



# Transformation of Jackfruit Varieties of Jaka (*Artocarpus Heterophyllus*) into Crackers to Increase the Economic Income of Farming Families

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## Abstract

The objectives of this study are to know the effect and interaction between sodium benzoate and temperature on jackfruit chips products, with randomized completely design method. The test of Organoleptic result on variables to the color combination of sodium benzoate treatment, with composition treatment is 15g (34,61% and temperature of 150°C (37,63 %). The treatment of sodium benzoate aroma is 15g (34,01%) and temperature of 100°C (37,34 %). The treatment Test at the sodium benzoate is 15g (33,67%) and temperature of 50°C (36,96 %). The Texture on the treatment 15g of sodium benzoate (33,77%) and temperature of 100°C (35,77 %). From all treatments, the best and most preferred by consumers is the N2T3 treatment with the results of 3,75 on the percentage of 24,93 ± 33,59 (%).

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**Key Words:** Jackfruit Chips, Sodium Benzoate, Temperature.

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## Introduction

Jackfruit as a plant that belongs to a tropical group and is famous everywhere because many people identify it as having a high economy value. Jackfruit category in the *family moraceae* because jackfruits has a large fruit, good taste, fragrant aroma, and has high sweet taste, jackfruit also has high nutrients for human health such as vitamin, minerals, and calories, (Adelina & Tiwow, 2020). This jackfruit plant comes from india and is spread throughout the word, including Indonesia and Timor-Leste. Jackfruit also has good prospects for development, but many people do not understand the prospect of economic value for local products and have the opportunity to increase economic, social and cultural values, (MAP, 2015). Jack fruit has seasonal characteristics and is easily damaged after ripening, but jackfruit as a food product can be developed as

innovative products such as jackfruit chips, (Nofrianti, 2013). The quality of jackfruit chips is seen in terms of color, flavor, aroma, and texture which can be tasted through organoleptic aspects, in order to ensure stability for long-term storage, (Jamaluddin et al., 2009). So that to reduce this problem there must be home processing industry activities where the harvest comes from farmers in order to increase economic value, therefore jackfruit must be engineered innovative products such as jackfruit chips in order to have the advantage of providing solutions to the characteristics of jackfruit to be able to store in long term, but also as an agro-industry strategy in order to add economic value added to be able to respond to the needs of life, (Sari et al., 2019).

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Jackfruit is also a category of plant type that has economic value and also has the potential to be developed to contribute to the home industry and increase the country's foreign exchange, therefore from now on many are starting to process jackfruit in various bproducts but it is not optimal because it still needs development and training.

Sodium benzoate is an additive added to food processing ingredients to improve the quality of the product (Faroch *et al.*, 2021; G.W., 2013), therefore to add a food ingredient to other foodstuffs requires regulations or requirements from the ministry of health, because these additives can have an impact on consumers, (Putra, 2017). The use of sodium benzoate for chips products with a concentration of 0,5-1% by comparing the 1 kg prime material based on the standard from the FDA (*Food and Drugs Administration*) so as not to affect the flavor of the jackfruit chip product, (Putra, 2017; Wibowo *et al.*, 2020). Chemical additive such as sodium benzoate are added to food products to ensure long-term storage, so as not to have an effect on human health, (Faroch *et al.*, 2021; G.W., 2013).

The result of research from (Ai Winarti, 2000) that the ideal frying temperature and time using a vacuum frying machine is 85-95°C and the frying time is 15-35 minutes, (Ariyantoro *et al.*, 2020; Kaswinda *et al.*, 2017).

The objectives of this study are to know the effect and interaction between sodium benzoate and temperature on jackfruit chips products.

## Materials and Methods

### Research Site

This research was conducted at the East Timor Coffee Institute, Post-Harvest Technology Laboratory, starting from August to October 2021.

### Materials and Tools

Materials used in this study such as jackfruit, sodium benzoate, cooking oil, and water. The tools used in this research are vacuum frying machine, spinner, pedal sealer, measuring cup, analytical balance, basin, bucket, knife, machete, label sticker, aluminium foil plastic, sticker, gloves, mask, hat, laboratory coat.

### Research Methods

The research design used in this study was a completely randomized design (CRD/completely

randomize design) consisting of two factors, namely the first sodium benzoate was divided into three treatments, namely the first treatment combination of 10g of sodium benzoate (N1), the second treatment 15g of sodium benzoate (N2), the third treatment sodium benzoate 20g (N3), and the second factor is the temperature with the first three treatment combinations at 50°C(T1), the second 100°C(T2), the third 150°C(T3), these two factors were combined to get 9 (nine) treatment combinations with three repetitions with three repetitions getting 27 (twenty-seven) treatments, (Sastrosupadi, 2000).

### Variables Observed

Variables observed such as organoleptic tests with hedonic methods on four variables with characteristics, namely:

1. Color with the sensory test method from 35 panelists with a score of 4 such as: (a). peak color, (b). Less yellow, (c). Yellow, (d). More yellow.
2. Aroma with the sensory test method from 35 panelists with a score of 4 such as: (a.) unscented, (b). Lack of fragrance, (c) Aroma, (d). Very flavorful.
3. Flavor with the sensory test method from 35 panelists with a score of 4 such as: (a.) not sweet, (b). Slightly sweet, (c) sweet, (d). Very sweet.
4. Texture with the sensory test method from 35 panelists with a score of 4 such as: (a.) mushy, (b). Not mushy, (c) not crunchy, (d). Very crunchy.

### Data Analysis

The data in this study used ANOVA analysis, the results of the analysis showed that the calculate F value was greater than F table value, then continued analysis using DMRT (*Duncan Mutiplay Range Test*) at a rate of ( $\alpha$  0,05) (Sastrosupadi, 2000).

## Results and Discussion

### 1. Results

The results of the ANOVA analysis show that the parameters of color, aroma, taste and texture can be seen in tables 1,2,3 and 4 below;



1.1. Color

Table 1. The results of the analysis of Natrium benzoate treatment and temperature on color using a two-way ANOVA table as follows

Treatment	T1	T2	T3
N1	3.50 a A	3.58 a A	3.55 a A
N2	3.58 a A	3.71a A	3.86 a ** A
N3	2.75b B	2.90b B	2.82 b B

Information: \*\*significantly different, \*significantly different.

Based on the results of the analysis in table 1 above, it shows that almost 34.61% of the combination of benzoate treatment (N2T3) and 37.73% of combination of temperature treatment (N2T3) resulted in the response of 35 panelists. The results of the study are in line with Anik et al., (2012), that the composition of Natrium benzoate for jackfruit chips with a percentage between 28%-37% is better than a composition that is higher or less than the percentage above. Color as a determining factor for the quality of all production which gives an influence in terms of quality and economic, social and cultural value. The results of this study are also in line with previous researchers Anik *et. al.*, (2012) in G.W., (2013), said that the sensory test (sensory test) for the treatment of color variables with a percentage of 28%-37% the results of the treatment combination (N2T3) Natrium benzoate showed results that were significantly different from other treatment combinations.

1.2. Aroma

Table 2. Results of analysis on aroma treatment

Treatment	T1	T2	T3
N1	3.59a A	3.40a A	3.39a A
N2	3.64a A	3.74 a ** A	3.62a A
N3	2.85b A	2.88b A	2.87b A

Information: \*\*significantly different, \*significantly different.

Based on the results of the analysis of variance in table 2, it shows that of the 35 panelists

representing the test consumers for the treatment combination (N2T2), sodium benzoic acid contributed 34.01% and 37.34% of the temperature treatment. Based on the results of the aroma test, namely the combination of treatments (N2T2), namely sodium benzoate 15g and a temperature of 100°C, it can produce 34.01%-37.34% compared to other treatment combinations. According to Sofyan. (2004) in Faroch et al., (2021); G.W., 2013; Son. (2017), said that sodium benzoate with a temperature that is too high can cause loss of aroma in jackfruit crackers, thus we need 15g of sodium benzoate at a temperature of 100°C to increase the quality of the aroma of jackfruit crackers.

1.3. Flavor

Table 3. The results of the analysis of the effect of sodium benzoic acid treatment and temperature on the taste of jackfruit crackers with a 2-way table

Treatment	T1	T2	T3
N1	3.27c B	3.37bc A	3.46abc A
N2	3.78 a ** A	3.71ab A	3.73ab A
N3	3.18c B	3.27c B	3.07c B

Information: \*\*significantly different, \*significantly different.

Based on the results of the analysis of the value of the treatment combination (N2T1), the value of the contribution of sodium benzoate (N2) was 33.67% and the temperature treatment (T1) with a percentage value of 36.96% gave significantly different results from other treatments. This is in line with Yulia et al., (2014), in Adelina & Tiwow. (2020), said that taste is an important factor in food quality. In addition, Bambang (1998), also stated that taste is a determining factor in food production in addition to color and taste. Thus, every food production has a taste based on the substance of the character of the basic ingredients (prime material) or other desired basic ingredients according to other addition processes to reduce the natural taste to maintain the good quality of jackfruit crackers.



1.4. Texture

**Table 4.** The results of the analysis of sodium benzoate treatment and temperature on the texture of jackfruit crackers with a 2-way table (Two Ways ANOVA)

Treatment	T1	T2	T3
N1	3.35 ab A	3.43 ab A	3.49 ab A
N2	3.68 ab A	3.81 a ** A	3.79 a A
N3	3.46 ab A	3.41 ab A	3.2 ab B

Information: \*\*significantly different, \*significantly different.

Based on the results of the table 4 test, it shows that the combination of N2T2 of 15g with a percentage value of 33.77% of sodium benzoate (N) and a temperature (T) of 100°C with a presentation value of 35.77% from 35 panelists of the sensory test consumer representation gave a good value. significantly different to the texture of jackfruit crackers when compared to other treatments. To be more clear, it can display the results of the recapitulation of the 4 observation variables as shown in table 5 below:

**Table 5.** Recapitulations 4 variabel component

Treatment	Variable				
	Color	Aroma	Flavor	Teksture	Means
N1T1	3.50	3.59	3.27	3.35	3.42
N1T2	3.58	3.40	3.37	3.43	3.44
N1T3	3.55	3.39	3.46	3.49	3.47
N2T1	3.58	3.64	3.78	3.68	3.67
N2T2	3.71	3.74	3.71	3.81	3.74
N2T3	3.86	3.62	3.73	3.79	3.75*
N3T1	2.75	2.85	3.18	3.46	3.06
N3T2	2.90	2.88	2.27	2.41	2.61
N3T3	2.82	2.87	3.07	3.20	2.99

Information: \*\*significantly different, \*significantly different.

Based on the results of the recapitulation of the 4 component variables, namely; The color, aroma, flavor and texture in table 5 above, shows the combination of N2T3 treatment of 15g with a temperature of 150°C with an average value of 3.75 with a percentage ratio of 24.93 ±33.59%. The results of this study agree with Ariani, (2010), which states that the composition of the treatment results is 14.93 ± 18.13 (%), also in line with

Widarti. (2013); Saxena et al., (2015) which stated that the composition of crackers production was approximately 24.93 ± 33.59 (%). The results of observations from 35 panelists of sensory tests on these 4 variables, namely; color, aroma, flavor and texture, showed that the treatment with Sodium benzoate (N2) 15g, and temperature (T3) 150°C, was more significant than the other treatments. Evaluation of sensory tests as a method used to measure and analyze food production, especially sensory tests. The sensory test is divided into 2 stages, namely objective and subjective sensory tests. The objective test is through panelists on food production and subjective tests through panelists representing consumers as a benchmark for sensory test on food production (Pereira et al., 2019). The important role of sensory tests in developing food production, this relates to panelists to identify and describe the sensory characteristics of tests on food production Setyaningsih at al., (2010) in Ardiansyah & Alam, (2019); Kusnandar, (2010); Suter, (2013) that the evaluation of sensory tests through panelists to observe changes that occur in the preparation of basic ingredients and additional materials for food production. Thus, panelists as a measuring tool, identify and determine the optimization of a food production are also related to changes that occur in chemical and physical production, Sumarni & Supanti, (2021). Agree with Susiwi, (2009), states the sensory test as a factor which is used to compare the characters of one production with another in food production.

Discussion

Color

The results of the study indicate that the higher the temperature used, the better the quality and the longer storage capacity of the crackers. According to Suryadi, (2015) in Faroeh et al., (2021) also stated that the higher the temperature the reaction will change color to brown (Jamaludin, 2009), also Breemer et al., (2018) that with frying using a vacuum machine with Treatment of sodium benzoate and temperature that is too high can cause changes in the color of characters to brown from the original color. Kataren, (2005) in (Asgar & Rahayu, 2014; Setyawan & Widaningrum, 2017), that the change in brown color is due to the cause of high temperature treatment and circulation of cooking oil during the frying process Yulia et al., (2014), also Asgar et al., (2010), also stated that the



intensity of the color level depends on the length of time used on the chemical composition of a food production. According to Auliana (2001) and Borém et al., (2018), the changes that occur are related to the combination of sodium benzoate and temperature of the components of cooking oil used during the cracker frying process. Added Annisa, (2012) in Asgar & Rahayu, (2014), frying for a food production processing of color characters must go through a combination of sodium benzoate, temperature and length of time used for crackers production components can have implications for reduced water content resulting in color crackers become black, charred and unattractive to consumers. According to Winarno (2004); Asgar et al., (2010); Asgar & Rahayu, (2014), stated that color is an important part in determining the quality of food production. According to Paramita (1999), that temperature also plays a role in changing the physical character of a product of chips production, therefore if to get good crackers production requires a temperature of 100°C with a length of time used 45 minutes, press 70cmHg. Wijayanti (2011) and Purnama et al., (2017) that to get quality crackers it is necessary to have a maximum temperature of 100°C with a pressure of 70 cmHg.

### Aroma

Aroma is part of the production of a food that accumulates circulating substances from water and oil content to food production. Kartika, at al., (1988) added in Kusnandar (2010); Suter (2013); Ardiansyah & Alam (2019), stated that in the food industry, aroma is also categorized into food quality, therefore it can have an influence on the quality of a food. According to Kemp et al., (2009); Jamaluddin et al., (2009); and Sucipto et al., (2018), stated that the aroma contained in a food is a volatile compound of a food. The composition of volatile aromas is easily assayed through the organs, and requires maximum concentration to obtain aroma interactions from food production. The composition of the aroma of a food or food is often found in foods such as; jackfruit crackers, banana crackers and papaya crackers. Also on the other hand, the role of aroma composition is very important in food production which is usually used in the food industry to improve the quality of the results of a production (Antara and Wartini (2014); Choiriyah *et al.*, (2020); Sucipto et al., (2018).

### Flavor

Flavor is a determining factor for the quality of food production. Besides that, there is also a sweet, bitter, sour taste in a type of food that is felt by consumers (panelists). The context of taste is biologically sensational as a result of the production itself. According to Midayanto and Yuwono (2014) in Bachtiar, (2018), that taste (taste) is an instrument that affects the receptors for aroma, taste, through human organs, because the composition of taste is a chemical mixture that is felt by the human senses. Taste appears in food production, meaning that the chemical components as protein, carbon hydrate and oil and also added by Soekarto (1985) in Bachtiar, (2018), taste can be grouped into 4 major parts, namely; sweet, bitter, sour and salty, Winarno (2002) in Sari *et al.*, (2019), that this taste arises through the sensory organs that feel in a processed product.

### Texture

The results of the texture variable indicate that the higher the temperature treatment, the better the physical texture. This is identical to the opinion of Yayang Ade Suprana (2012), that the texture of the production of crispy crackers needs to be increased in temperature so that it can directly reduce the water content of the crackers production, in order to maintain quality and storage for a long time. Texture is the integrity with the physical characteristics of food through methods, models and quantities to form compositions in food production by tasting through human sensory tests; eyes, mouth, and nose (Midayanto and Yuwono, 2014). Meilgard et al., (2006), food texture through the response of taste can cause physical characteristics that occur in food production through the senses.

### Conclusions

The results of the study it can be concluded as follows;

1. Color parameter of jackfruit crackers through 35 panelists representing consumers in the combination of sodium benzoate 15 grams (N1) which contributes to crackers with a percentage of 34.61%, and a temperature of 150°C (T3) with a percentage of 37.63%.
2. The aroma parameter shows that 15 grams of sodium benzoate (N2) contributes to crackers with a percentage of 34.01 % and a



temperature of 100°C (T3) with a percentage of 37.34%.

3. The taste parameter shows that 15 grams of sodium benzoate (N2) contributes to crackers with a percentage of 33.67%, a temperature treatment of 50°C (T1) with a percentage of 36.96% and texture parameters indicate that 15 grams of sodium benzoate (N2) which contributes to crackers with a percentage of 33.77% and a temperature of 100°C (T2) with a percentage of 35.77%.

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### Author's Contributions

All authors contributed in collecting and analyzing data. All authors participated in writing every part of this study. All authors read and approved the final version.

### Ethics

This manuscript has not been published or presented else where in part or in entirety and is not under consideration by another journal. All the authors have approved the manuscript and agree with submission to the esteemed journal. There are no conflicts of interest to be declared.

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