

## WAR 46 STUDY OF CHARACTERISTIC INSTANT TIWUL BREADFRUIT (*ARTOCARPUS ALTILIS*) BASED ON VARIOUS OF STEAMING TIME

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### ABSTRACT

Breadfruit has high carbohydrate content. Breadfruit usually processed to be dodol, fermented breadfruit, flour and pudding. Based on this carbohydrate content, breadfruit has potency to processed into alternative staple foods. To extend the shelf life, tiwul can be dried becomes tiwul instant. Breadfruit has different level of gelatinization compared to cassava. Gelatinization occurs in the process of steaming, where the starch granule swelling, this process occurs due to the addition of water and heating. The purpose of this study was to determine time of steaming which produced tiwul with good characteristics and preferred by the panelists. The method used was explanatory research with independent variable (treatment) time of steaming from 30 minutes to 90 minutes with 10 minute intervals. The variables measured were water content, color, yield, organoleptic test before rehydration, and organoleptic test after rehydration. The results showed that the longer steaming related linearly with water content, the water content of instant tiwul breadfruit more decrease. Instant tiwul breadfruit has good characteristics are steamed for 90 minutes has water content of 4.54%, yield 50.25%, color value of L\* 57.385, a\* 3.505, b\* 9.947, protein content 6.52%, fat content 0.45%, fiber content 7.4%, and has the organoleptics properties (aroma, color, flavor, and texture) that can be accepted by the panelists.

**Keywords** : Breadfruit; Instant Tiwul; Gelatinization; Staple Foods

### INTRODUCTION

Indonesia is an agricultural country with a potential diversity of food resources. The problem is the majority food source of people reliant on a single commodity such as rice. Rice production in Indonesia itself is still less than the number of Indonesian population is now more than 200 million people with a growth rate above 1.7% per year (BPS 2000). Diversification based local food is now widely encouraged. Efforts diversification of food refers to the green revolution. The green revolution is a term to describe an agricultural transformation that brings significantly increased production in many developing countries around the years 1960-1980 (Las 2009).

Food diversification refers to alternative food as other carbohydrate sources which can be used as a substitute for rice, one of is the breadfruit. Breadfruit is obtained from plants of *Artocarpus altilis* is a commodity agricultural potential to be used as a raw material source of carbohydrate based food local staple. Breadfruit plants can grow well in dry areas and rarely attacked by pests

and diseases. The most deployment of breadfruit in Indonesia is in the region of Central Java and East Java (Widoyoko, 2010).

Generally, the types of breadfruit in Indonesia there are three kinds, which consists of bald breadfruit, small breadfruit and medium breadfruit (Shah and Nazaruddin, 1994). A striking difference of the three types breadfruit is the shape and size. Bald breadfruit has round shape and weighs between 2.5 to 4.5 kg, medium breadfruit has oval shape with weight 2 to 2.5 kg and small breadfruit has round shape with weight 1 to 1.5 kg. Utilization of breadfruit in Indonesia is not optimal because of the consumption is usually simple processed as boiled, steamed, fried or chips. This shows that the diversification of breadfruit is very limited, whereas breadfruit can be processed into a wide range of processed food products, one of is tiwul.

Tiwul is the traditional food from Java and usually made from cassava. According Wiraputra (2010), who tried various steaming time of tiwul from cassava rice flour and corn flour from the range of 15 minutes to 55 minutes with 5 minutes intervals. The best result is steaming time 30 minutes, tiwul already have the characteristics of a rather sticky and chewy that indicates the starch of the dough tiwul start to gelatinized marked by starch has absorbed water up to 25% - 30%. In This study, variation steaming time of instant tiwul breadfruit is range between 30 minutes to 90 minutes with 10 minutes intervals.

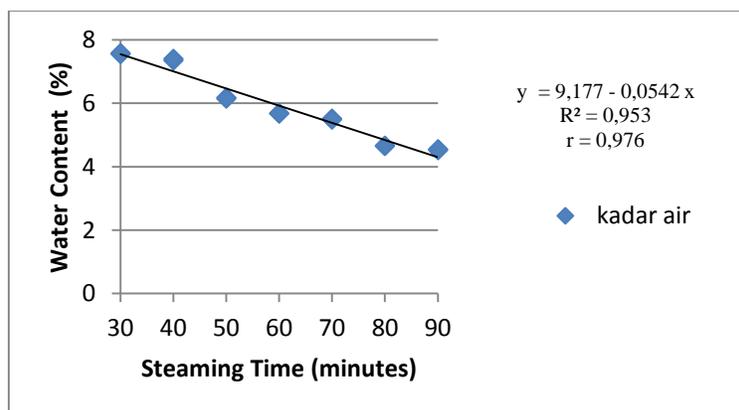
#### The Criteria of observations:

1. Water content by Thermogravimetry method (AOAC, 1990)
2. Color Lightness, green-red, and blue-yellow by Chromatometer CR-400, Minolta
3. Yield (by Apriyantono, 1989)
4. Organoleptic test by hedonic before rehydration (color, flavor, and texture)
5. Organoleptic test by hedonic after rehydration (aroma, color, flavor, and texture)
6. Protein content by Kjeldahl Method
7. Fat content by Soxhlet Method
8. Fiber content

## RESULT AND DISCUSSION

### Water Content by Thermogravimetry Method

Based on the results of the regression analysis that is a linearly related between the steaming time of breadfruit with water content. The curve can be seen in Figure 1.



### Figure 1. Curve Regression of Water Content of Instant Tiwul Breadfruit

The longer steaming time will give the lower water content of instant tiwul breadfruit. Each addition of 1 minute steaming, the water content of instant tiwul breadfruit will decreased by 0.05425%. According to Winarno (2004), the lower of water content, the better quality of dried product. Reduction of water content caused by the the evaporation process of water from the material. At the time of dried starch, water bound to the granules will be released into the air.

Differences of steaming time affects to the water content in an instant tiwul breadfruit it caused by the gelatinization process that occurs. The starch granules absorb water, if the process has continued to be heated above the temperature of gelatinization so the granules can be broken and water will be evaporates during the steaming process. Therefore, the longer of the steaming time more water will be evaporated while drying process (Muchtadi et al. 1988).

### **Color Lightness, green-red, and blue-yellow by Chromatometer CR-400**

#### **Lightness ( $L^*$ )**

Based on the results of the regression analysis that is a not linearly related between the steaming time of breadfruit with lightness.  $L^*$  value indicates the intensity of the brightness of a product, when the higher the values of  $L^*$  so the higher brightness intensity will be. Based on data, the color values  $L^*$  of instant tiwul breadfruit with the steaming time for 30 minutes to 90 minutes has a value of 59.364. According Nurhadi (2010), when a value of  $L^*$  is 0 to 50 it showing product is dark and if the value is 50 to 100 it showing bright with the higher value will be the brighter intensity of the color. In this study the  $L^*$  value of the instant tiwul breadfruit can be classified as having good brightness.

Different of steaming time is not significantly effect on the value of brightness ( $L^*$ ), it can be caused by the use of raw materials only breadfruit flour and water so the brightness of instant tiwul breadfruit obtained just from breadfruit flour with the bright color. The breadfruit flour used comes from the mature breadfruit with the bright white color and the brightness remain while processed into instant tiwul breadfruit. Brightness of breadfruit flour as the main raw material is also associated with the absorption of the light particles. The absorption of light is affected by the velocity of light and the particle size. According to Wong (1989), the absorption of light in a material is inversely proportional to the wavelength and the velocity of light in a vacuum chamber.

#### **Green – Red ( $a^*$ )**

Based on the results of the regression analysis that is a not linearly related between the steaming time of breadfruit with green – red color. Positive values  $a^*$  indicate the color of product is tend to have a reddish color, whereas on a product that has a negative value of  $a^*$ , the products tend to have a greenish color. The value  $a^*$  color of instant tiwul breadfruit by steaming time for 30 minutes to 90 minutes has a value of 4.1987 which indicates that the instant tiwul breadfruit has a tendency to red color. The longer of steaming time does not affect the color of instant tiwul breadfruit, it because the color produced of instant tiwul breadfruit is closely related to harvesting the breadfruit. According Rusmayanti (2006), the level of mature breadfruit was related to the color flour produced.

### Blue – Yellow (b\*)

Based on the results of the regression analysis that is a not linearly related between the steaming time of breadfruit with blue – yellow color. Positive values b\* indicate the color of product is tend to have a yellowish color, whereas on a product that has a negative value of b\*, the products tend to have a bluish color. The value b\* color of instant tiwul breadfruit by steaming time for 30 minutes to 90 minutes has a value of 12.591 which indicates that the instant tiwul breadfruit has a tendency to yellow color. The yellow tendency of instant tiwul breadfruit can also caused to browning reactions still occur in small amounts. Browning reaction can occur even if the particles breadfruit has low water content.

### Yield Content of Instant Tiwul Breadfruit

Based on the results of the regression analysis that is a not linearly related between the steaming time of breadfruit with yield content. The curve can be seen in Figure 2.

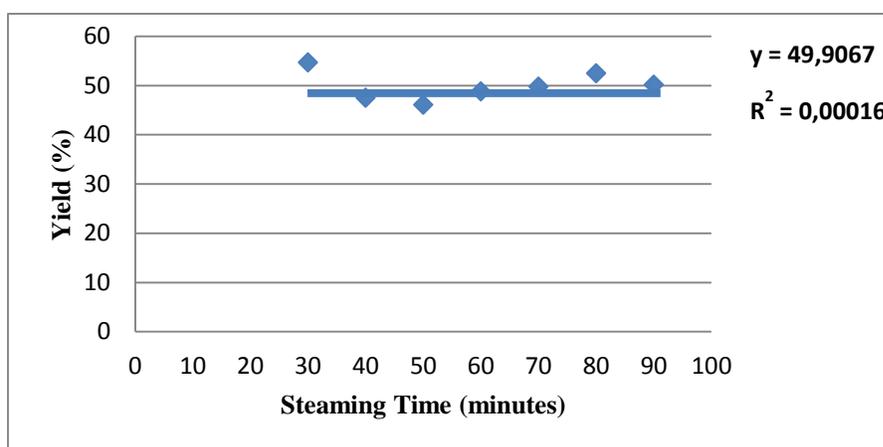


Figure 2. Curve Regression of Yield Content of Instant Tiwul Breadfruit

Based on the research results, the yield of instant tiwul breadfruit in the steaming time for 30 minutes to 90 minutes has a yield value of 49.91%. The yield value calculated from the weight of instant tiwul breadfruit after drying process against to the weight of the dough after mixing the ingredients. According Nurgawar (2003), the good value of the tiwul yield at least 50% of the total weight of the material, so the instant tiwul breadfruit in the experiment has a good yield value.

The yield value of the instant tiwul breadfruit influenced by the starch content in breadfruit particles, where the particles breadfruit has low amylose content. The low amylose content makes the water bound to the instant tiwul breadfruit is free water. Different steaming time affects to different of free water content in breadfruit tiwul, free water is easily evaporated during the process of drying and resulting different yield values on the instant tiwul breadfruit.

### Organoleptic Test by Hedonic Before Rehydration (Color, Flavor, and Texture)

#### Color

Based on the results of the regression analysis that is a not linearly related between the steaming time of breadfruit with organoleptic color test. The color value preference of instant tiwul

breadfruit with steaming time for 30 minutes to 90 minutes has a value of 3.314 which is in the range usual preference level. Based on this assessment, the panelists can accept instant tiwul breadfruit for all treatment. The different steaming time does not affect the organoleptic color, caused the steaming process does not change color on each steaming process.

### **Flavor**

Based on the results of the regression analysis that is a not linearly related between the steaming time of instant tiwul breadfruit with organoleptic flavor test. Based on calculations, the flavor preference of instant tiwul breadfruit with steaming time for 30 minutes to 90 minutes has a value of 2.6047 which is in the range between the level of preference usual to dislike. Flavor value is the subjective assessment, it caused by majority of the panelists does not like flavor of instant tiwul breadfruit that resulting is not great flavor value. Flavor of instant tiwul breadfruit comes only from breadfruit flour and water without the flavor from sugar.

### **Texture**

Based on the results of the regression analysis that is a not linearly related between the steaming time of breadfruit with organoleptic texture test. The texture value of instant tiwul breadfruit with steaming time for 30 minutes to 90 minutes has a value of 4.0523 which is in the range level of preference like. Based on this assessment, the panelists like texture instant tiwul breadfruit before rehydrated. This result can be caused by dry instant tiwul breadfruit ground directly and sieved with suitable smoothness of 20 mesh.

## **Organoleptic Test by Hedonic After Rehydration (Aroma, Color, Flavor, and Texture)**

### **Aroma**

Based on the results of the regression analysis, is not linearly related between the steaming time of breadfruit with organoleptic aroma test. The aroma value of instant tiwul breadfruit with steaming time for 30 minutes to 90 minutes has a value of 2.485 which is in the range dislike to usual level. This result caused by subjective assessment of the panelists where most of the panelists does not like aroma instant tiwul breadfruit after rehydration that resulting not good aroma value.

### **Color**

Based on the results of the regression analysis, is not linearly related between the steaming time of breadfruit with organoleptic color test. The color value preference of instant tiwul breadfruit with steaming time for 30 minutes to 90 minutes has a value of 3.2619 which is in the range usual preference level. The different of steaming time does not given the affects of the products, it because the formula has been used to produced instant tiwul breadfruit on each treatment has same, which is consists breadfruit and water. The different treatment has just came from level of gelatinization in each steaming time, so it does not given the different color of instant tiwul breadfruit.

### **Flavor**

Based on the results of the regression analysis, is not linearly related between the steaming time of instant tiwul breadfruit with organoleptic flavor test. The flavor of instant tiwul breadfruit with steaming time for 30 minutes to 90 minutes has a value of 2.50 which is in the level of dislike preference. Flavor value is a form of the component that related with the enzyme during

the digested of food in mouth occurs. Different steaming time does not affects to flavor of instant tiwul breadfruit because the raw material only breadfruit flour and water.

### **Texture**

Based on the results of the regression analysis, is not linearly related between the steaming time of breadfruit with organoleptic texture test. The texture value of instant tiwul breadfruit with steaming time for 30 minutes to 90 minutes has a value 2.98 which is in the level of preference like. Rehydration of instant tiwul breadfruit doing by addition water (80<sup>0</sup>C) into instant tiwul breadfruit (5 grams) with 10 minutes rehydration time.

### **Protein content by Kjeldahl Method**

Based on the protein analysis on the best treatment of instant tiwul breadfruit with 90 minutes steaming time, the result of protein content is 6.58%. Proteins contained in instant tiwul breadfruit higher when compared with breadfruit flour which is the protein content is 3.6 grams in 100 grams material. The increase number of proteins that occur in the instant tiwul breadfruit because of the water that in the material to evaporate entirely when the drying process so the percentage of other compounds in the material to be increased. It also happens on fresh breadfruit, fresh breadfruit has a protein content in the range of 1.3 to 2.0 grams in 100 grams of material and the protein range was increased from 1.3 to 2 grams to 3.6 grams when processed into flour breadfruit.

### **Fat content by Soxhlet Method**

Based on the fat analysis on the best treatment of instant tiwul breadfruit with 90 minutes steaming time, the result is 0.43% fat content. Low fat content is because the main raw material used is breadfruit flour has a fat content which is very low it only 0.8 grams in 100 grams of material. According Noviarso (2003), a low fat content on breadfruit can be caused harvesting the breadfruit, the older the harvest breadfruit, the fat content will decrease. Low fat of the mature breadfruit can be caused by during the maturation process of breadfruit, white sap constantly out of the surface of the skin fruit and the sap is contain fat.

### **Fiber content**

Based on the fat analysis on the best treatment of instant tiwul breadfruit with 90 minutes steaming time, the result of fiber content is 7.2 %. The amount is good when compared with the amount of fiber in a variety of products on the market such as wheat with fiber containing only 3.6%. According Anggraini (2004), fiber consumption should be as much as 20-35 grams a day, so it needs addition of other ingredients to meet requirements of fiber if the instant tiwul breadfruit will be staple food.

### **CONCLUSION**

Based on the research results can be concluded that the 90 minutes of steaming time affects the low water content of instant tiwul breadfruit (4.54%), yield of 50, 25% and value color of L\* 57.385, a\* 3.505 and b\* 9.947. the organoleptic test produced characteristics can be accepted by the panelists. The protein, fat, and fiber of instant tiwul breadfruit for each is 6.58% protein content, 0.43% fat content and 7.2% fiber content.

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