Effect of Composite Flour (Wheat and Orange Sweet Potato Flour) on the Physicochemical and Sensory of Cookies

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Abstract: Cookies are one of the foods made from wheat flour. Indonesia depends on import of wheat flour from abroad. The effort to reduce imports of flour from abroad is by conducting research on local resources that can be used as flour to substitute wheat flour on making cookies. One of the foods that can be used as a source of flour is sweet potatoes.This research deal about the physicochemical and sensory of cookies from composite flour (wheat and orange sweet potato flour). The orange sweet potato flour can substitute wheat flour about 20% to make cookies.

1 INTRODUCTION

Indonesia has many plant sources of carbohydrates that can be used as flour to substitute imported flour such as flour. Examples of these plants include sweet potatoes, cassava, corn, breadfruit. Sweet potatoes have several varieties based on their tuber colors, namely white, yellow, orange and purple sweet potatoes (Juanda and Cahyono, 2000). Sweet potato (Ipomoea L.) is one of the food commodities that has the potential to be developed as an alternative ingredient in food diversification. Fulfillment of energy sources from sweet potatoes as food is 215 cal / day. The advantages possessed by sweet potatoes compared to other plants are that they can survive in an unfavorable climate, can grow in various types of soil and have economic value that can be calculated (Rukmana, 1997). Sweet potatoes can also be an alternative food that can improve the fulfillment of community nutrition (Liur, 2014). Orange sweet potato has a high water content and carotenoid content (β-carotene). Caroteneid is known as provitamin A and is a pigment that causes the flesh of the tuber to be yellow to orange, the more orange color on the tuber, the higher the β-carotene content (Wahyuni, et al, 2005).

Sweet potato production in the North Sumatra Province of Indonesia from 2013 to 2016 experienced fluctuations where successive production from 2013, 2014, 2015 and 2016 was 116,671, 146,671, 122,362, 91,531.4 tons (Badan Pusat Statistik, 2017). This figure shows that sweet potato production is quite good, but this is not supported by efforts to develop its products. Product development is only limited to making sweet potatoes into chips, cassava and the like. Agro-industry development efforts need to be carried out to process agricultural crops into attractive and durable products so that they can fulfill market desires, which are realized through counseling and introduction of sweet potato products as alternative food sources to the community. Forms of sweet potato include sweet potato products ready to eat, ready to cook and the development of semi-finished sweet potato products for food raw materials such as flour and starch (Juanda and Cahyono, 2000). During the process of processing into flour such as drying, the heat flowing in the material will degrade the carotenoid compounds in sweet potatoes, namely β-carotene. This degradation is due to warming can break the carotene chain so that there is a decrease in β-carotene levels which results in a decrease in the intensity of carotene color. The interaction between compounds naturally found in sweet potatoes and oxygen during heating can cause an enzymatic browning reaction which has an impact on the decrease in color intensity of flour (Setyabudi, 1994). Non-enzymatic browning that occurs when drying sweet potato slices is a maillard reaction which can be prevented by doing initial treatment such as adding anti-browning and soaking in hot

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water or a combination of both (Sappers and Miller, 1992). Orange sweet potatoes contain antioxidant compounds that are important for maintaining a healthy body because it can function as an antidote to free radicals. One type of antioxidant is β-carotene. Sweet potatoes contain high fiber, carotenoids, anthocyanins and polyphenol compounds that can function as antioxidants (Usmiati, 2005).

2 MATERIAL AND METHOD

This research was conducted at Analisa Kimia Bahan Pangan Laboratory, University of North Sumatera. Orange sweet potato were purchased from farmer at Kecamatan Saribudolok, kabupaten Simalungun, Indonesia. The making of orange sweet potato flour: the sweet potato was peeled with 0.2 cm thick sliced knife, placed in a baking sheet and dried in an oven with temperature 50°C about 24 hours, then milled and sifted with 80 mesh sieve. The making of cookies: Mixed composite flour (orange sweet potato and sweat flour) with formulation 80%:20%; 60%:40%; 40%:60%, and 20:80% with total treatment about 100 gr. Mixer sugar 20%, salt 0,2%, egg 14%, 50% margarine until swelling, added 5 treatment of composite flour with 4 stabilizer (non stabilizer, arab gum, CMC, and Tween 20). Kneaded about 25 minutes with hand, make the dough in a circle and dried in the oven at 160°C about 25 minutes. Analysis consist of moisture content analyis by using oven method (AOAC, 1995), ash content using dry ashing method (Sudarmadji et al., 1997), betacarotene content (Apriyantono et al, 1989), sensory test (Soekarto, 1982).

The data analysis using randomized design were analyzed using SPSS version 22 for windows. The results reported in all tables are average of triplicate observation subjected to one way analysis of variance (ANNOVA). Different among the ranges of the properties were determinate using the method of Least Significant Differences (LSD) tests at 95% confidence level (P<0.01). The best treatment was then compared with the control treatment T-test De Garmo was used in determining the best treatment method.

3 EFFECT COMPOSITE FLOUR (WHEAT AND ORANGE SWEET POTATO) ON PHYSICOCHEMICAL OF COOKIES

Tabel 1: Effect composite flour (wheat and orange sweet potato flour) on moisture content

Wheat flour:orange sweet potato flour	Moisture Content
T1 = 80:20	3.590d
T2 = 60:40	4.480c
T3 = 40:60	5.350b
T4 = 20:80	5.990a

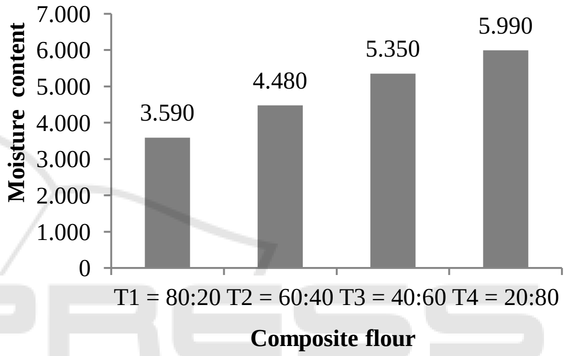

Figure 1: Effect composite flour (wheat and orange sweet potato flour) on moisture content

Table 1 and Figure 1 showed that the moisture contain of cookies are 3.590 until 5.990. This our cookies had moisture content lower until higher than SNI 01-2973-1992 (quality requirements for cookies in Indonesia). Cookies with substitutes of orange sweet flour about 20 to 40 percent have a moisture content that is still below the maximum required by SNI. Cookies with subtitutes of orange sweet flour about 40 to 60 percent have moisture content that is higher than SNI. The heating causes the particles to become more porous, thus increasing the ability to absorb water after drying, which in turn can increase the moisture content contained in the material (Pangastuti et al, 2013).

Tabel 2: Effect composite flour (wheat and orange sweet potato flour) on ash content

Wheat flour:Orange sweet potato flour	Ash Content
T1 = 80:20	0,911d
T2 = 60:40	1,350c
T3 = 40:60	1,710b
T4 = 20:80	1,970a

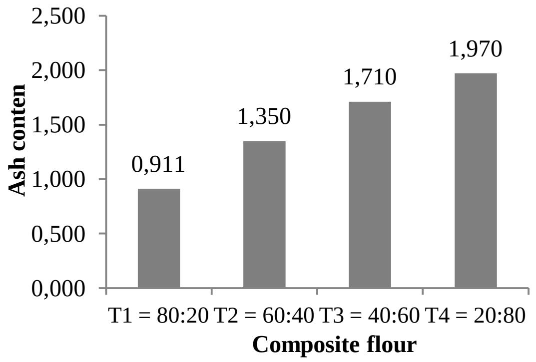

Figure 2: Effect composite flour (wheat and orange sweet potato flour) on ash content

Table 2 and figure 2 showed that the ash content of cookies are 0.911 until 1.970. Ash content increases with increasing amount of orange sweet potato flour. Orange sweet potato flour has high amounts of vitamin A, ascorbic acid, phosphorus, iron and calcium (Lingga, 1984). An increase in ash levels indicates that cookies made from orange sweet potatoes contain minerals and vitamins that are high enough and good for people who want to get more valuable food products, not just eating cookies, but getting more benefits.

Tabel 3. Effect composite flour (wheat and orange sweet potato flour) on betacarotene content

Wheat flour:orange sweet potato flour	Betacarotene content
T1 = 80:20	1.000d
T2 = 60:40	2.089c
T3 = 40:60	5.684b
T4 = 20:80	7.395a

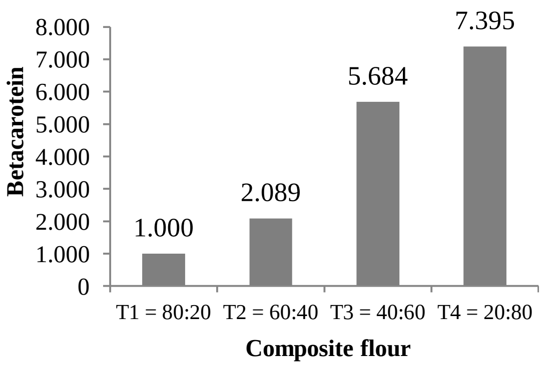

Figure 3: Effect composite flour (wheat and orange sweet potato flour) on betacarotene content

Table 3 and figure 3 showed that the betacarotene content of cookies are 9.140 until 73.950 (mg/100 ml). Betacarotene is increasing with the increasing number of orange sweet potato flour added in making cookies. Orange sweet potato flour has caroteneid pigments which are yellow, red, and orange pigments that serve as precursors of vitamin A and antioxidants (Wahyuni and Widjanarko, 2015). Beta carotene is one of the color pigments found in orange sweet potatoes. It is very unsaturated, easily isomerized and oxidized. In general, cis-isomers will form when in contact with acids, heat and light. Carotenoids are highly reactive so they are easily oxidized when processing and storing occur. The amount of oxidation reaction depends on the presence of carotenoids, oxygen, light, the amount of temperature, the presence of enzymes, metals, proxidan, and antioxidants. The oxidation reaction catalyzed by enzymes can occur due to heat when s.tripping, slicing, dissolving, and extracting (Amaya and Kimura, 2004).

4 EFFECT COMPOSITE FLOUR FLOUR (WHEAT AND ORANGE SWEET POTATO) ON SENSORY OF COOKIES

Table 4 and figure 4 showed that the hedonic flavor of cookies are 1.830 until 3.000. The more orange sweet potato flour is added, the lower the flavor value, it shows panelists tend not to like cookies that contain a lot of orange sweet potato flour . Sweet potato aroma that arises in the product is caused by starch in sweet potato initially breaks into a shorter glucose chain called dextrin, then dextrin is broken down into maltase and broken down again into glucose. the starch extraction process in the roasting process raises the aroma of sweet potatoes (Krisnawati dan Indrawati, 2014). We can see from this aroma data, it can be seen that the panelist can only accept the aroma from cookies which are only substituted with 20 percent orange sweet potato flour, more than that the value of the aroma deteriorates or the consumer does not like the aroma.

Tabel 4: Effect composite flour (wheat and orange sweet potato flour) on flavor content

Wheat flour:Orange sweet potato flour	Flavor Content
T1 = 80:20	3.000a
T2 = 60:40	2.440b
T3 = 40:60	2.180c
T4 = 20:80	1.830d

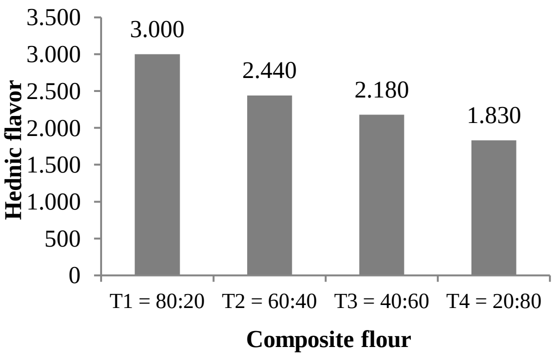

Figure 4: Effect composite flour (wheat and orange sweet potato flour) on flavor content

Tabel 5: Effect composite flour (wheat and Orange sweet potato flour) on taste content

Wheat flour:Orange sweet potato flour	Taste Content
T1 = 80:20	2.940
T2 = 60:40	2.340
T3 = 40:60	2.100
T4 = 20:80	1.600

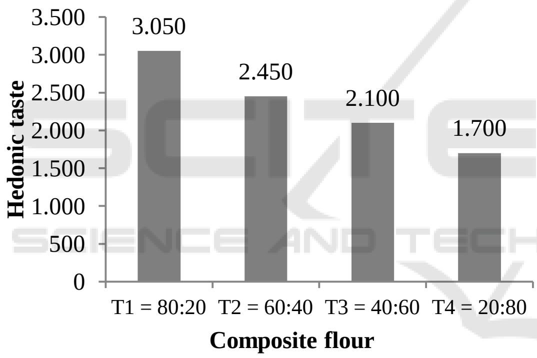

Figure 5. Effect composite flour (wheat and orange sweet potato flour) on taste content

From table 5 and figure 5. We can see the higher amount of orange sweet potato that we added, the lower of value of hedonic taste. It indicated, the panelist didn't like much flour from orang sweet potato. Taste is the most important factor in determining the decision for consumers to accept or reject a food or food product. Even though the other parameters are good, if the taste is bad or not liked, the product will be rejected (Suharman et al, 2016).

6 CONCLUSSION

The orange sweet potato flour can subtitute wheat flour about 20% to make cookies.

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