THE FORMULATION OF SAGO NOODLE WITH MODIFIED CASSAVA FLOUR (MOCAL) COMBINATION

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Abstract

Formulation development of sago noodle is needed to improve its sensory quality especially odor and elasticity. The formulation of sago noodle with modified cassava flow (MOCAL) combination had been studied in this research. The purpose of this research was to find the best formulation of sago starch and MOCAL to make noodle. It was held in Crop Processing and Analysis Laboratory at Agriculture Faculty and Food Chemistry Laboratory at Fishery Faculty, from April to June 2009. The research was done by using completely randomized design (CRD/RAL) by 5 (five) treatments 3 (three) replications. The treatments were: SMO (100% sago starch), SMI (90% sago starch, 10% MOCAL), SM2 (80% sago starch, 20% MOCAL), SM3 (70% sago starch, 30% MOCAL), and SM4 (60% sago starch, 40% MOCAL). The parameters observed were moisture content, ash, and protein content of noodle. Sensory evaluation (odor, color, taste, elasticity and overall acceptance) of noodle was analyzed by Friedman test. The results shows that all treatments give not significantly different effect $(P>0,05)$ for moisture and ash content. The protein content of SMO was not significantly different $(P>0,05)$ with SMI treatment and significantly different'$(P<0,05)$ with SM2, SM3 and SM4 treatments. Based on hedonic scale of sensory evaluation can be concluded that the average level of panelists preferences for all parameters^j of noodle were from neutral to like it. The SM4 (60% sago starch, 40% MOCAL) was the best formulation in this research (moisture content 61,525%, ash 0,195% and protein content 3,497%).

Keywords

sago starch, modified cassava flour, sago noodle

INTRODUCTION

Sago (*METROXYLON SP.*) Is a palm plant producing starch (carbohydrate source) and ranks fourth after -cassava, maize, and Sweet potato. Sago plants spread in ¡eastern Indonesia, especially Maluku, Papua, Sulawesi • and parts ofwestem part of Indonesia especially Riau [2]. Sago (sago starch) is used as the main food for the people ■■ in Eastern Indonesia (K.T1). Consumption of sago as a ^ staple food among others in the form of traditional foods 'such as *PAPEDA, KAPURUNG,* baked sago and others. ¡Consumption of sago in Riau in the form of grain sago, Trendang sago, laksa sago, *BANGKIT* cookies, etc. But there is trend toward decreased consumption of sago in sago- producing areas such as in Papua, where more people switch the sago consumption to rice. There is the assumption that as a staple food, sago is in lower position than rice or other foodstuffs, especially flour. TTiis is a challenge for the development of sago in Indonesia.

In connection with this condition, sago processed products should be developed to meet the consumer desire. Sago noodle is one of the processed products from sago. Noodle is one type of processed food that is very popular for the people of Indonesia. The way of consumption of noodle is very flexible and does not give the impression inferior.

Noodle from local materials such as sago needs to be developed. Utilization of sago as the raw of sago noodle is expected to reduce wheat flour which still needs to be imported. Sago noodle also do not contain gluten, so suitable for people with autism who usually sensitive to the content of gluten (protein in wheat). Besides that, sago starch containing resistant starch are beneficial for intestinal health, and also contain low glycemic index so good for diabetics and those who are on a diet [7J.

Sago noodle often still have a distinctive odor that is less desirable and have a smooth taste in the mouth which is different with wheat flour noodle. These things are weakness, especially in terms of sensory quality (odor, color, flavor and elasticity) and need the formula developments to produce good-quality noddle and increase consumer acceptance of noodle made from sago starch.

One effort to modify the formula of sago noodle is by substituting Modified Cassava Flour (MOCAL) in the production of sago noodle. MOCAL is the product of the cassava flour processed by using the principle of modifying the cells in the fermentation of cassava so the result is different from cassava flour and *GAPLEK* flour. MOCAL has been produced in the province of East Java [9]. Microbes that grow cause changes characteristic of the resulting flour, a rise of viscosity, gelation ability, power and ease of rehydration dissolves. Microbes also produce organic acids especially lactic acid which will absorbed in the material which is processed to produce aroma and distinctive taste that can cover the smell and taste of cassava that consumers tend to be unpleasant **[12]-**

MOCAL can be used as a food ingredient with a very broad use. The previous studies showed that MOCAL can be used as raw materials from a variety of foods, ranging from noodle, bakery, cookies to semi- moist food.. Brownish cake, steamed cake and sponge

cake can be made with materials made from the flour mixture MOCAL as up to 80%.

Based on these conditions, the research entitled "The Formulation of Sago Noodle with *MODIFIED CASSAVA FLOUR* - (MOCAL) Combination" has been done. The purpose of,this research was to determine the effect the use of *MODIFIED CASSAVA FLOUR* (MOCAL) in the production of sago-MOCAL noodle on some nutritional value and sensory evaluation. It is also to find the best formulation of sago starch and MOCAL to produce sago-MOCAL noodle.

16.875 16.875 16.875   16.875   16.|

MATERIAL AND METHOD
Time and Place
This research has been conducted at the Agricultural Product Processing Laboratory, while the testing of nutritive quality conducted at the Analyze Laboratory Faculty of Agricultural and Food Chemistry Laboratory of the Faculty of Fisheries and Marine Science University of Riaiu The study lasted from April until June 2009.

Materials
The materials used in this research were sago starch ("Altai" brand), MOCAL, water, eggs, chitosan, oil, water, ash and chemicals for analysis. The tools-used in this study include steamer, boiled pan, noodle maker, scales, stove, glass tools, aluminum foil, plastic polypropylene, sealer and stationery.

Research Methods
Research carried out by using the Completely Random Design (CRD/RAL) with 5 (five) treatments and 3 (three) times repetition. The treatments in this research were:

SMO = sago starch 100%, MOCAL 0%, SMI = sago starch 90%, MOCAL 10%, SM2 = sago starch 80%, MOCAL 20%, SM3 « sago starch 70%, MOCAL 30%, and

SM4 = sago starch 60%, MOCAL 40%.

Parameters measured in this research were moisture content, ash content, protein content [11], whereas sensory evaluation consists of color, odor, taste, elasticity and overall acceptance of noodle with hedonic scale 1-5 (extremely liked-extremely rejected) [4], Mean data of all parameters evaluated were subjected to an analysis of variance (ANOVA). If the F calculated is greater than or equal to the F table, analyze followed by DNMRT.

Research implementation
The materials for the manufacture of noodle prepared in accordance with the composition and treatment as shown in Table 1. Chemical content of raw material sago-MOCAL noodle can be seen in Table 2.

Water	18.750	18.750	18.750	18.750	18|S
Egg Chitosan	0.93	0.93		0.937	
Water Ash	7	7	0.937		
Salt	0.62	0.62	0.625		
Total	5	5	0.625 0.313	0.313	0.313
			0.313 0.315		
	100.00	100.00	100.00	100.00	100.9

Table 1. Standard formulation of sago-MOCAL noodle

Composttion (g)	Treatments				
	SMO	SMI	SM2	SM3	SM
Sago starch	62.500	56.250	50.000	43.750	37.
MOCAL	0.000	6.250	12.500	18.750	25.
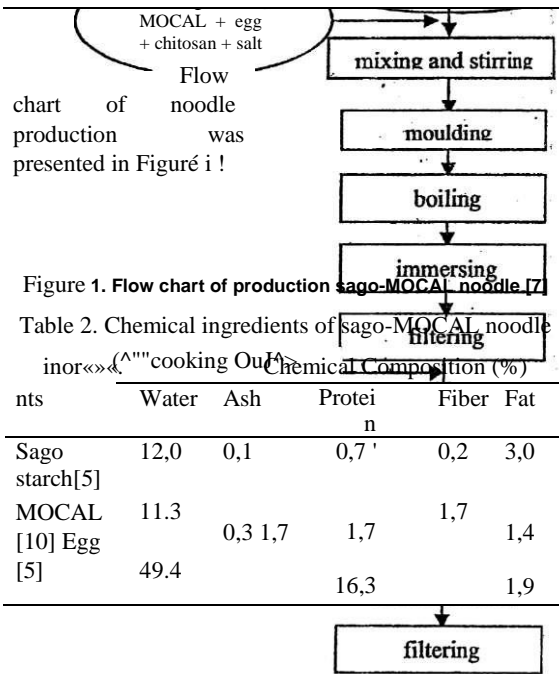
Figure **1. Flow chart of production sago-MOCAL noodle [7]**

Table 2. Chemical ingredients of sago-MOCAL noodle

inor«»«(^""cooking Ou nts	Water	Ash	Chemical Composition (%)		
			Protein	Fiber	Fat
Sago starch[5]	12,0	0,1	0,7 '	0,2	3,0
MOCAL [10] Egg [5]	11.3	0,3 1,7	1,7	1,7	1,4
	49.4		16,3		1,9

RESULTS AND DISCUSSION

The average content of moisture, ash, and protein of sago-MOCAL noodle after further tested with standard test DNMRT were presented in Table 3.

Table 3. Chemical content of sago-MOCAL noodle

Treatment	Chemical Content (%)		
	Moisture	Ash	Protein
SMO	67.62 ±2.29"	0.16 ±0.02'	2.24 ±0.14"
SMI	66.54 ± 1.19°	0.14 ± 0.02'	2.36 ± 0.07[b]
SM2	63.03 ± 3.37[a]	0.17 ±0.04'	3.00 ±0.17°
SM3	63.91 ±3.28'	0.19 ±0.07'	3.40 ±0.41'
SM4	61.53 ±4.88"	0.20 ± 0.04"	3.50 ± 0.45'

Numbers followed with different letters in the same column are significantly different at $P<0.05$

Moisture Content

Moisture content is the amount of water contained in the material expressed in percent. This parameter is one of the most important characteristics of food, because the water can affect the appearance, texture, and flavor to food. Water content in foodstuffs and in determining the freshness of food resources are durable, high moisture content which easily lead to bacteria, mold, and yeast to multiply, so it can decreasing the quality of food.

Table 3 shows that the moisture content of sago-MOCAL noodle was between 61.53% to 67.62%. The not significantly different of moisture content was due to all treatments using the same raw materials. Different composition of sago starch and MOCAL in each treatment did not provide the significant effect on moisture content of sago-MOCAL noodle. This was because the moisture content of sago starch and MOCAL has almost the same value (Table 2).

Moisture content of sago-MOCAL noodle in this study ranged from 61.53%-67.62% which was very high. This was more than the quality standard of wet noodle (SNI 01-2987-1992) i.e. 20-35%. Moisture content of wet noodle can reach 52% [1], This was because the boiling stage so that its shelf life relatively short (40 hours at room temperature).

Ash Content

Measurement of ash content aims to know the size of the mineral content contained in the noodle. The ash is -anorganic remains as a result of combustion of organic materials [11]. Determination of ash content was closely related to the mineral content contained in a material, the purity and cleanliness of the resulting materials.

Ash content of sago-MOCAL noodle obtained in this ; study ranged from 0.14%-0.20%. Assessment of ash content of sago-MOCAL hoodie showed not significantly effect (Table 3), although the levels of ash content of sago starch and MOCAL were used differently. Ash content of sago starch and MOCAL were 0.1% and 0.3%, respectively. This was because at the time of combustion there were some missing minerals. Ash content of each material produced was not always equivalent to the basic materials used because there were some minerals lost during combustion.

Ash content of sago noodle MOCAL shows the number of mineral substances contained. An ash content of mineral components that do not evaporate during combustion of organic compounds. Ash in a food product will also determine the quality of a product. The results showed that the ash content in this research met the quality standards of wet noodle (SNI 01-2987-1992) which maximum of 3% [8].

Protein Content

The data in Table 3 also shows that SMO treatment was not significantly different with SMI, but significantly different with SM2, SM3 and SM4. The increased usage of MOCAL in noodle, so that the protein content in sago-MOCAL noodle also increased. MOCAL has a protein content higher than the sago starch whereas 1.7% and 0.7%, respectively [10].

High levels of protein content of MOCAL because MOCAL was a flour product that was processed using the principle of modifying cassava cells in fermentation, where lactic acid bacteria mikrobia (BAL) dominates over flour MOCAL fermentation. Microbes that grow will produce enzymes that will increase the protein content of flour (MOCAL). This was in line with the opinion which stated that fermentation is microbial metabolism application to convert raw materials into products was higher, such as organic acids, single cell protein, antibiotics and biopolymer [6]. Fermentation process with the appropriate technology can produce the protein.

The results of protein content in this research ranging from 2.24%-3.50%. Protein content of SMO and SMI had not reached the quality standard of Wet noodle, but SM2, SM3, and SM4 treatments had reached the wet noodle quality standards (SNI 01-2987-1992) which was 3% minimum [8],

Sensory Evaluation

Result of sensory evaluation sago-MOCAL noodle was presented in Table 4.

Color

Color is the first parameter that determines the level , of consumer acceptance of a product. Subjective assessment by the vision is still very decisive in the sensory evaluation of colors.

Table 4 showed that die panelist assessment of the color of the sago-MOCAL noodle average ranges between 2.32-2.76 (like). Data showed that the different composition of MOCAL to produce sago-MOCAL noodle did not give the significant affect the level of panelists preferred the color of noodle. This was because the color of all noodle were yellow that same with the noodle from wheat flour. Yellow color in noodle came from the egg yolk used in the process of mixing and making dough.

Table 4. Sensory evaluation of sago-MOCAL noodle

Treatment	Color	Odor	Taste	Elasticity	Overall
SMO	2.32°	2.72*	2.88^a	2.68"	2.56"
SM1	2.06	2.80	2.81	3.56^{abcd}	3.20^1
SM2	2.4 8^a	2.80"	3.12*°	2.80^{abc}	2.68"
SM3	2.68^a	2.72"	3.40^	2.88^{ab}	2.96"
SM4	2.56^1	3.00"	3.08^{ab}	2.88^{ab}	2.88^1

Numbers followed with different letters in the same column are significantly different at P<0.05

Odor

Odor also plays a role as a one important factor for consumers in choosing preferred food products. Many cases of food palatability were determined by odor of the food [13].

Data in Table 4 showed that result of odor evaluation were between 2.72-3.00 (neutral to like). This means that odor of sago-MOCAL noodle was nearing the odor of noodle in general. It was also known that .usage of MOCAL to produce sago-MOCAL noodle does not significantly affected the level of panelists preferred the odor of noodle.

Taste

The results of sensory evaluation of the taste of sago-MOCAL noodle gave significantly different on its taste. Data (Table 4) conducted on the taste of noodle was showed that the average ranges between 2.88-3.52 (neutral to like). It showed the significantly different on taste of noodle, which taste of SMO treatment did not significantly different with SM2 and SM4 treatments but significantly different by SMI and SM3.

MOCAL was fermented flour so it will produce a unique taste which an unusual taste in the noodle. This mean that MOCAL during fermentation will produce aroma and distinctive taste.

Elasticity

The results of sensory evaluation of sago-MOCAL noodle elasticity gave significantly different effect. Data in Table 4 showed that the average ranges between 2.68-3.56 (neutral to like). Elasticity of SMO treatment did not significantly different with SM2, SM3, and SM4, but significantly different with SMI. This was caused by the treatment of SMI (90% sago starch, MOCAL 10%), the texture of the noodle produced less well so panelists does not really like it.

Elasticity of sago noodle was influenced by amylopectio content which contained in the sago starch, amylopectin fraction determine the elastic properties so became the good adhesive for the other components in the mixture which has homogeneous [7],

Overall acceptance

The results of sensory evaluation of the overall assessment of MOCAL sago noodle with hedonic scale did not give the significant effect on the overall, acceptance evaluation of sago-MOCAL noodle.

Sensory evaluation data performed on the value of the overall acceptance of sago-MOCAL noodle showed.; that the average 2.56-3.20 (neutral to like). Data in Table i 4 also showed that no significantly different on the' overall evaluation of sago-MOCAL noodle. This was, because the MOCAL formulation in sago-MOCAL noodle was still small In number (maximum 40%) so that no significant effect on overall acceptance of the product

CONCLUSION

Based on the results of this research; the summarized as follows:

• Combination of MOCAL to produce sago-MOCAL noodle does not affect the moisture content and ash content. Combination was also not affected the sensory evaluation with hedonic scale of odor, taste and overall acceptance. However, the different composition of MOCAL effect on protein content and the sensory evaluation of taste and elasticity of the product.

• The best treatment of sago-MOCAL noodle produced in this research was SM4 (60% sago starch, MOCAL 40%) treatment with 61.525% moisture content, ash content of 0.195% and 3.497% protein content whereas the overall assessment was 2.88 (like).

• Sago-MOCAL noodle which produced in this research generally still met the quality standards of wet noodle (SNI 01-2987-1992), except the moisture content which was very high.

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