**COMPARISON EFFECT OF WHEAT FLOUR WITH MOCAF AND ADDITION OF BLACK MULBERRY LEAVES (*Morus nigra*)**

**AS ANTIOXODANT TO PHYSICAL AND CHEMICAL CHARACTERISTICS OF WET NOODLES**

**ARTICLE**

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**COMPARISON EFFECT OF WHEAT FLOUR WITH MOCAF AND ADDITION OF BLACK MULBERRY LEAVES (*Morus nigra*)**

**AS ANTIOXODANT TO PHYSICAL AND CHEMICAL CHARACTERISTICS OF WET NOODLES**

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***ABSTRACT***

*A wet noodles is one of the foodstuffs considerable potential as a replacement source of carbohydrates. It’s raw material is wheat flour that imported. So that it is necessary to reduce wheat flour consumption in wet noodle production. Mocaf is flour from cassava to ferment. Mulberry leaf is a good source of antioxidants and can be used as a natural green coloring where utilization is still rarely used to make food products.*

 *The method used is a randomized block design (RAK) with two factors, the first factor which is the ratio of flour and mocaf (9: 1, 8: 2, 7: 3) and the second factor is the addition of slurry mulberry leaves (10%, 20%, 30%). The results showed that the comparison flour with mocaf influence the moisture content of wet noodles, the addition of mulberry leaves influences the organoleptic flavor and moisture content of wet noodles, the interaction comparison flour with mocaf and the addition of mulberry leaves influences the organoleptic colors and flavors, antioxidant activity, and tensile strength.*

*Key words : wet noodle, mocaf, mulberry leaves*

**INTRODUCTION**

A wet noodles is one of food considerable potential as a replacement source of carbohydrates. According to the survey the development of staple food consumption by Socio-Economic Survey (Susenas), wet noodle consumption in Indonesia in 2002 reached 0,3Kg per capita per year. According to ISO 01-2987 (1992), is a wet noodle food products made from flour with or without the addition of other foodstuffs and food additives are allowed, typical shaped noodles were drained.

According Juniawati (2003), noodle is a food product that is commonly consumed by most consumers both as breakfast or as a snack. According Irviani and Nisa (2014), in 2012 the import of wheat has exceeded 6.3 million tonnes. Efforts implementation of diversification that is not dependent upon the flour should be done, Therefore now been developed noodles with substitution of various types of flour other than wheat, for example by *mocaf* (Modified Cassava Flour), tapioca starch, and starch tubers others. Wet Noodle best quality based on physical examination and organoleptic, derived from a combination of 20% *Mocaf* and 80% wheat flour *(hard*wheat),while the wet noodles from flour yam and wheat *(hard wheat)* is best obtained from the 40% flour yam and 60% wheat flour *(hard wheat)* (Iva and Bella, 2013).

Mulberry plant parts are leaves, more known simply as feed silkworms. Mulberry leaf is rich in flavonoids reported that have biological activity, including in terms of antioxidant activity. Some studies suggest that fruit and mulberry leaf has many bioactive compounds, such as alkaloids, anthocyanins, and flavonoids. Mulberry leaves contain ecdisterone, inkosterone, lupeol, β-sitosterol, ritin, moracatein, isoquersetin, scopoletin, scopolin, α-heksenal, β-heksenal, cis-β heksenol, cis-β-heksenol, cis-t-heksenol, benzaldehyde, eugenol, linalool, benzyl alcohol, butilamin, trigonelin, choline, adenine, amino acids, vitamin A, vitamin B, vitamin C, carotene, fumaric acid, folic acid, acid formiltetrahidrofoli, mioinositol, metals, zinc and copper (Mursito, 2001) , Mulberry leaf so this needs to be done further diversification process, one of them by adding a mulberry leaf on a wet noodle.

The addition of mulberry leaves on wet noodles is expected to increase the nutritional value of antioxidants as well as provide attractive green color on wet noodles. Natural antioxidants in mulberry able to protect the body against damage caused by reactive oxygen species, preventing the growth of free radicals in the body and improve the body's cells are damaged, able to inhibit the degenerative disease and is able to inhibit lipid peroxide in food.

**Problem Identification**

Based on the background that has been described, can be identified problems in this study as follows:

1. Does the ratio of flour to mocaf effect on the characteristics of a wet noodle
2. Does the addition of mulberry leaves affects the characteristics of a wet noodle
3. Do interaction comparison flour with mocaf and the addition of mulberry leaves influential against the physical and chemical characteristics of the wet noodles

## **Purpose and Objective**

The purpose of this study was to learn how to make noodles drenched in substitution mocaf and determine the correlation between the concentration of the addition of mulberry leaves with a wet noodle characteristics with mocaf substitution. While the purpose of the research that will be done is to determine the ratio of flour to mocaf and the addition of mulberry leaves to the physical and chemical characteristics of the wet noodles.

**Benefits of Research**

This research is expected to provide information on the manufacture of wet noodles with substitution mocaf and the addition of mulberry leaves, inform the public that mocaf can be used as a substitution of wheat flour in the manufacture of wet noodles so as to minimize the use of flour, utilization of mulberry leaves as an antioxidant, improves the economic value of mulberry leaves, and provide a new alternative noodle product diversification so as to increase the nutritional value of antioxidants and provide a natural green color in noodles.

**Framework**

SNI 01-2987-1992 declared wet noodles is a food product made from wheat flour with or without the addition of other food ingredients and additives are allowed, typical shaped noodles are drained. While Widyaningsih and Murtini (2006) also called the wet noodles yellow noodles are experiencing different kinds of noodles with boiling water levels reached 52% so that the endurance or durability is quite short. At room temperature only last up to 10-12 hours. After the noodles will smell sour and slimy or stale (Widyaningsih and Murtini, 2006).

The main raw material is wheat noodles, which type of wheat flour is very important in the manufacture of a particular food. High protein wheat is about 12% -14% is ideal for making bread and noodles (Hasya, 2008). The main protein content of the wheat flour noodles are instrumental in making gluten. Gluten can be formed from gliadin (prolamin in wheat) and glutenin (Koswara, 2005).

Research on the substitution of wheat flour in the manufacture of wet noodles, has a lot to do. One of them is the addition of the addition mocaf. Wet noodles best quality is obtained from a combination of 20% *Mocaf* and 80% wheat flour *(hard*wheat),while the wet noodles from flour yam and wheat *(hard wheat)* is best obtained from the 40% flour yam and 60% wheat flour *(hard wheat)* ( Iva and Bella, 2013).

Variations in the percentage of purple sweet potato flour substitution effect significantly to increase the fiber content and antioxidant activity in wet noodles, but did not affect significantly to the increase of amylose content on a wet noodle. Wet noodles with flour substitution purple sweet potato has a higher antioxidant activity than the wet noodles made from 100% wheat flour. The highest antioxidant activity contained in the wet noodles with purple sweet potato flour substitution of 30% is 7.51%, the highest antioxidant activity derived from the content of beta-carotene. In addition, the antioxidant activity obtained vitamin E, vitamin C and selenium contained in the egg yolks. (Nintami, 2012).

The addition of spinach can improve the quality of wet noodles good chemical quality (protein) and organoleptic (color and flavor) (Sri et al, 2014). Assessment of the color of spinach noodles in the category of highly dislike value contained in spinach additional treatment with a percentage of 25% as much as 25%. For the category of value in the treatment really like there spinach addition of 12.5% percentage gain as much as 55% (Sri et al, 2014)

The addition of spinach in Sri study, et al (2014) above will increase the nutritional value of protein as well as provide attractive green color on wet noodles. In addition to spinach to give green color to the noodles, Mulberry leaf also has the same function as a natural green coloring, and can increase the nutritional value as a source of antioxidants and chlorophyll rich source of natural fiber. Mulberry leaves are extracted using water, resulting in the leaf pulp or juice.

Ethanolic from mulberry leaf extract is reported efficacious as anticancer, because it contains phytochemicals such as *quercetin* and *anthosi fetus* (Zafar *et al.,* 2013). *Quercetin* and anthocyanins are substances found in a variety of mulberry plants, which have potential as a chemopreventive agent. Aside from being a chemopreventive agent, *quercetin* also been reported to act as co-agent chemotherapy (Song *et*al.,2009).

Addition extract mulberry leaves at a concentration of 1%, 3%, 5% and 7% (w / w), impact and correlation against physical and chemical characteristics *of the edible film* tapioca which include water content, antioxidant activity, speed-soluble, tensile strength, and elongation (Faqih Radina, 2016).

Research on mulberry leaves wet noodle and is expected to be known to a comparison of wheat flour and mocaf and the proper concentration of mulberry leaves to get wet noodles that are characteristics preferred by the panelists.

**Research Hypothesis**

Based on this conceptual framework, it can be hypothesized that the alleged interaction with a comparison of wheat flour and the addition of mulberry leaves mocaf effect on the characteristics of wet noodles, there is a minimum of one treatment had no effect.

## **Time and Place of Research**

 Research was held in August 2016 until completion in Pharmaceutical Laboratories PT. Tanabe Indonesia in Hospital street No.104, Ujung Berung, Bandung. And in the laboratory of Food Technology Faculty of Engineering, University of Pasundan Bandung, Dr. Setiabudhi street No. 193.

# MATERIALS, EQUIPMENT AND METHODS

**Materials**

The materials used in the manufacture of wet noodles are the leaves of the black mulberry *(Morus nigra)* obtained from the lembang, *Mocaf* from CV. Karunia Maha Cipta as a substitute gift of wheat flour, wheat flour *(hard wheat)* cakra kembar bogasari brands of PT Indofood Sukses Makmur Tbk, eggs from healthy market Cileunyi, iodized salt from kapal brands and baking soda from koepoe-koepoe brands

The materials used for the chemical analysis of DPPH (using 2,2-*Dipenyl*-1-*picrylhydrazyl),* methanol, HNO3, H2SO4, K2SO4, HgO, H3BO3, NaOH-Na2S2O3, HCl 0.02 N, Luff Schrool, KI, Na2S2O3.

**Tools**

The tools used in the manufacture of wet noodles are *blenders,* digital scales, noodle making machine, thermometer, basins, spoons, pots, strainers, and *stopwatch.*The tools used for chemical analysis is a beaker, stir bar, *magnetic* stirrer, spatulas, bowls vaporizer, analytical balance, eksikator, oven, kjedhal, *hot* plate,flask, burette 50ml, flask 10 ml, flask 50 ml, *micropipette* pipettes measuring, cuvette, and UV-Vis spectrophotometer.

**RESEARCH METHODS**

**Preliminary Research**

The preliminary study is testing the key raw materials such as pulp mulberry leaves covering test antioxidant activity mulberry leaves DPPH, test chlorophyll, test tannins and cyanide on mulberry leaves, so the results of this study can be used as a benchmark and reference to the main research ,

**Primary Research**

Main research is a continuation of the preliminary study that aims to determine the effect of a comparison of wheat flour and *mocaf* and concentration slurry mulberry leaves. The main study consisted of the design of the treatment, experimental design, design analysis and design response.

**Treatment Plan**

Design treatment on primary research consists of two factors; ie comparison of flour and *mocaf* (A) with 3 levels namely; a1 = 9: 1; a2 = 8: 2; a3 = 7: 3 and the concentration of mulberry leaf pulp (B) with 3 levels namely; b1 = 10%; b2 = 20%; b3 = 30%

**Design of Experiments**

Design of experiments conducted in this study is a Randomized Design (RAK) with a 3x3 factorial design with three replications. An experimental model for the study were as follows: Yijk = μ + K + the + pj + (sp) ijk + ɛijk

**Draft Analysis**

Draft analysis is performed to determine whether or not a treatment effect on the response observed. The values obtained were then compiled in the table ANOVA or analysis of variations to the conclusion whether a treatment effect on the response or not.

# Draft Response

Draft response on primary research consisted of a chemical response (Moisture Content, Antioxidant activity DPPH), a physical response (Score noodles tensile strength /*tensile*strength) and the response organoleptic (color, aroma, and flavor).

**Description Trial**

Stages of making a wet noodle porridge with the addition of mulberry leaves were conducted in this study are as follows:

1. Mixing

mixing phase aims to get the dough evenly and form a homogeneous paste. How to manufacture begins with the mixing of flour, salt, baking soda and egg until evenly distributed. Mulberry leaf slurry is then added little by sediikit until the dough can be rolled.

1. Roll the dough

After the dough is homogeneous and dull then flattened dough to make thin sheets of wet noodles according to the size and use the mill pool steel plated stainless steel. Pasta dough thick end of approximately 1.2 - 2 mm. The purpose of pemipihan is to soften the fibers gluten and makes the dough sheet.

1. Cut the noodles

Dough has formed then a thin sheet from the mill and then cut to length with a cutter mill. Then cut crosswise with a certain length in order to obtain the typical shape of noodles.

1. Boiling

Results of the pieces then put in boiling water until noodles to float. At this stage also add coconut oil or cooking oil to taste with the aim of instant noodles do not stick to each other.

1. Draining

Afterthrough the boiling process, drained noodles and dindinginkan. The purpose of draining it is to be absorbed oil solidified and stuck to the noodles and also makes the texture of the noodles to be strong.

**RESULTS AND DISCUSSION**

**Preliminary Research**

Table 1. Results of Preliminary Research

|  |  |  |
| --- | --- | --- |
| **Parameters** | **Mulberry porridge** | **Mulberry Leaf Extract** |
| Cyanide Test (qualitative) | Negative | - |
| Tannin | 0.90% | - |
| chlorophyll | 5.8 ppm | - |
| Antioxidant activity, IC50  | 1469 ppm | 311 ppm |

The first study is research cyanide on raw materials qualitatively. From the experiment, the raw material giveresults *negative* cyanide. Cyanide is one of the most toxic venom and rapid reaction to the bodies of animals and humans. With a fairly small doses (0.5-2.5 mg.kg-1), cyanide can turn off almost all animal species within a few minutes after taking it. So necessary to test the cyanide on raw materials to make products that will be produced not to be toxic when consumed.

A second study that measured levels of tannin using titrimetric method (permanganometry). From the experimental results obtained tannin content of 0.90%. The very small levels for potential binding protein than calliandra leaf contains tannin of 11.3% and 13.9% Leucaena leucocephala. Tannin is a [compound](https://id.wikipedia.org/wiki/Senyawa) [polyphenols](https://id.wikipedia.org/wiki/Polifenol) derived from [plants,](https://id.wikipedia.org/wiki/Tumbuhan)taste bitter and chelates, which reacts with and agglomerate [protein,](https://id.wikipedia.org/wiki/Protein)or various other organic compounds including [amino acids](https://id.wikipedia.org/wiki/Asam_amino) and [alkaloids.](https://id.wikipedia.org/wiki/Alkaloid) Generally tannins spread almost in all parts of the plant such as on the bark, stems, leaves, and fruit (Sajaratud, 2013). Tannin research was conducted to determine the levels of tannin contained in the raw material, because the tannin can cause a bitter taste and affect the taste of the product.

The third study was conducted using a spectrophotometer measurement of chlorophyll content Wintermans method and De Mots (1965) in Suyitno (2008). Obtained from experiments in total chlorophyll content of 5.8 ppm. The green color of the leaves comes from chlorophyll content therein. Chlorophyll is one of the potential secondary metabolism. Green substance is not only important, in the process of photosynthesis in plants, but also very useful to support the health of those who consume one of them is efficiently delivers magnesium and helps the blood carry much needed oxygen to all the cells in the body's tissues.

The fourth study was conducted is a measurement of antioxidant activity. Data antioxidant activity of mulberry leaves porridge, IC50 gained an average of 1469 ppm to force weak antioxidant activity. Meanwhile, mulberry leaf extract antioxidant activity, IC50 gained an average of 311 ppm with the strength of moderate antioxidant activity. The big difference in ICvalues50 on mulberry leaf extract compared mush mush leaves are caused by the processing of the leaves, which is the process of adding water which causes the concentration becomes more diluted as well as their current mechanical process usingleaves destruction *a blender* thatcauses heat. Where the heat can cause the loss of value of antioxidant activity significantly. This is according to research Nintami (2012) which states that the loss of antioxidant activity that occurs during processing due to the high temperatures and the length of time of boiling and frying. The leaves are used on main product is the mulberry leaf porridge, because porridge leaves provide color and distinctive appearance on the main product.

**Primary Research**

**Water Content**

Based on the analysis of variance (ANOVA) showed that each factor compaision of wheat flour with mocaf and the addition of slurry mulberry leaves provide a very real effect (α = 0.05) to water content of a wet noodle but the interaction of both factors did not differ real (α = 0.05). The influence of each factor A and B to the water content of a wet noodle can be seen in Table 2 and Table 3

Table 2.Effect of wheat flour with mocaf comparison to water content of a wet noodle

|  |  |  |
| --- | --- | --- |
| **Treatment A****Flour Comparison : Mocaf** | **Wet Noodle Water content (%)** | **Error Term 5%** |
| a1 (9: 1) | 49.71 | a |
| a2 (8: 2) | 50.56 | b |
| a3 ( 7: 3) | 51.22 | c |

Description: the same letter in the column shows no significant difference in the level of 5%

Based on the results in table 2. the higher the addition mocaf, then the water level is also increased. These results caused by the content of starch contained in the material. Subagyo (2008) mocaf starch content in the range between 85 -87% of this level is greater than the starch content in wheat flour ranged between 65-70%. The number of hydroxyl groups in a large starch molecule causes the starch's ability to absorb water even bigger (Winarno, 2004). So the addition of mocaf can increase the water content in the product.

Table 3. The effect of the addition of slurry mulberry leaf to water content of a wet noodle

|  |  |  |
| --- | --- | --- |
| **Treatment B****The slurry concentration Mulberry Leaves** | **Wet Noodle Water Content (%)** | **Error Term 5%** |
| b1 (10%) | 47.85 | a |
| b2 (20%) | 51.08 | b |
| b3 (30%) | 52.56 | c |

Description: the same letter in the column shows no significant difference in the level of 5%

Based on the results in table 3. the higher the slurry addition of mulberry leaves, then the water level is also increased. This is due to the raw material slurry which has a fiber mulberry leaves. According Piliang and Djojosoebagio (1996) and Lisdiana (1997), the fiber has the ability to bind water (quickly in large quantities). Therefore, the more the addition of mulberry leaf pulp, the higher the fiber content (fiber), the more water is bound, and the higher the water content measured.

**Antioxidant Activity**

Based on the analysis of variance (ANOVA) showed that the ratio of wheat flour with mocaf and the addition of slurry mulberry leaves a very real effect (α = 0.05) on a wet noodle antioxidant activity and have a very real interaction as well. Comparison ffect of wheat flour with mocaf and addition of slurry mulberry leaves to the ICvalue50 can be seen in Table 4.

Table 4. Comparison ffect of wheat flour with mocaf and addition of slurry mulberry leaves to IC50 (ppm)

|  |  |
| --- | --- |
| **Comparison****Wheat Flour : Mocaf** | **Concentration Slurry Mulberry Leaves** |
| **b1 (10%)** | **b2 (20%)** | **b3 (30%)** |
| **a1 (9: 1)** | A | A | A |
| 35 612 | 8440 | 7089 |
| b | a | a |
| **a2 (8: 2)** | B | A | A |
| 51 862 | 12 378 | 8000 |
| b | a | a |
| **a3 (7: 3 )** | C | A | A |
| 63946 | 17110 | 11 484 |
| b | a | a |

Description: the same letter in the column shows no significant difference in the level of 5%, small letters read horizontal

large letters read vertically.

Based on the results, a decline in the value of the antioxidant activity of the raw material pulp products mulberry leaves. This antioxidant activity is reduced due to the processing of wet noodles. This is due to the destruction of antioxidants due to oxidation when exposed to air (O2)and the heating temperature is too high. Nintami research results (2012) states that the loss of antioxidant activity that occurs during processing due to the high temperatures and the length of time of boiling and frying. While the addition of flour mocaf affect the value of the antioxidant activity of the product. Extra mocaf where the higher the higher the ICvalues50 were obtained or in other words, the lower the value aktivtas antioxidant products. This is due, because mocaf not have owned a typical protein flour is gluten which can bind water. So that the antioxidant content of mulberry leaves porridge is not bound completely by the batter.

**Tensile Strength**

Based on the analysis of variance (ANOVA) showed that the ratio of wheat flour with mocaf and the addition of slurry mulberry leaves a very real effect (α = 0.05) to power breaking wet noodle and have a very real interaction as well. Comparison ffect of wheat flour with mocaf and addition of slurry mulberry leaves to tensile strength wet noodles can be seen in Table 5.

Table 5. Comparison ffect of wheat flour with mocaf and addition of slurry mulberry leaves to Tensile

 Strength (N / mm2)

|  |  |
| --- | --- |
| **Comparison****Wheat Flour : Mocaf** | **Concentration Slurry Mulberry Leaves** |
| **b1(10%)** | **b2 (20%)** | **b3 (30%)** |
| **a1 (9: 1)** | C | C | C |
| 1.14 | 1.00 | 0.88 |
| c | b | a |
| **a2 (8: 2)** | B | B | B |
| 0.58 | 0.55 | 0.42 |
| b | b | a |
| **a3 (7: 3)** | A | A | A |
| 0.31 | 0.22 | 0.15 |
| c | b | a |

Description: the same letter in the column shows no significant difference in the level of 5%, small letters read horizontal

large letters read vertically.

Tensile strengthassociated with protein content, where a high protein value higher tensile power. This is due to the higher levels of protein means the longer the peptide bond, so it takes more energy to breaking the peptide bond (Horseney, 1994 in Umri, 2016). So the higher the number of substitutions in the manufacture of wet noodles mocaf will lower the value of the tensile strength at a noodle product produced anyway. Mocaf flour protein content in wheat flour is lower than it was supported in the study (Umri, 2016). Where the amount of the higher mocaf substitution will reduce the amount of protein, causing a wet noodle products easily broken because the gluten content decreased (Umri, 2016). In a typical protein wheat flour are not available to others, namely their gluten flour. The results of the analysis of tensile strength of noodles decreases with increasing concentration mocaf flour and slurry mulberry leaves

**Organoleptic**

**Color Attribute**

Based on the analysis of variance (ANOVA) showed that the ratio of wheat flour with mocaf and the addition of slurry mulberry leaves a very significant effect (α = 0.05) to the average value of the color of the resulting wet noodle. The average value is highest color with a wet noodle treatment a1b2 (comparison wheat flour with mocaf 9: 1, the addition of mulberry leaves slurry 20%) that is 4.08 while the average value is lowest that wet noodle with treatment a3b3 (comparison wheat flour with mocaf 7 : 3, the addition of mulberry leaves slurry 30%) is 3.03. Comparison ffect of wheat flour with mocaf and addition of slurry mulberry leaves to a wet noodle color can be seen in Table 6.

Table 6. Comparison ffect of wheat flour with mocaf and addition of slurry mulberry leaves to color a wet

 noodle

|  |  |
| --- | --- |
| **Comparison****Wheat Flour : Mocaf** | **Concentration Slurry Mulberry Leaves** |
| **b1(10 %)** | **b2 (20%)** | **b3 (30%)** |
| **a1 (9: 1)** | A | B | A |
| 3,46 | 4,08 | 3,11 |
| b | c | a |
| **a2 (8: 2)** | A | B | A |
| 3.42 | 4.04 | 3, 22 |
| a | b | a |
| **a3 (7: 3)** | A | A | A |
| 3.46 | 3.38 | 3.03 |
| b | b | a |

Description: the same letter in the column shows no significant difference in the level of 5%, small letters read horizontal

large letters read vertically.

The color in a food becomes an important parameter in the organoleptic assessment. A food is considered nutritious, tasty, and very good texture will not be eaten if they have an unsightly color (Winarno, 2004). A decline in the average value of the colors in each treatment allegedly because more substitutions and additions mocaf pulp mulberry leaves affect the resulting color of the wet noodles. The resulting wet noodle color becomes brownish green so that the lower level of the panelists A wet noodle color produced. Brownish-green color on a wet noodle slurry concentration due to the addition of mulberry leaves and the ripening process in noodle causing noodle color becomes concentrated.

**Flavor Attribute**

Based on the analysis of variance (ANOVA) showed that the ratio of flour and porridge mocaf and the addition of mulberry leaves a very significant effect (α = 0.05) against a mean value of the resulting wet noodle flavor. The average value is highest sense with a wet noodle treatment a1b2 (comparison wheat flour with mocaf 9: 1, the addition of mulberry leaves slurry 20%) that is 3.46 while the average value is lowest that with a wet noodle treatment a2b3 (comparison wheat flour with mocaf 8 : 2, the addition of mulberry leaves slurry 30%) is 2.46. Comparision ffect of wheat flour with mocaf and addition of slurry mulberry leaves to flavor attribute wet noodles can be seen in Table 7.

Table 7. Comparision ffect of wheat flour with mocaf and addition of slurry mulberry leaves to Flavor

 a wet noodle

|  |  |
| --- | --- |
| **Comparison****Wheat Flour : Mocaf** | **Concentration Slurry Mulberry Leaves** |
| **b1(10 %)** | **b2 (20%)** | **b3 (30%)** |
| **a1 (9: 1)** | B | C | A |
| 3.15 | 3.46 | 2.56 |
| b | c | a |
| **a2 (8: 2)** | B | B | A |
| 3.19 | 3.22 | 2, 46 |
| b | b | a |
| **a3 (7: 3)** | A | A | A |
| 2,81 | 2,85 | 2,49 |
| b | b | a |

Description: the same letter in the column shows no significant difference in the level of 5%, small letters read horizontal

large letters read vertically.

The flavor is one of the factors that affect a person's acceptance of foods. Acceptance panelists to taste is influenced by several factors, including the chemical, temperature, concentration, and other flavor components interaction (Winarno, 2004). From the table above it can be seen that the higher the number of substitutions and additions mocaf pulp mulberry leaves the taste of wet noodles is not preferred by the panelists.

**Aroma Attribute**

Based on the analysis of variance (ANOVA), showed that only additional factors slurry mulberry leaves are significant (α = 0.05) to the mean value of the resulting aroma of wet noodles. While the addition of mocaf noodles factors had no significant effect (α = 0.05) to the mean value of the resulting aroma of wet noodles. The average value is highest aroma with a wet noodle treatment a2b1 (comparison wheat flour with mocaf 8: 2, the addition of mulberry leaves slurry 10%) that is 3.46 while the average value is lowest that with a wet noodle treatment a3b3 treatment (comparison wheat flour with mocaf 7: 3, the addition of mulberry leaves slurry 30%) is 2.49. The effect of the addition of slurry mulberry leaves on the aroma of wet noodles can be seen in Table 8.

Table 8. Effect of the addition of slurry mulberry leaves on the aroma of wet noodles

|  |  |  |
| --- | --- | --- |
| **Treatment B****Concentration slurry Mulberry Leaves** | **Wet Noodle Aroma Value** | **Error Term 5%** |
| b1 | 3.42 | c |
| b2 | 3.15 | b |
| b3 | 2.53 | a |

Description: the same letter in the column shows no significant difference in the level of 5%

Aroma is one of a wet noodle organoleptic very important to know. Treatment of increasing concentration slurry mulberry leaves significant effect, this is due to the distinctive aroma given by the slurry mulberry leaves. This has caused an increase in slurry mulberry leaves, the more different scent each treatment inflicted on a wet noodle. While the treatment is the addition mocaf no significant effect on the scent of a wet noodle, it is suspected because of the addition mocaf, water, salt and other materials do not pose a different fragrance in each treatment, so it tends to produce aroma noodles uniform and panelists regard the aroma of noodles from a variety of additional treatment mocaf on wet noodles are the same.

**Selected Products Research**

Selected product research was conducted to determine the change during the process of making noodles, especially in terms of chemical nature. By comparing the results obtained with the results of the preliminary study and SNI on a wet noodle in force. Selected product inspection includes examination of the levels of tannin, chlorophyll content, carbohydrate content, protein content, fat content and crude fiber content. Selected product selection by scoring test results of primary research results. Thus obtained treatment a1b2 (comparison wheat flour with mocaf 9: 1, the addition of mulberry leaves slurry 20%) as the selected products with ICvalues50 obtained on average 8440 ppm. Selected product research results can be seen in Table 9.

Table 9. Comparison of the results of the selected products with comparative test results

|  |  |
| --- | --- |
| **Parameter Test** | **Test Result** |
| **Raw Material****(Slurry Mulberry Leaves)** | **SNI****Wet Noodles** | **Selected Product****(treatment a1b2)** |
| Tannin Content | 0,90 % | - | 0,38% |
| Total chlorophyll | 5,80 ppm | - | 4,58 ppm |
| Water Content | - | 20 – 35% | 50,18% |
| Antioxidant activity, IC50 value (ppm) | 1469 ppm | - | 8440 ppm |
| Protein Content | - | Min 3% | 5,09 % |
| Carbohydrates Content | - | - | 35,11 % |
| Fat Content | - | - | 5,98 % |
| Crude fiber Content | - | - | 1,55 % |

Tannin content of a wet noodle products in research has decreased. Decreased levels of tannin can be seen in Table 9. Declining levels of tannin due to the processing of the product so that the degradation of tannins. One is the process of heating during the *glazing.*This is in line with the opinions Merck (1920) *in* Makfoeld (1992) where the tannin will decompose due to high heat. Tannins hydrolyzed into a compound of amorphous, hygroscopic, yellow brown soluble in water (especially hot water) to form a colloidal solution instead of the actual solution. According Makfoeld (1992) one of the properties of tannins are water soluble. Based on product processing treatment, *glazing* is one of the factors causing reduced levels of tannin in which the product of this process is boiled in hot water. So tannin hydrolysis into an amorphous compound.

The results of measurements of chlorophyll content based on table 9 decline of chlorophyll content in the raw materials. This decrease is due to degradation of chlorophyll in products due to processing. One of the important chemical properties of chlorophyll which is of extreme instability, such as sensitivity to light, heat, oxygen, and the chemical degradation reactions that include feofitinasi, klorofilid forming reaction and the oxidation reaction (Gross, 1991). Meanwhile, according to Fennema (1996) when the heating, chlorophyll undergo isomerization. As a result of the isomerization will lead to the presence of Mg to be easily replaced by two H atoms which will form pheophytin brown. This reaction is irreversible in a liquid solution.

The quality requirements specified moisture content SNI for wet noodle product is 20-35%, so it can be said that the water content of a wet noodle products of this research are too high and do not meet the standards. Department of Food Science and Technology, Bogor Agricultural University (2005) mentions that the wet noodles cooked moisture content of about 64-65%. Corn wet noodles were overcooked Kurniawati of research results (2006) also contains a fairly high water content, namely 63.71%. Based on the results of previous studies, it can be said that the water content of wet noodles in this study were within bounds of normal / reasonable.

Based on data in Table 9, a decrease in the value IC50 increase compared to the raw materials that mark the antioxidant activity decreases. This is due to the antioxidant activity is reduced because of the processing of wet noodles. This is due to the destruction of antioxidants due to oxidation when exposed to air (O2) and the heating temperature is too high. Nintami research results (2012) states that the loss of antioxidant activity that occurs during processing due to the high temperatures and the length of time of boiling and frying.

The protein content in the wet noodle products were obtained 5.09%. The quality requirements specified protein content SNI for wet noodle products is at least 3%, so it can be said that the protein content of wet noodles in this study have met the standards. The higher the number the lower the mocaf substitution levels of protein in a wet noodle products. The protein content of wheat flour 11% (Astawan, 2006), while the protein content mocaf 1.949% (Hersoelistyorini, 2015). In this study showed that the protein content of 10% substitution mocaf still meet the quality standards of wet noodles. This is consistent with research Iva and Bella (2013), where his research shows the best results mocaf to 20% substitution of known protein content of 10.37% and still meet the ISO standard.

The results of the analysis of carbohydrate content of wet noodle products obtained 35.11%. SNI does not require carbohydrate levels to a certain extent for a wet noodle products. The carbohydrate content in more product derived from wheat flour is used. This is consistent with the statement of Benjamin (2009) in Hidayati (2013) that adding more flour will produce the carbohydrate content of the noodles is increasing.

The results of the analysis of the fat content of wet noodle products obtained 6.24%. SNI requires no fat levels to a certain extent for a wet noodle products. The fat content in more products derived from oil are added when boiling and *glazing*process.

Crude fiber content of wet noodle products selected key products 1.55%. SNI does not require fiber content to a certain extent for a wet noodle products. Crude fiber content wet noodles in this study can be said to be not high enough to meet the average needs of food fiber adults 21-27 grams per day (Lisdiana, 1997), because the fibers are measured in this study are coarse fibers (crude fiber) and not dietary fiber (dietary fiber). According Tensiska (2008), crude fiber is the hydrolysis of a residual component of foodstuffs by acids and strong bases, causing loss of about 50% cellulose and hemicellulose 85%. Meanwhile, dietary fiber is a fiber which still contains the missing components, so that the value of dietary fiber is always higher than the value of crude fiber.

Measurement of the content of macromolecules such as lipids, carbohydrates and proteins are meant to find out information on the nutritional value per serving of wet noodle products, so that information such as the number of calories and the nutritional adequacy rate can be displayed on the nutritional label products. Information Nutritional Value Products can be seen in Table 10.

Table 10. Wet Noodle nutrition facts

|  |
| --- |
| **NUTRITION FACTS** |
| Serving size 1 cup (100 g)Serving per container about 1 |
| Amount per ServingTotal Calories 214,62 Kkal | Calories from fat 53,82 Kkal |
|  |  % Daily Value\* |
| **Total Fat 5,98 g** |  2,891 % |
| **Protein 5,09 g** |  1,018 % |
| **Carbohydrtae 35,11 g** |  7,022 % |
| \*Percent Daily Values are based on a 2000 calorie diet |

**CONCLUSIONS AND RECOMMENDATIONS**

**Conclusion**

Based on the results of the research that has been done it can be concluded that:

1. Comparison of wheat flour with mocaf affect the water content of a wet noodle.
2. The addition of mulberry leaves affects the water content of a wet noodle and organoleptic aromas of wet noodles.
3. The interaction between the ratio of wheat flour with mocaf and the addition of mulberry leaves affect the antioxidant activity, tensile strength , organoleptic color and taste of wet noodles.
4. Selected product are a1b2 treatment by comparison wheat flour with mocaf (9: 1) and the addition of slurry mulberry leaves 20% with value of IC50 8440 ppm, tannin content 0.38%, a total chlorophyll 4.58 ppm, protein content 5.09% , carbohydrate content 35.11%, Fat content 5.98% fat and crude fiber content 1.55%.

**Recommendations**

Based on the evaluation of the research that has been done, the advice can be given:

1. Keep trying mulberry leaf extract manufacture a variety of ways of extraction to obtain potent antioxidant activity.
2. Need to try a variety of treatments in the manufacture of wet noodles which can reduce the loss of antioxidant activity during the process.
3. Need to do more research regarding the shelf life of wet noodles substitution mocaf with the addition of slurry mulberry leaves

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