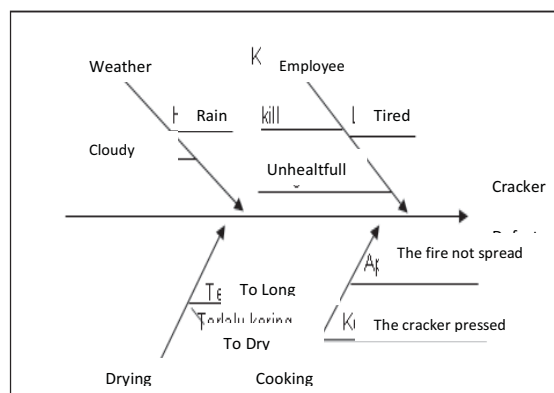


Diagram 2. Fishbone Diagram of Defective Crackers Products in Mangli

### Crackers Industry in District Arjasa

#### Observations Based on Pareto Diagram

Based on the observation of the crackers industry product quality in District Arjasa conducted for seven days, there are four kinds of criterion of the defective product including thickness, maturity, broken and dull colours. Pareto diagram for the factors that lead to defective crackers can be seen in diagram 3 .3.

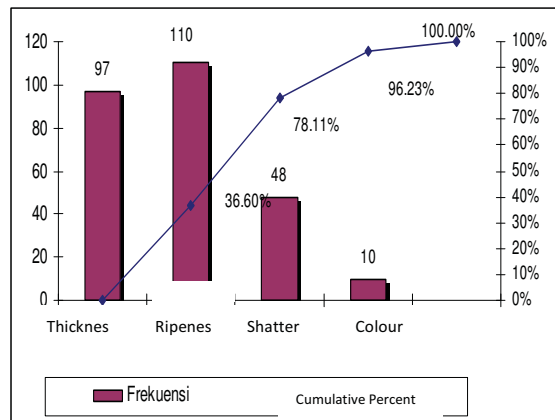


Diagram 3. The Pareto Diagram of Crackers Industry Product Defect in District Arjasa

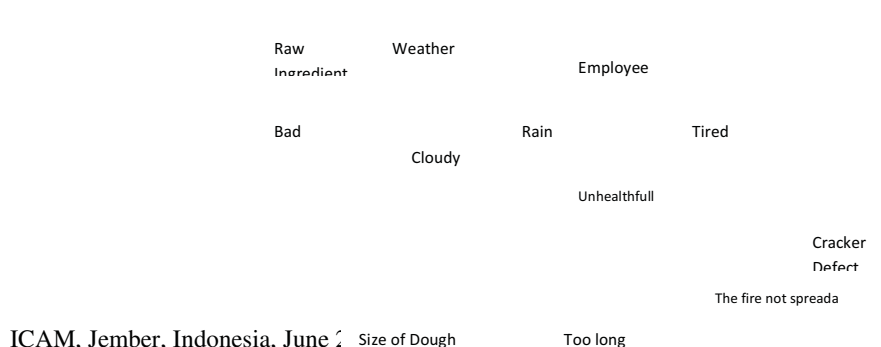
Based on the above diagram can be seen that the highest level of the defect is maturity and the second criterion is the thickness that is 36.60% of the product defects that occur. The existence of undercooked crackers or overcooked crackers is caused by the lack of prevalence of fire in the furnace. The overcooked crackers have a better expansion than the undercooked crackers.

### Observation Based on Checking Sheet

Checking sheet is a simple form that is used to display or organize the data as these data were collected. For the seven days of observation in the crackers industry in Arjasa, the properties were observed on the sheet are raw ingredients, moulding, drying and cooking.

### Observation Based Fishbone Diagram

Based on the results of observations and the results of the Pareto diagram of the crackers quality in Arjasa conducted for seven days found four types of defect types, these are thickness, maturity, and colour burst. The highest types of defects are maturity and thickness.



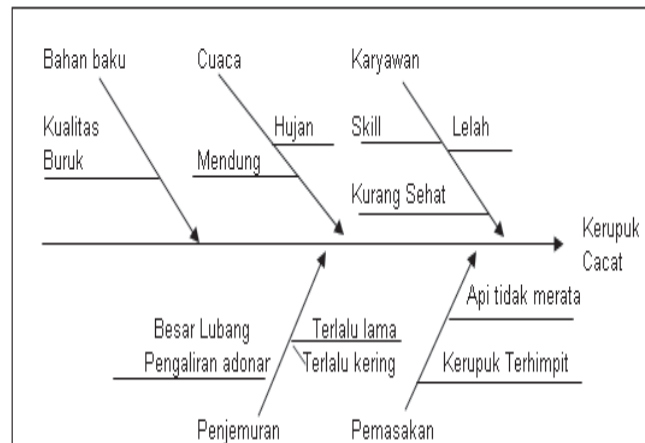


Diagram 4. Fishbone Diagram of Defective Crackers Products in Arjasa

From the diagram above can be seen that the main cause of the defective products are employee, weather, raw ingredient, drying and cooking.

### Crackers Industry in District Kalisat

#### Observation Based on Pareto Diagrams

Pareto diagram for the factors that lead to defective crackers can be seen in diagram 5.

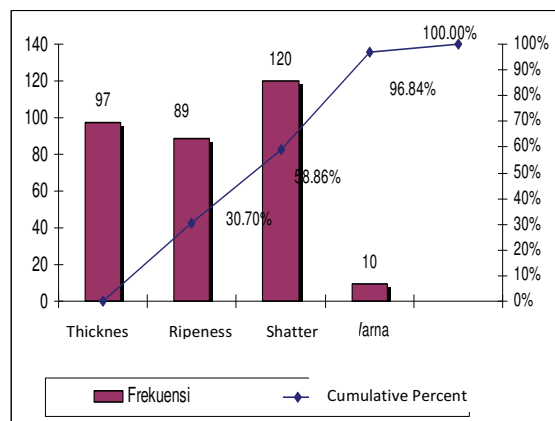


Diagram 5. The Pareto Diagram of Crackers Industry Product Defect in District Kalisat



Based on the above diagram can be seen that the highest levels of defective products are on break and the second criterion is the thickness that is equal to 37.97% of the product defects that occur. It is mostly caused by low water content in these crackers.

### Observation Based on Checking Sheet

For the seven days of observation in the crackers industry in Kalisat, the properties were observed on the sheet are raw ingredients, moulding, drying and frying.

### Observation Based on Fishbone Diagram

Based on the results of observations and the results of the Pareto diagram of the crackers quality in Kalisat conducted for seven days found four types of defect types, these are thickness, maturity, and colour burst. The highest type of defect are broken and thickness.

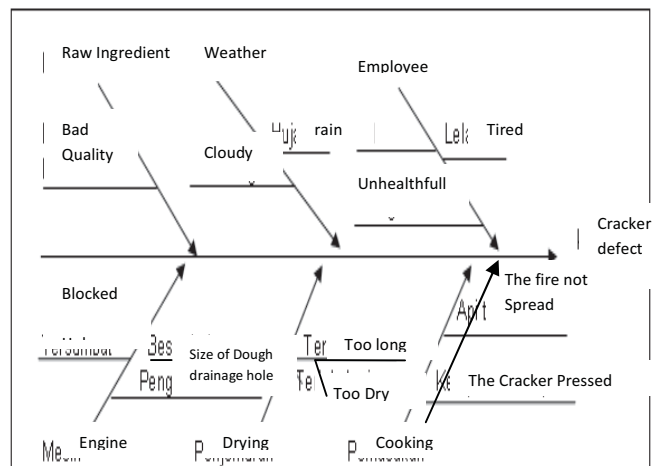


Diagram 6. Fishbone Diagram of Defective Crackers Products in Kalisat

From the diagram above can be seen that the main cause of the defective products are employee, weather, raw ingredients, drying, cooking and engine.

### Passion Test

Preference test is conducted by 25 panelists at the three crackers which are produced in three different districts in Jember. Then the result of scoring by panelists analyzed using a test group random planning (RAK).

#### 1. Colour

The preferred colour of the crackers by panelist are brightly coloured, clean and not dull crackers. Based on the analysis results can be obtained the following results:

Table 3.1 Variety Inquiring of Colour Cracker Passion Test

Source of Variety	Degree of Freedom	Total of Square	Middle Square	Arithmetic F	F-Table	
					5%	1%
Group	24	26.666	1.111	3.035**	1.746	2.201
Treatment	2	2.427	1.213	3.314*	3.191	5.077
Error	48	17.573	0.366			
Total	74	46.667				

Description:

\*\* = Differ very rea

\* = Significantly different

ns = Not significantly different

Based on the Tabel 3 above can be seen that F value treatment calculated is equal to  $3.314 >$  of F table (3.191) at the level of error ( $\alpha$ ) 5%. Thus it can be stated that there is a significant color difference between the 3 groups of cracker of 3 sub- district (Mangli, Arjasa and kalisat).

Test results of the average value of color preferences by showing the most preferred color of the panelists is Arjasa crackers. The crackers color in Arjasa is brighter, cleaner and not dull. While the color of crackers in Mangli and Kalisat showed no significant differences with average value of color preferences are 2.92 and 2.96.

## 2. Texture

The preferred value of the texture chose by the panelists is crispy crackers which are not too thick or too thin. Variety inquiring of texture cracker passion test can be seen in Table 3.2 as follows:

Table 3.2 Variety Inquiring of Texture Cracker Passion Test

Source of Variety	Degree of Freedom	Total of Square	Middle Square	Arithmetic F	F-Table	
					5%	1%
Group	24	30.88	1.287	3.126*	1.746	2.201
Treatment	2	2.907	1.453	3.530*	3.191	5.077
Error	48	19.760	0.412			
Total	74	53.547				

Description:

\*\* = Differ very real

\* = Significantly different  
 ns = Not significantly different

Based on the Tabel 5. 2 above can be seen that F treatment calculated value is equal to 3.530 > of F table (3.191) at the level of error ( $\alpha$ ) 5%. Thus it can be stated that there are significant differences of crispness between the 3 groups of crackers of 3 districts (Mangli, Arjasa, and Kalisat).

### 3. Flavor

The preferred flavor chose by the panelists are delicious and not greasy so it does not make feel queasy. Based on the analysis results can be obtained the following results:

Table 3. Variety Inquiring of Taste Cracker Passion Test

Source of Variety	Degree of Freedom	Total of Square	Middle Square	Arithmetic F	F-Table	
					5%	1%
Group	24	25.146667	1.048	2.037*	1.746	2.201
Treatment	2	3.307	1.653	3.214*	3.191	5.077
Error	48	24.693	0.514			
Total	74	53.147				

Description:

\*\* = Differ very real  
 \* = Significantly different  
 ns = Not significantly different

Based on table 3. 3 above can be seen that F treatment calculated value is equal to 3.214 > of F table (3.191) at the level of error ( $\alpha$ ) 5%. Thus it can be stated that there was a significant difference of the taste between the 3 groups of crackers of 3 districts (Mangli, Arjasa and Kalisat).

### Chemical Test

The test of the crackers from 3 districts in Jember is done based on the water content and ash content on the crackers. Chemical test is performed based on the water content and ash content.

### A. Water Content

The result of RAK related to the water content of the crackers of the three districts can be seen on Tabel 4.

Table 4. Variety Inquiring of Water Content Test

Source of Variety	Degree of Freedom	Total of Square	Middle Square	Arithmetic F	F-Table	
					5%	1%
Repetition	2	1.338	0.669	1.330 <sup>ns</sup>	6.944	18.000
Treatment	2	8.452	4.226	8.403*	6.944	18.000
Error	4	2.012	0.503			
Total	8	11.801				

Description:

\*\* = Differ very real

\* = Significantly different

ns = Not significantly different

Based on the Tabel 3. 4 above can be seen that F treatment calculated value is equal to 8.403 > of F table (6.944) at the level of error ( $\alpha$ ) 5%. Thus it can be stated that there are significant differences in water content between 3 tested crackers of 3 districts (Mangli, Arjasa and Kalisat).

### 2. Ash content

The result of RAK related to the ash content of the crackers of three districts can be viewed at the following Tabel 3.5.

Table 5. Variety Inquiring of Ash Content Test

Source of Variety	Degree of Freedom	Total of Square	Middle Square	Arithmetic F	F-Table	
					5%	1%
Repetition	2	0.076	0.038	8.933*	6.944	18.000
Treatment	2	0.128	0.064	14.944**	6.944	18.000
Error	4	0.017	0.004			
Total	8	0.222				

Description:

\*\* = Differ very real

\* = Significantly different

ns = Not significantly different

Based on his Tabel 3.5 above can be seen that F treatment calculated value is equal to 14.944 > of F table (6.944) at the level of error ( $\alpha$ ) 5%. Thus it can be stated that there are significant differences in ash content of 3 repeating crackers process of 3 districts (Mangli, Arjasa and Kalisat).

### **Conclusion**

The criterion of product flaw widely spread from smallest to the biggest. They are thickness, crack, the ripeness and the colour.

The factors that affect the quality are raw materials, weather, employers, the engine, drying process, and cooking process.

Chemical analysis shows that Crackers which is produced in Mangli contains high amount of water (11,56%) caused by high content of fiber, while crackers which is produced in Arjasa contains high amount of ash (1,70%)

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