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Wet Noodle Quality Improvement Using Paste Breadfruit (*Artocarpus altilis*)

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ABSTRACT

Breadfruit is an annual crop that commonly cultivated fruit without fertilize and pesticide application. It has a special character whit low water content, high carbohydrates and less sugar, the which tend range to make it less utilized. Therefore, as a carbohydrate source, breadfruit can be used as material in noodles processing. The research was conducted in the post harvest laboratory, Assessment Institute for Agriculture Technology (AIAT) of East Java. It was using completely randomized design with a factor of breadfruit substitution. The treatment was consisted 20% breadfruit paste, 30% breadfruit paste, 40% breadfruit paste, and a control. The observation parameters Consist of: 1) physical properties such as expanded power, water holding capacity, stretching and color; 2) Including chemical properties of protein content, moisture, and fiber content, 3) organoleptical properties namely color, taste, and texture. The results showed that the substitution of paste noodles with breadfruit 20% have physical and chemical characters are best used in power expands 150.76%, 1.32% water absorption, tensile strength of 70%, the brightness of 59.40, the protein content of 5.20 %, 59.85% moisture content, fiber content of 3.18%, while according to the test results of the organoleptic quality is the best treatment to 30% substitution of breadfruit paste with color score of 3.68, a score of 3.80 flavor, texture score of 3.96, and an overall score of 3.76.

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1. INTRODUCTION

Breadfruit is an annual plant that grows well in a dry environment. Breadfruit cultivation is generally not carried out intensively, that is without fertilizer and pesticide. Breadfruit plants produce fruit that is round, fleshy thick, seedless, low water content, and high in carbohydrates. The older fruits, the sugar levels rise and the texture becomes soft. Breadfruit utilization among the public is usually used as a snack which means cooking with fried or steamed.

Utilization of breadfruit into a kind of intermediate products are more varied subsequent processing. As an intermediate product of breadfruit can be processed dry and wet. In wet processed into paste breadfruit. Paste breadfruit can be further processed into various preparations such as cookies, cake, noodles, etc.

Breadfruit has a high content of carbohydrates, so the potential to make paste or it could be called *getuk*. Paste breadfruit has advantages, easily processed into various preparations. The paste can be stored longer. Paste storage generally uses low temperatures or freezing.

Noodle is a product that comes from China, but in Indonesia the noodles have a very entrenched and loved by people of all ages, gender, economic level. Mie has become one of the staple food. Noodle product

evolved into many variations, besides wheat flour ingredients, now growing thin noodles called *bihun*, derived from corn starch and rice flour. Noodle-making research done in an effort to diversify food products, utilization of local agricultural commodities and their byproducts in the manufacture of noodles, extend shelf life and improvements in the quality and nutritional value of noodles. Local ingredients are substituted include corn, sago, tubers (such as yam, mocaf, canna), vegetables (including carrots and pumpkin) and fruits (such as dragon fruit) (Amalia and Finarifi (2016), Liandani (2015), Auliah (2012), Nasution, *et al* (2006), Pangestu (2009) , Anam and Handajani (2010), Oktiarni, et al. (2012).

Breadfruit is also the potential for the substitution of raw material for making noodles. breadfruit has a distinctive flavor and strong enough, so that it will form the noodles that have certain characteristics. This study aims to obtain the optimal breadfruit toe composition to get the best quality of wet noodles.

2. RESEARCH METHOD

The research was conducted in the laboratory Mechanization and Postharvest Processing Technology, Assessment Institute for Agriculture Technology (AIAT) of East Java in May 2016. Materials and tools were used in this study include swatter machines and formers noodles, pot of noodle boiled and auxiliaries such as basins, mixers and drainer. Material consists of high protein wheat flour from PT Indofood Sukses Makmur Tbk. and breadfruit obtained in traditional markets. Breadfruit used is harvested for a few days, the maturity level of 80-90%.

Research using experimental design RAL (Complete Random Design) with the addition breadfruit treatment, consisting of P20 (20%Paste breadfruit), P30 (30%Paste breadfruit), P40 (40%Paste breadfruit), and control. Manufacture of paste and noodles breadfruit is showned in Figures 1 and 2.

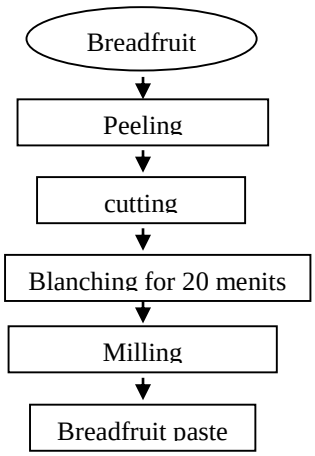

Figure 1. Flowchart of making paste breadfruit

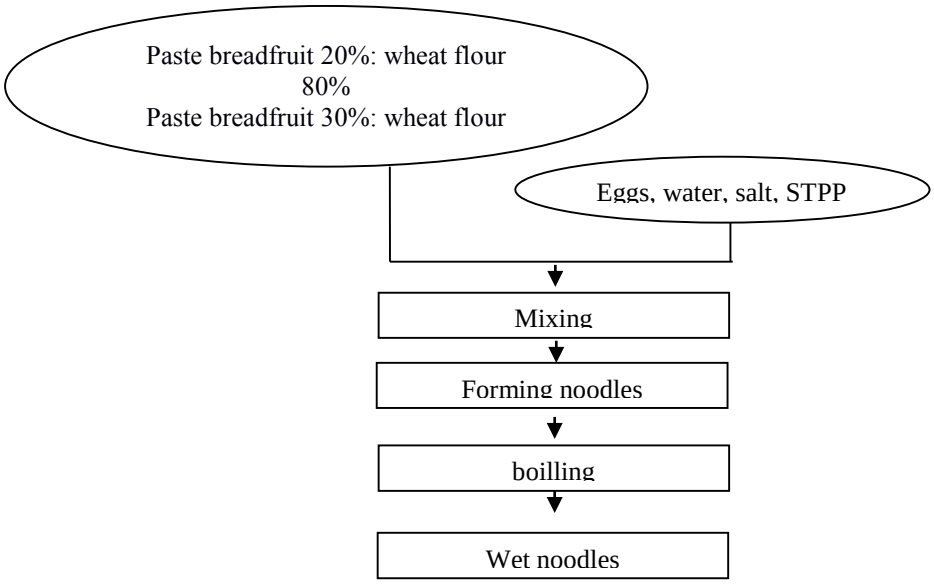

Figure 2. Flowchart of noodle making breadfruit

Parameters observed include breadfruit as a raw material and noodles breadfruit as a result of refined products. Breadfruit observed percentage BDD (edible materials). While the noodles breadfruit observations include 1) the physical properties of noodles ie water absorption, flower power, stretch resources, the degree of brightness and color, 2) the chemical nature of the water content of the noodles, protein, and fiber, and 3) the organoleptic quality of noodles.

Water absorption according to (Muhajir, 2007) was calculated using the following equation:

$$\text{WA (\%bk)} = \frac{(W_A - W_B) - (K_a \, x \, W_0)}{W_0 \, (1 - K_a)} \text{ x } 100\%$$

Expands power tests calculated using the following equation:

$$\text{Expands power (\%)} = \frac{d_1 - d_0}{d_0} \text{ x } 100\ \%$$

Test of tensile strength / power breaking noodles using equation:

$$\text{Tensile Strength (\%)} = \frac{P2 - P1}{P1} \times 100\%$$

3. RESULTS AND ANALYSIS

The physical, chemical and organoleptic quality of breadfruit noodle represented by its tensile strength, expands power, water absorption, brightness, water content, crude fiber, protein, color, taste, textur and overall are sequentially described in the following.

Effect of breadfruit paste on the physical quality of a wet noodle

Some of the important physical qualities on the noodle product is the color brightness, power breaking, power expands, water absorption, cooking time, cooking loss (Jatmiko and Estiasih, 2014). Tensile strength of the noodle product, demonstrated ability noodle strands are stretched and cut off. Tensile strength can also show the texture of the noodles. Noodles which have high tensile strength generally also textured chewy. According Dessuara, et al (2015) noodles that have higher tensile strength is the noodle that substituted by tapioca flour. In Table 1, the percentage of breadfruit paste significantly affect the physical properties of tensile noodles ($\alpha < 0.05$). The higher % breadfruit paste, it will lower% wheat flour, causing the lower the tensile strength of the noodles. This is due to the decreased content of gluten, found in wheat flour. In addition to gluten, according Imanningsih (2012) amylopectin content of the starch was also served to increase the tensile strength of the noodles.

Table 1. Power stretch, power expands, absorption and brightness levels paste noodles made from breadfruit.

No.	Treatment	Tensile strength (%)	Expands power (%)	Water absorption (%)	The brightness (L)
1	P20	70.00 a	150.76 a	1.32 a	59.40 a
2	P30	30.44 b	102.45 b	1.98 a	56.31 ab
3	P40	40.00 ab	38.19 c	1.41 a	59.83 a
4	Control	69.00 a	138.89 ab	1.98 a	59.80 a

Note: The same letters in the same colum showed no significant difference in the level of 0.05%

Boiling causes noodles absorb water and expand. Expands power is measured to determine the noodle expand percentage during the cooking process. In Table 1, the percentage of breadfruit paste significantly affect to noodle expands power ($\alpha < 0.05$), higher paste breadfruit substituted into the noodle make lower noodle expands power. In successive breadfruit paste as much as 20%, 30% and 40% produce noodles that have a fluffy 150.76%, 102.45%, 38.19%. This is according to the study produced by Dessuara (2015) The role of wheat flour in noodles development power, the lower the percentage of wheat flour, resulting in the expands power of noodles diminishing.

Expands power is closely related to water absorption. Water absorption is the ability of the noodles absorb water during the boiling process from raw noodles into a wet noodle. Table 1, the percentage of breadfruit paste does not affect the water absorption ($\alpha > 0.05$) values ranged between 132-198%. Paste breadfruit is wet thereby increasing the water content of the dough. In this study, the percentage increase breadfruit paste, followed by a decrease in the amount of water added to the dough. It aims to form a noodle dough that is easily printed. Therefore, breadfruit paste treatment did not affect the percentage of water absorption on the noodles. According to Prabowo (2010) and Dessuara (2015) when boiling, the higher the moisture content of raw noodles will lead to decreased absorption of water.

Effect of breadfruit paste on the chemical quality of wet noodles

The water content of the noodles were measured are moisture content of wet noodles or boiled noodles. The water content indicates the amount of water contained in a material, and expressed as a percent. In Table 2, showed that the percentage of breadfruit paste affect water levels of noodles (α <0.05). The water content ranged between 59.85% -67.96%, the higher content water tendency to noodles with the higher percentage of breadfruit paste. According Faramudita (2015) water content water noodles are generally about 68.2%. The moisture content of the noodles come from breadfruit paste, the addition of water during the making of the dough, and the water is absorbed during boiling. In addition to some of those, content water also were influenced by fiber.

Table 2. The water content, crude fiber and protein paste noodles made from breadfruit.

No.	Treatment	Water content (%)	crude fiber (%)	Protein (%)
1	P20	59.85 c	3.18 a	5.20 a
2	P30	67.96 a	1.33 b	6.07 a
3	P40	60.69 c	1.68 b	6.54 a
4	Control	-	0.62 *	6.23 *

* Yustisia R. (2013)
Note: The same letters in the same column showed no significant difference in the level of 0.05%.

Fiber is a component in food that is needed by the body. Fiber works to improve food digestion in the body. According Safitri (2014) food containing high fiber are hydrocolloids, that is able to bind water. The higher fiber absorb more water. In Table 2, the percentage of breadfruit paste affect the content of noodles crude fiber (α <0.05). A high percentage breadfruit paste cause a low crude fiber content. This is happened in Safitri (2014) research. This can be caused by mixing paste breadfruit uneven.

The protein content of the noodles come from eggs and wheat flour. Gluten in wheat flour is also one form of vegetable protein (Jatmiko and Estiasih, 2014). In Table 2, showed that the percentage difference breadfruit paste does not affect the protein content of the noodles, which ranged from 5.20 to 6.54%. The noodles have low protein content and did not differ among treatment because of source of protein a derived from eggs only (with the use of a small amount) and wheat flour. This is different in cheese making where wheat flour as additional ingredient (Fitasari, 2009). It states that in making cheese, the addition of wheat flour composition lead to decreased protein in cheese.

Effect of breadfruit paste on organoleptic quality of noodles

Both food and drink, color is a very important factor of product. Color determines the person's desire or passion in choosing and enjoying a meal, so that it can be an indicator to determine the color of the product is accepted or not by the consumer society. The food quality is not necessarily appreciated by the public if it has a less preferred color or different from the original color (Prhandoko, 2015).

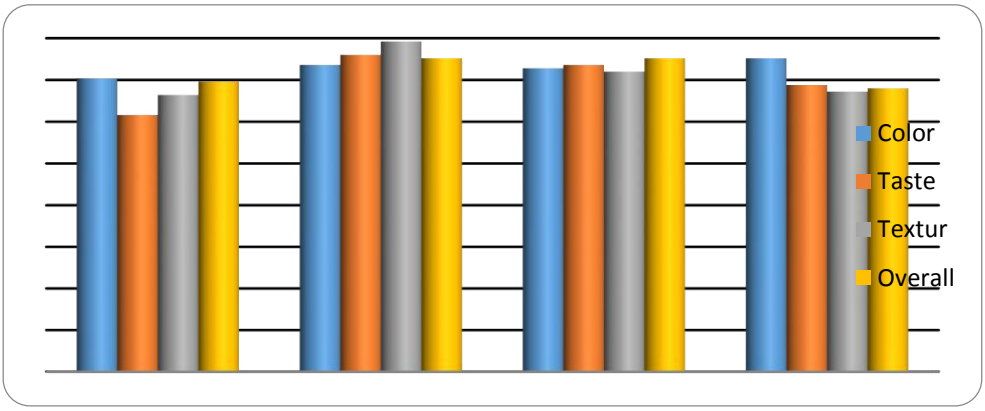

Figure 3. Diagram beam panelist preference test results for color, taste, texture and overall breadfruit paste noodles substitution of 20%, 30%, 40% and controls (100% wheat flour)

Based on Figure 3, the preferred color noodles are noodles with 30% breadfruit paste with a score of 3.68. Its value approaching treatment control treatment (100% flour) is 3.76. Breadfruit paste has yellowish color. It forms noodles are yellowish color. Such noodle color preferred by the panelists.

The taste is a response to a chemical stimulus to the sense of taste. Good taste will make consumers to repeat what has been consumed. According Prhandoko (2015) fits composition between the breadfruit and wheat flour affect panelists in judging a product. Based on the results of organoleptic test been done, in figure 3, addition of 30% breadfruit paste noodle is more preferred by the panelists, with a score of 3.80.

Elasticity of the noodle is one of the desired texture of the noodles. In food products, chewy texture is generally obtained from the content of amylopectin and starch materials. In Figure 3, the substitution treatment of paste noodles with breadfruit 30% more preferred by the panelists with a score of 3.96, compared to other treatments and control. This indicates that the breadfruit paste add elasticity of noodles. According to Setiani, et al. (2013) breadfruit has a starch content of 76.39%, 26.76% content of amylose, 73.24% amylopectin and 22.38% moisture content material.

A vote on the whole preference is influenced color, flavor and texture (Prhandoko, 2015). Overall, for the organoleptic properties of noodles (color, taste, texture) a panelist more likely on the addition of breadfruit paste treatment 30% and 40% with a score of 3.76%. This value exceeds the overall liking scores of the control noodle is 3.40. This indicates that the addition of breadfruit paste in noodles does not interfere with the taste panelists, even preferred by the panelists.

4. CONCLUSION

The percentage number of breadfruit paste in noodle significantly affect tensile strength, power expands, the degree of brightness, moisture content and crude fiber noodles. The percentage of the breadfruit paste in noodles with the physical, chemical and organoleptic best character is 20-30%. Noodles with breadfruit paste 20-30% have 150.76% expansion, 1.32% water absorption, 70% tensile strength, brightness level of 59.40, 5.20% protein content, 59.85% moisture content, fiber content 3,18%, color score 3,68, taste score 3,80, texture score 3,96, and overall score 3,76.

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