EFFECT OF BACKING TEMPERATURE AND LEAF MULBERRY (MORUS ALBA L) EXTRACT ADDITION TO CHARACTERISTICS OF COOKIES SWEET POTATO (IPOMEA BATATAS L)

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ABSTRACT

Cookies are one type of biscuit made from dough is soft, high-fat, relatively crisp when on break and a cross-cut tertekstur solid, but cookies are rich in nutrients needed to do additional nutrition by utilizing the antioxidant content of mulberry leaves, and take advantage of snacks such as local sweet potato as a substitute for wheat flour.

The purpose of this study was to obtain sweet potato cookies baking temperature and determine the concentration of mulberry leaf extract on the characteristics of sweet potato cookies

The method performed include preliminary research and primary research. The preliminary study is to determine the formulation ratio of sweet potato flour with flour mocaf using organoleptic response to the attributes, color, aroma, and taste. The main study was done using the experimental design randomized block design (RBD) and using the treatment design consisting of two factors, namely A (temperature baking) and Factor B (concentration of leaf extract muolberry)

Selected samples are sample test results rank a2b1 (1600 baking temperature with mulberry leaf extract concentration of 0.5%) which has a value of water content of 4.26%, 4.83% protein, fat content of 18.31%, 30.73% starch content

The results of analysis of antioxidants in selected sample that is on the cookies before baking products have IC50 values 3537.5 ppm, the treatment cookies after dipanggan have IC50 values 5913.386 ppm

Keywords : cookies, sweet potatoes, mulberry leaves, baking temperature, and concentration of leaf extract muolberry

Introduction

Indonesia is a country with a majority of the population consumes rice as a staple food. Therefore, rice is the main ingredient for some communities in Indonesia. But the price of rice increased to make people switch other carbohydrates sourced foods such as wheat, corn, sweet potato, cassava and others for a more affordable price.

Sweet potato is a fourth alternative source of carbohydrates from food after rice, maize, and cassava (Zuraida, 2003). The sweet potato has a relatively high nutrient composition, ie the weight of 100 grams contains 27.9 grams carbohydrates, 1.8 grams protein, 0.7 grams fat, 0.09 mg vitamin B1, vitamin C 22 mg, 49 mg phosphorus, iron 0.7 mg, 68.5 grams of water and vitamin A 7700 SI (Nutrition Directorate of the Ministry of Health, 1996).

Sweet potato is one umbiumbian easily found in Indonesia. In 2012, West Java is the province's first order of the largest sweet potato producer in Indonesia with the number of 436,577.00 tons / year in 2012 (Central Bureau of Statistics, 2013) .Pemanfaatan sweet potato in Indonesia is still very limited as food and little industrial raw material. Ordinary sweet potato processed directly as in steamed, fried, grilled.

Sweet potato processing into flour is one of the efforts to obtain semi-finished products of these commodities so as to

reproduce the application and storability of these commodities in subsequent periods. Sweet potato flour is sweet potato semi-finished products that can be used as raw materials in the food industry and also has a longer shelf life. Sweet potato flour made from dried shredded or chip by means of ground and sieved (Widowati et al, 1994).

Utilization substituent sweet potato flour as wheat flour for baking raw materials are expected to reduce the use of flour, so that imports of wheat flour can be reduced and also could increase the added value of sweet potatoes. Raw materials used for research in making cookies are sweet potato flour. Sweet potato flour is crushed yams were eliminated partially water content by drying and then grinded (milled) with a degree of fineness of 80 mesh and 60 mesh (lies Suprapti M, 2003).

The sweet potato flour serve as a replacement (substitution) or a mixture of wheat flour (Sarwono, 2005). Cookies are one of the forms of processed food products are widely liked by children to adults. Cookies are quite popular in Indonesia, it is practical and durable making such products more widely consumed. According to SNI, cookies are made of a type of biscuit dough is soft, high-fat, crisp, and when broken cross section less dense textured pieces. Cookies term commonly used in America, but in England meant cookies are a sweet biscuit.

This research was conducted by making sweet potato flour to reduce the use of wheat flour in making cookies. However, pengguanaan sweet potato flour and wheat flour can not add nutritional content in sweet potato cookies so that the addition of mulberry leaf extract for adding the antioxidant content of sweet potato cookies. According Sunanto (1997), plant mulberry known as common as the magnitude (Central Java, East Java and Bali), kertu (North Sumatra), gertu (Sulawesi), kitaoc (South Sumatra), kitau (Lampung), Moerbei (Netherlands) , mulberri (England), Gelsa (Italy), Murles France). Mulberry basically have single sex flowers, though sometimes also androgynous duplicate (Atmosoedarjo, et al, 2000).

Based on the results of the analysis carried out by the phytochemical screening Tiaraswara (2015) mulberry leaves contain flavonoids, tannins, phenols, and steroids. Mulberry leaves have a high phenol values, fresh mulberry leaf also contains theaflavins, as well as caffeine. Ethanol extract of mulberry leaves contain quersentin and anthocyanins. Both kinds of these compounds include both flavonoid glycosides. The compound has many hydroxyl group (OH) that can serve as free radical or antioxidants. Mulberry leaf is a product of the mulberry plant is widely used in the process of breeding silkworms. Mulberry leaf has good potential as alternative feed sources for protein content is quite high at 20.4%. In addition to nutrient content is quite complete, mulberry leaves are also known to have a high phenolic component values. Reported mulberry leaves are rich in flavonoids that have biological activity, including in terms of antioxidant activity. (Damayanthi, 2008).

According Tiaraswara (2015) From the results of testing the antioxidant activity against DPPH mulberry leaves with two different drying methods found that mulberry leaves are dried by natural drying method or the sun has antioxidant activity of 109.47 ppm which has a moderate antioxidant activity while the dried mulberry leaves with artificial drying methods (tunnel dryer) has antioxidant activity of 69.77 ppm which have strong antioxidant activity 82.

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Therefore the drying method chosen to do in the main study in the manufacture of hard candy extract and mulberry leaf is a method of artificial drying tunnel dryer with a tool because it has the best antioxidant activity that is 66.77 ppm.

Based on the results of the proximate analysis, mulberry leaves are fertilized with Gandasil and bayfolan, has a chemical makeup that is relatively similar in terms of water content (difference 1.00), crude protein (difference 1.49) crude fiber (difference 1.05), carbohydrates (margin 1.2%), fat (difference 0.2%), ash (3.52%), BETN (difference 0.39%), Ca (difference 0.49%) and P (0.02%) (Andadari and Diana, 2005). According Tazima (1978) mulberry leaves with 24-36% crude protein, crude fiber 7-11%, BETN 43-55%, 2-4% crude lipid and ash 7- 9% is required for the growth of silkworms. Mulberry leaf crude protein content (22-23%) higher than other forage such as grass king (8.2%), star grass (8.9%) and bulrush (9%) (Boschini 2002). One to increase the economic value of mulberry leaves, it can be used as an added antioxidant by used as extract, thus increasing the nutrients of sweet potato cookies.

One important process in making cookies are baking. According to Fellows (1988), baking is an operating unit that uses hot air to improve the quality of the food. Another purpose of grilling is to reduce microorganisms and the water activity (Aw) on the surface of the food. According Muchtadi et al, (2010), in general, is a process of dry-heat baking of the food is done to change the sensory characteristics so that products can be more acceptable to consumers. In a special sense, the oven is heating the dough in the manufacture of products rerotian (bakery). Baking process causes the food is more durable because the process causes the inactivation of microbes and enzymes, as well as lower aw (water activity).

Identification of problems

Problems can be identified from the above background are:

1. How does the baking temperature on the characteristics of the resulting cookies?
2. How does the addition of mulberry leaf extract on the characteristics of the resulting cookies?
3. How does the interaction effect of baking temperature variations and the effect of the addition of mulberry leaf extract on the characteristics of the resulting cookies?

Purpose and Objective

The purpose of this study was to determine the temperature of baking cookies, and the effect of mulberry leaf extract and its interaction with the characteristics of the resulting cookies

The purpose of this study was to determine the temperature of baking cookies and sweet potatoes right to determine fortification mulberry leaf extract the right to obtain the characteristics of cookies that can be accepted by consumers.

Materials and Methods

Materials and tools.

The materials used for the manufacture of cookies is a Sweet potatoes Ipomoea batatas L) (potato starch) obtained from the market commotion bats, mocaf flour obtained from the store Kijang Mas Tamansari Bandung, leaves of mulberry (Morus Alba L) obtained from Lembang, Bandung, margarine, backing powder, eggs, refined sugar, salt, and vanilla, derived from traditional markets Gegerkalong Bandung. The materials used for the analysis is the solution Luff Schoorl, H2SO4 6 N, H2SO4 (p), powder KI, Na2S2O3 0.1 N, Na2S2O3 5%, 1% starch, HCl 9.5 N, NaOH 30%,

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NaOH 0.1 N, Na2S2O4, anhydrous, HgO, black Selenium, Sodium metabisulphite, stone boiling, granules Zn, phenolphthalein indicator, n-hexane, and distilled water, ethanol, DPPH reagent.

The tools used for manufacturing cookies are, knives and basin, oven (international), mixer, an analytical balance, mold pastries, place dough baking sheet, spoon. Blander, measuring cups. A set of distillation equipment, condensers, pumpkin Kjedahl, tube Soxhlet extraction, eksikator, rolling press, flask of 100 ml, pipette volumetric 10 mL, Erlenmeyer 250 mL, bath, dish or watch glass tangkrus, burret, pipette, test tubes, spectrophotometry.

Research methods

The method used includes the design of treatments, experimental design, design analysis, design response.

Design of treatment

The design of the treatment consists of the preliminary study and the main study research Introduction

The preliminary study conducted to compare the exact formulation for the manufacture of sweet potato cookies, which will be used in the main study with a ratio of starch (potato starch flour mocaf) 3: 1, 2: 1 and 1: 1

Main research

The experimental design used in this study was a randomized block design (RBD) with factorial 3 x 3 with three repetitions. The main study consists of two factors, namely the baking temperature (A) and the addition of mulberry leaf extract (B).

1. Factors Baking Temperature (A) 140 ° C, 160 ° C, 180 ° C
2. Factor Mulberry Leaf Extract (B) 0.5%, 0.75%, 1%

Experimental design

The experimental design used in this study was a randomized block design (RDB) with factorial 3 x 3 with three replications, in order to obtain 27 times the combined treatment. The factorial design is done can be seen in Table 1.

Table 1. Experimental Model RDB 3x3 factorial pattern with three replications

Baking Temperature (A)	Mulberry Leaf Extract (B)	category		
		I	II	III
a_1	b_1	a_1b_1	a_1b_1	a_1b_1
	b_2	a_1b_2	a_1b_2	a_1b_2
	b_3	a_1b_3	a_1b_3	a_1b_3
a_2	b_1	a_2b_1	a_2b_1	a_2b_1
	b_2	a_2b_2	a_2b_2	a_2b_2
	b_3	a_2b_3	a_2b_3	a_2b_3
a_3	b_1	a_3b_1	a_3b_1	a_3b_1
	b_2	a_3b_2	a_3b_2	a_3b_2
	b_3	a_3b_3	a_3b_3	a_3b_3

Analysis design

Based on the above it can be prepared a draft analysis of variance (ANOVA) to obtain conclusions about the effect of the treatment. hypothesis

The experimental design variation analysis (ANOVA). Furthermore, it can be determined the rejection of the hypothesis, namely:

• H0 if F arithmetic <F table, if the baking temperature and concentration of mulberry leaf extract has no effect on the characteristics of sweet potato cookies, so no need for further testing.

• H0 is accepted, if F count> F table, if the baking temperature and mulberry leaf extract concentration affect the characteristics of sweet potato cookies, so it is necessary to further test Duncan 5% level (LSR Test)

Plan Response

The draft response that will be done in the main research was conducted on the response of organoleptic and chemical response

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1. Response Organoleptic
Organoleptic tests will be done to the color, aroma, and taste of sweet potato flour cookies, which tested the panelists to judge from each treatment. Organoleptic tests carried out based preference level panelists using a hedonic scale test scoring.
2. Response Chemistry
The analysis conducted on coockies sweet potatoes with the addition of extract of mulberry leaves is the analysis of water content by gravimetric methods (AOAC, 2003), starch with Method Luff Schoorl (AOAC, 2003), protein content with Method Kjedahl (AOAC, 2003), fat content with Soxhlet method (AOAC, 2003), then analysis of antioxidant activity using DPPH method (AOAC, 2012) of selected products response organoleptic and chemical response.

Description Experiment
Research procedure is divided into two stages: a preliminary investigation procedures and procedures for primary research.
Research Description Introduction
1. Mixing of materials I
Mixing the ingredients I would do is mix the margarine, eggs, refined sugar, milk powder, backing pwder, salt, and, vanilla, mixed using a mixer until it forms a cream.
2. Mixing of materials II
II material mixing is done by adding a comparison mocaf flour and sweet potato flour in accordance with a predetermined formula, and mulberry leaf extract. Materials that have been mixed to form the dough is ready to be printed
3. Printing
Printing will be done by thinning the dough using a steel roll and shaped biscuit mold 2x2 cm size as well as put on a baking sheet.
4. Baking
Using the baking oven that will be carried out at a temperature of 160oC, with longer baking for 13 minutes. During baking ongoing changes occur, such as a reduction in the density of biscuit products for the development of porous texture (textural changes). Cookies prepared observed
5. Observations
The observations made are the organoleptic response form to get a ranking scale of formulation to be used in the main study.
Description Main Research
1. Mixing of materials I
Mixing the ingredients I would do is mix the margarine, eggs, refined sugar, backing powder, milk powder, salt, and, vanilla, mixed using a mixer until it forms a cream.
2. Mixing of materials II
II material mixing is done by adding a comparison mocaf flour and sweet potato flour which has been determined from the results of preliminary research, and mulberry leaf extract concentration (0.5%, 0.75%, 1%). Materials that have been mixed to form the dough is ready to be printed.
3. Printing
Printing will be done by thinning the dough using a steel roll and shaped biscuit mold 2x2 cm size as well as put on a baking sheet.
4. Baking
Using the baking oven that will be carried out at a temperature of 1400C, 160oC, 1800C with long baking for 13 minutes. During baking ongoing changes occur, such as a reduction in the density of biscuit products for the development of porous texture (textural changes). Cookies prepared observed
5. Observations
The observations made in the form of scoring is the response organoleptic and chemical analysis.

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Results and Discussion

Research Introduction Results

The preliminary study aims to determine the ratio of sweet potato flour formulation with mocaf flour used in the manufacture of cookies substitution sweet potato flour and flour mocaf with the addition of mulberry leaf extract selected to be performed on primary research. Response to do is test the organoleptic properties of the color, aroma, and taste.

Based on the analysis of variance (Appendix 7) known that the ratio of sweet potato flour with flour mocaf significant effect on the color, but no significant effect on the aroma and taste of the sweet potato cookies. Organoleptic response results can be seen in Table 2.

Table 2. Comparison of Selected Formulation Sweet Potato Flour and Wheat Mocaf

Kode Sampel	attribute		
	Color	Aroma	Taste
1:1	3.20 (a)	3.33 (a)	3.67 (a)
2:1	2.80 (b)	3.93 (a)	4.00 (a)
3:1	4.27 (b)	4.13 (a)	4.13 (a)

Based on preliminary research results it can be concluded that the formulation ratio of flour selected, namely the ratio of potato flour with flour mocaf 3: 1

Comparison of sweet potato flour with flour mocaf, assessment of color at a ratio of 3: 1 preferably panelist compared with a ratio of sweet potato flour with flour mocaf 1: 1 and 2: 1. This is because the color of sweet potato flour itself has a color that is more attractive than the flour mocaf, so it will give effect to the color of the resulting cookies. This is because the sweet potato are carotenoid compounds that cause yellow color. (Winarno, 2004)

Results of analysis of variance (ANOVA) showed that the treatment cookies with a ratio of sweet potato flour with flour mocaf 1: 1, 2: 1 and 3: 1 did not significantly affect ratings scent produced, but the average value of the attribute scent samples 3 : 1 higher than the sample 1: 1 and 2: 1, so the comparison sample of 3: 1 is more preferred by the panelists.

Based on the results of analysis of variance that the treatment cookies with pebadingan sweet potato flour with flour mocaf not significantly affect scoring attributes the resulting flavor, but the average value in Table 12, shows a comparison of sweet potato flour with flour mocaf 3: 1 value 4:07 highest, while the ratio of 1: 1 3.67, 2: 1 ie 4:00, so the comparison cookies with sweet potato flour with flour mocaf 3: 1 is preferred panelists.

Result can be concluded that the formulation chosen in the preliminary study is a comparison of sweet potato flour with flour mocaf 3: 1, so that the ratio of flour will then be used in the main study

Research Main Results

The main research is a continuation of the preliminary research study to determine the baking temperature and the addition of mulberry leaf extract terhadapn characteristic sweet potato cookies. In this primary research conducted by making cookies sweet potato products in the ratio of sweet potato flour and flour mocaf with the treatment selected in the preliminary study. The draft response that is done is the chemical response analysis of water content, fat content, protein content and starch content, organoleptic responses to determine the level of A panelist on cookies generated is based on the attributes of color, aroma, and taste. Having obtained the best treatment of chemical and organoleptic response as analysis of antioxidants.

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Response Organoleptic

Color

Color is the physical attributes assessed in advance in the quality of the food and can sometimes be used as a measure to determine the flavor, texture, nutritional value and microbiological properties. Foodstuffs are nutritious, tasty and very good texture sometimes not be consumed if it has colors that do not attract and gave the impression has deviated from the color that should (Nurhadi, 2010)

Based on the analysis of variance of the results of the organoleptic response of color can be seen that their influence on the baking temperature, the addition of mulberry leaf extract as well as the interaction of baking temperature and the addition of mulberry leaf extract. Results Analysis organoleptic response variations of color can be seen in Table 3.

Table 3. Effect of baking temperature and concentration of mulberry leaf extract of the sweet potato color values Cookies

Baking Temperature (A)	**Mulberry Leaf Extract (B)**		
	b1 (0,5%)	**b2 (0.75%)**	**b3 (1%)**
a1 (140^0 C)	B 4.38 a	B 4.47 A	A 4.08 A
a2 (160^{0}C)	C 4.67 b	A 4.37 A	A 4.36 A
a3 (180^{0}C)	A 4.13 c	B 3.89 B	A 2.13 A

Description: Each different letters indicate significant difference at 5% level test of Duncan (small letters read horizontally and vertically to read large letters)

Table 3 shows that the higher the temperature of the oven, the cookies panelists votes sweet potato lower .. Table 13 can be seen in the interaction a1b2 ie baking temperature 1400C degan concentration of 0.75% mulberry leaf has a color that most panelists favored the average value average 4:47, while the interaction of treatment a3b3 ie baking temperature 1800C with a concentration of mulberry leaf extract 1% showed the lowest assessment results with the average value of 2:13. 1800C pemangganan where temperatures are less preferred by the panelists. This is due to color produced by the cookie comes from the baking process. According Muchtadi, et al (2010), is generally dry baking is a process of heating the food was done to change the sensory characteristics so that products can be more acceptable to consumers.

Effect of baking temperature is also related to the caramelization reaction. According Kusnandar (2010), caramelization reaction is a reaction that involves a simple sugar that can result in the formation of brown caramel color and flavor components.

In the treatment of a3b3 is baking temperature 1800C with a concentration of mulberry leaf extract 1% affect the resulting color. Research conducted by Tiaraswara (2015) use mulberry leaf extract on sweets is very small, this is because the use of a minor has been greatly affect the color, the use of extracts of which many led to the final color becomes dark green. aroma

The aroma of a food ingredient is an important thing that dpat determine the quality of these foods, if a food has a scent less good it will result in a less preferred by the panelists. The aroma of a food or drink normally usually determines the delicacy of the food or the drink, in general, foods or drinks that can be accepted by the nose and the brain is more of a variety of herbs or a mixture of four kinds of smells main,

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sweet, sour, rancid, and charred (Winarno, 2004)

Based on the analysis of variance to the response of organoleptic aromas (Annex 8.2) it can be seen that the baking temperature (a) and mulberry leaf extract concentration (b) and their interactions (ab) significantly affect the aroma of sweet potato cookies. Results of analysis of variance to the response of the organoleptic aromas can be seen in Table 4

Table 4. Effect of baking temperature and mulberry leaf extract concentration against the value of the aroma of sweet potato Cookies

Baking Temperature (A)	**Mulberry Leaf Extract (B)**		
	b1 (0.5%)	**b2 (0.75%)**	**b3 (1%)**
a1 (140^{0}C)	A 4.18 b	C 4.38 C	B 3.69 A
a2 (160^{0}C)	B 4.24 A	B 4.20 A	C 4.56 B
a3 (180^{0}C)	A 4.16 C	A 3.59 B	A 3.44 A

Description: Each different letters indicate significant difference at 5% level test of Duncan (small letters read horizontally and vertically to read large letters)

Table 4 shows that the higher the temperature of the oven, the cookies panelists votes sweet potato lower .. In Table 14, can be seen in the interaction a2b3 ie baking temperature 1600C degan mulberry leaf concentration of 1% has the most preferred scents panelists with an average value of 4:56 whereas treatment a3b3 interaction that baking temperature 1800C with a concentration of mulberry leaf extract 1% showed the lowest assessment results with the average value of 3:44, wherein the temperature of 1800C pemangganan are less preferred by the panelists. The higher the temperature baking the cookies generated will provide aroma that is not preferred by the panelists. Differences aroma can be caused by the process of caramelization of the sugar and the Maillard reaction. As the flavor, aroma changes can also be determined by the material composition and mechanism of the reaction, so that the aroma generated is also suspected to be a combination of glucose degradation products, namely formaldehyde and furyldialdehyde, the aroma of bread crust-like (Puspitasari, 2009)

flavor

The taste is a factor that is important from a food product, taste assessment showed consumer acceptance of a foodstuff, which is generally done with the assessment of the human senses. (Winarno, 1997)

The result of the calculation of variance analysis shows that the taste factor adding mulberry leaf extract significantly affect the taste response. Can be seen in Table 5.

Table 5. Effect of the addition of mulberry leaf extract on the value of the sweet potato flavor cookies

Mulberry Leaf Extract	**Average Value**	**Taraf 5%**
b1	6.36	b
b2	5.93	b
b3	5.48	a

Description: each different letter indicate significant differences at the level of 5%.

Based on Table 5 that the addition of mulberry leaf extract showed differences nyara to taste sweet potato cookies. This can occur because the higher the addition of mulberry leaf extract the flavor cookies generated will have a strong bitterness. Thus the lower the addition of mulberry leaf extract, the panelists will prefer sweet potato cookies with a bitter taste of the increasingly low.

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According Tiaraswara (2015) felt the bitter taste of hard candy mulberry leaf extract caused by an polyphenols or phenolic compounds are powerful antioxidants. Even though its has a flavor that is less comfortable but has good benefits, it makes sense as one of the attributes that determine the quality of these sweets.

Chemical response

Water content

Water is a major component in foods that greatly affects the texture, appearance or flavors in the food. The durability of the processed products are also strongly associated with a water content because it is affecting the development of microorganisms in processed products (Winarno, 1991).

The water content in food ingredients affect the durability of foodstuffs against microbial attack expressed by aw, ie the amount of free water that can be used by microorganisms for growth (Winarno, 1991).

The result of the calculation of variance analysis shows that the water content of the baking temperature factors significantly affect the response of the water content of cookies. While on the mulberry leaf extract additional factors and the interaction of baking temperature and the addition of mulberry leaf extract had no significant effect. Hasili Anva can be seen in Table 6

Table 6. Effect of baking temperature and mulberry leaf extract concentration against% moisture Cookies sweet potato

Baking Temperature	Average Water Content (%)	Taraf 5%
a1	6.27	b
a2	4.70	a
a3	3.60	a

Description: each different letter indicate significant differences at the level of 5%.

Based on table 6 that the baking temperature show significant differences on water content of sweet potato cookies. In the treatment of baking temperature best product obtained by the value of low water levels, namely the treatment of a1 with a temperature of 1600 with the average value of 3.60%, while at a temperature of 1600C has the average value of 4.70%, at a temperature of 1400C has a moisture content high enough ie 6:27%. This is because the lower the baking temperature treatment, the higher the water content, the higher the temperature baking conversely, the lower the water content. The capacity of the evaporation of water will be reduced due to the decreasing temperature of the hot air flow and higher relative humidity so that the hot air becomes saturated and no longer able to evaporate the water.

Baking process with time varying causes evaporation of water is different. The higher the temperature, the baking heat received by the material will be larger and more so that the amount of water evaporated in the growing number of food and water content were measured to be low (Setiaji, 2010).

According to the Indonesian National Standard, the quality requirements for cookies maximum moisture content of 5%, cookies qualified Indonesian National Standard is baking cookies with temperature treatment 1600C (a2) and 1800C (a3).

Protein Content

Protein is a macronutrient food ingredients. Protein molecule contains special elements that are not contained in carbohydrates and fat is the element nitrogen. Protein is essential for the body, because these substances function as builder substances and regulators. Protein in the biological material is usually in the form of tenuous physical bonding and chemical bonding more

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closely with carbohydrates or fats (Sudarmadji et al, 1996).

Based on the calculation of variance analysis showed that the factors significantly affect the baking temperature response protein content cookies. While on the mulberry leaf extract additional factors and the interaction of baking temperature and the addition of mulberry leaf extract had no significant effect. Hasili Anava can be seen in Table 7.

Table 7. Effect of baking temperature and mulberry leaf extract concentration against% Protein content of Cookies yams

Baking Temperature	**Average Protein Content (%)**	**Taraf 5%**
a1	5.67	b
a2	5.32	b
a3	4.16	a

Description: each different letter indicate significant differences at the level of 5%.

Based on Table 7 that the baking temperature showed a real difference to the water content of sweet potato cookies. In the baking temperature treatment at a temperature of 1400 a1 treatment had higher levels of starch with an average value of 5.67%, while at a temperature of 1600C has an average value of 5:32%, at a temperature of 1800C has a water content is high at 4:16%.

Fat Content

Fat has a very high calorie content so that fat plays an important role in the body. The presence of fat can give the flavor delicacy on groceries. The content of fatty acids in the body is a precursor to the formation of certain hormones such as prostaglandins, as well as a constituent of membranes which is very important for various metabolic activities. Fat can dissolve a variety of vitamins, namely vitamins A, D, E and K, thus consuming foods that contain fat will guarantee the supply of these vitamins for the purposes of the body. Fat in the body has an important role, which can protect the vital organs, such as kidneys, liver and so on, not only as an insulator, but also physical damage that may occur at the time of the accident (Kemenkes, 2012).

The results of calculation of the fat content of variance analysis showed that the baking temperature (a) and mulberry leaf extract concentration (b) as well as the interaction with the baking temperature mulberry leaf extract concentration significantly affect sweet potato cookies. Results of analysis of variance to the response of the fat content can be seen in Table 8.

Table 8. Effect of baking temperature and concentration of mulberry leaf extract of the fat content of sweet potato Cookies

Baking Temperature (A)	**Mulberry Leaf Extract (B)**		
(A)	**b1 (0.5%)**	**b2 (0.75%)**	**b3 (1%)**
a1 (140^{0}C)	A 16.93 a	A 17.45 a	A 17.37 a
a2 (160^{0}C)	B 18.31 a	B 19.16 a	B 18.66 a
a3 (180^{0}C)	A 16.12 a	B 18.98 c	AB 17.72 b

Description: Each different letters indicate significant difference at 5% level test of Duncan (small letters read horizontally and vertically to read large letters)

In Table 8 can be seen in the interaction a2b3 ie baking temperature 1600C degan concentration of mulberry leaves 1% has a fat content of the highest with

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the average value of 19:16% while the interaction a3b1 ie baking temperature 1800C with the concentration of leaf extract mulberry 0.5% shows the results of votes most low with average values 16:12%.

In general, after the processing of foodstuffs, there will be damage to the fat contained in it. The fat breakdown level varies greatly depending on the temperature used and length of time the treatment process. The higher the temperature used, then the damage will be more intense fat. Essential fatty acids will isomerized when heated in an alkaline solution and sensitive to light, temperature, and oxygen. The process of fat oxidation can cause the inactivation of biological function and can even be toxic. In the baking process to the extreme, linoleic acid and possibly other fatty acids that are converted into hydroperoxide unstable by the activity of lipoxygenase enzyme. The change will affect the nutritional value of fats and vitamins (oxidation of fat-soluble vitamins) in the product (Muchtadi, 1989).

According to Ketaren (2008), damage due to heating oil or fat will occur at high temperatures, namely at a temperature of 200 ° C - 250 ° C. At a temperature of 200 ° C oil or fat will have reactions okisdasi primarily on oil or fat with a high degree of unsaturation which is characterized by the formation of peroxides. Generally, oxidative damage occurs in unsaturated fatty acids, ie fatty acids which have a double bond, but with high heating temperatures jenuhpun fatty acids can be oxidized. All essential fatty acids are easily damaged by the oxidation reaction and heating. At high temperatures, linoleic acid can be polymerized and formed a short-chain fatty acids. Fat or oil that has been damaged not only have negative effects for nutrition and health but also affect the texture and taste of the food is produced.

Fats and oils are triglycerides which is a mixture of esters of glycerol and long-chain fatty acids (Ketaren, 2008). According to research Herman (2004), the longer the heating, the higher content of saturated fatty acids and less saturated fatty acid content in the oil or fat. This is shown during the heating process margarine, which at the time had not been heated margarine content of saturated fatty acids in margarine amounted to 45.96%. At the time of margarine heated once (preheated) saturated fatty acid content of margarine be 46.09%, upon heating the excess with a longer time then the content of saturated fatty acids in margarine increased to 46.32% (Rahman, 2015)

Starch Content

Starch is composed of amylose and amylopectin, which is a water-soluble amylose, amylopectin whereas insoluble in water. The heating process causes the starch loss occurs in part resulting in a drop amylose starch. Amylose has a straight chain tends to form a parallel arrangement to each other and linked to each other through hydrogen bonds. This bonding can occur because the amylose molecule has many hydroxyl groups, where these groups are polar and polar nature of this cause amylose is hydrophilic (Winarno, 1997).

According to the table ANOVA effect of baking temperature (A), the addition of mulberry leaf extract (B) as well as the interaction of baking temperature with the addition of mulberry leaf extract the starch content of the cookies, were not significantly different, so it does not do a further test Dunca.

analysis Antokisdan

Antioxidants are electron donating compound or compounds capable of counteracting or mitigating impacts

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oxidants in the body. Antioxidants work by donating an electron to compounds that are oxidant so that the oxidant compound activity could be inhibited (Winarsi, 2007). Free radicals (free radical) is one of the compounds that have unpaired electrons (Winarsi, 2007). The presence of unpaired electrons cause the highly reactive compounds mate. These free radicals will snatch electrons from other molecules in the surrounding areas to stabilize themselves.

The method used to measure the antioxidant activity antiksidan sweet potato cookies with DPPH. The purpose of this method is to know the equivalent concentration parameter gives 50% effect of antioxidant activity (IC50). DPPH is a free radical that can react with compounds that can donate a hydrogen atom, can be useful for testing the antioxidant activity of certain components in an extract. Observation of the DPPH radical arrest can be made by observing the decrease in absorbance. This can happen because of the reduction of radicals by antioxidants (AH) or react with other radical compounds (Yu et al, 2002).

DPPH antioxidant activity test (1.1-diphenyl-2-picrylhydrazyl) measures the ability of antioxidant compound in capturing free radicals. This method is based on the reaction to the arrest of radical DPPH by antioxidant compounds through the mechanism of the donation of hydrogen atoms that will produce DPPH-H (a form of non-radical) and caused a decrease in the intensity of the purple color of the DPPH or it can be said also of the existence of antioxidants neutralize DPPH radical by donating electrons to DPPH, produces a color change from purple to yellow. Decoloration will be proportional to the number of electrons captured by DPPH so that it can be measured by visible spectrophotometry at a wavelength of 517nm.(Windono,2004).

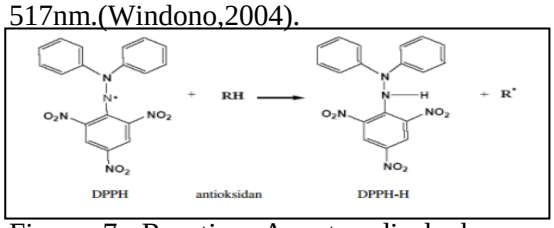

Figure 7. Reaction Arrest radicals by DPPH

The results of the analysis of antioxidants in selected products of sweet potato cookies can be seen in the following table

Table 10. Data antioxidant activity cookies before baking

Sampel	repetition readings	Value IC_{50} (ppm)	Average IC_{50} (ppm)
Cookies before Backing	1	3432.542	3437.5
	2	3442.458	

Table 11. Data antioxidant activity cookies after baking

Sampel	repetition readings	Value IC_{50} (ppm)	Average IC_{50} (ppm)
Cookies after baking	1	5913.386	5913.386
	2	5913.386	

Based on Table 10 and Table 11 it can be concluded that the antioxidant activity of sweet potato cookies have a weak intensity as IC50-value> 150 ug / ml. This is due to the addition of mulberry leaf extract concentration is very small at 0.5% so the level of antioxidants produced will be very small.

According to Aryanto (2006), the level of antioxidant power using DPPH test compounds can be classified according to the IC50 value. The smaller the IC50 value of the very high antioxidant activity

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Table 12. Method of DPPH Antioxidant Power Level

Intensity	Value IC_{50}
Very High	< 50 ppm
High	50 – 100 ppm
medium	101 – 150 ppm
Low	>150 ppm

(Aryanto, 2006)

Based on table 12, it can be concluded that the antioxidant activity in cookies sweet potato has a weak intensity as IC50-value> 150 ug / ml. But the value of antioxidant activity in cookies baked before is greater than the value of antioxidant activity in cookies after dipanggan. This suggests that the antioxidants vulnerable to the warming process. Increasing the heating temperature and heating times the antioxidant activity of the resulting lower. Other factors also affect the antioxidant activity is a process, wherein the antioxidant is easily terokisdasi and degraded by air and heat. Materials that have the potential antioxidant activity are processed with heat and exposed to direct air will damage the chemical constituents that affect antioxidant activity (Burda and oleszek, 2001)

The second factor that causes the intensity of the weak antioxidant activity in cookies sweet potato products is the use of mulberry leaf extract is very small at only 0.5%, so most likely the antioxidant compounds resulting smaller. The antioxidant activity in cookies sweet potatoes are not so good or activity is low, because the material is tested with DPPH are cookies or products, where the product or cookies sweet potato has other components such as butter, sugar, and other ingredients, DPPH not always detect compounds active in a material or product only. but because it is factor that caused the antioxidant activity of flavonoids is still in the form of extracts impure that flavonoid compounds contained in extracts may still bind to the cluster because the cluster glycoside glycosides that bind to the flavonoids can reduce the activity of antioxidants. According Fukumoto and mazza (2000) antioxidant activity will increase with the increase of hydroxyl and 110 will decrease in the presence of cluster glycosides.

Table 13. Data antioxidant activity of mulberry leaves

Sampel	repetition readings	Value IC_{50} (ppm)	Average IC_{50} (ppm)
Murbei leaf	1	907,89	908,72
	2	909,55	

Based on the above table that the intensity of the antioxidants in mulberry leaves is weak due to the IC50-value> 150 pg / ml at this is because the storage process on the leaves so that the analysis is performed not immediately after picking, this is likely to affect the content of chemicals present on mulberry leaves. Another factor due to the natural flavonoid compounds in general are very rarely found in the flavonoid aglycone form. According to Harborne (1987) that the flavonoids found in plants often occur as glycosides (flavonoid glycosides) and rarely found in a single form or aglycone flavonoid, therefore, to analyze flavonoids better to hydrolyze glycosides attached to the flavonoid before complexity, glycosides which may contained in the original extract.

The antioxidant activity obtained IC50 values are calculated by linear regression equation. IC50 value is inversely proportional to the ability of a compound of antioxidants contained in the test material. The smaller the IC50 value, the greater the ability of antioxidants. When the electrons into pairs by the presence of free radicals catcher, then measure the absorbance decreases stoichiometric according to the number of electrons captured. The

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existence of antioxidant compounds can change the color of the solution from purple to yellow DPPH absorbance changes as a result of this reaction has been used extensively to test the ability of some molecules as a catcher of free radicals.

Activity is measured by calculating the amount of the reduction of the intensity of the color purple DPPH. Damping is produced by reacting molecule Diphenyl Pikril Hidrazil with hydrogen atoms that are released one molecule of sample components to form compounds Diphenyl Pikril Hydrazine and cause decay color DPPH from purple to yellow, a decrease in the absorbance value of the DPPH were given a sample of the control means that the occurrence DPPH radical arrest by the sample, with the capture of the radical resulting diazo bond on DPPH is reduced so that the decrease in absorbance. Absorbance values of measurement data can be analyzed the effect of concentration of the sample with the percentage of inhibition where increased activity is proportional to the increased concentration

Conclusion And Suggestion

Conclusion

From research that has been done, it can be concluded as follows:

1. The temperature of the oven to give effect to the color, aroma, moisture content, fat content and protein content
2. The concentration of mulberry leaf extract significantly affect the characteristics of color, aroma, flavor and fat content
3. Interaction baking temperature and concentration of mulberry leaf extract significantly affect the color, flavor, and fat content
4. Selected samples are sample test results rank a2b1 (1,600 with the baking temperature mulberry leaf extract concentration of 0.5%) which has a value of water content 4:26%, 4.83% protein, 18:31% fat content, starch content of 30.73%

Suggestion

1. It is necessary to conduct further research on the baking temperature and time on making sweet potato cookies in order to obtain better results cookies again.
2. It is necessary to conduct further research on the product again sweet potato cookies in order to remove the bitter taste so the response organoleptic unacceptable to consumers.
3. Keep dilakakuan further research to determine the shelf life of the product sweet potato cookies.

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