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Community Empowerment as Initiator of Micro, Small, and Medium Enterprises (MSMEs) in Food Processing Through Training in Producing Modified Cassava Flour (*Mocaf*) from Cassava Roots

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ABSTRACT
Diversification of processed cassava into mocaf flour has the potential to be developed into products with high economic value. Mocaf flour made through a fermentation process has low HCN content and better organoleptic properties compared to cassava flour. Cassava roots are abundantly available and are the main commodities in Gunungpati, Semarang. On the other hand, the level of community welfare in this area is still low, hence efforts are needed to improve the economy through community empowerment activities. Efforts that can be made are to provide training and assistance in processing the local resources into products that have economic value. The training carried out was processing cassava into mocaf flour with participants from the PKK (Family Welfare Program) group in Ngijo, Gunungpati, Semarang. This training can improve the skills of the participants so that they can initiate the production of mocaf on a micro-enterprise scale. The series of activities that were done during this service program included the research steps and analysis of mocaf characteristics, followed by training in making mocaf flour for the community group and assisting in the initiation of MSMEs that produce mocaf flour.

Keywords — mocaf, cassava, fermentation

1. Introduction

Cassava is one of the local resources that are abundantly available and are the main commodities in Gunungpati, Semarang. Processed food products made from cassava are still limited to traditional foods with relatively low economic value. One of the obstacles to processing cassava into a food product is the HCN content which exceeds the safe limit (≥ 50 ppm). The high content of HCN has the potential to be toxic if consumed [1], [2]. HCN content in cassava can be reduced through appropriate processing steps, such as washing, heating, and drying. Moreover, fermentation methods with enzymes or enzyme-producing microbes are also known to reduce the HCN content in cassava. The fermentation method has been widely used for various applications, including for preserving traditional drinks, such as kombucha tea from salak peel and talang flowers [3], as well as for making organic fertilizer [4] using microorganisms. Modification of processing through fermentation can change the characteristics of the resulting flour, i.e. increased viscosity, rehydration power, and solubility, so that it has characteristics like wheat flour [5]. Mocaf flour (modified cassava flour) is a product from cassava that is processed through a fermentation process using active ingredients consisting of lactic acid bacteria [6]. In contrast to cassava flour, mocaf flour has better organoleptic properties, i.e., it has a neutral aroma and taste [7]. With this improvement in quality, processing cassava into mocaf flour is an alternative product diversification that has the potential to increase the economic value of products (added value) made from cassava.

Mocaf flour can be used as a substitute for wheat flour or a mixture of wheat flour to make various food products such as cakes and noodles [8]–[11]. Mocaf flour is economically cheaper than wheat flour, because the raw materials are relatively easier to obtain at a low cost, and the processing is simpler without using high technology [12]. This is in line with the program launched by the government through the Ministry of Agriculture to encourage increased diversification of food products from local agricultural products such as flour made from cassava. The aim of the program is to improve food consumption patterns that are safe, high quality, and nutritionally balanced [5]. The development of a cassava-based flour industry can increase the consumption of staple foods from tubers and can reduce rice consumption, thereby encouraging the achievement of food security in society.

Ngijo Village is located in Gunungpati District, Semarang, Central Java, Indonesia. The average level of welfare of the Ngijo residents is still relatively low. Based on the dynamic monograph data for 2021, it is known that the number of job seekers in Ngijo Village is 59% of the total population [13]. This high unemployment rate shows that the availability of jobs is inadequate, which has an impact on the community’s low economy. Therefore, various efforts from the government are needed to encourage the creation of new jobs. Moreover, intervention from universities is needed to encourage community empowerment through training programs, especially to increase community skills in processing local natural resources into products with economic value.

The solution that can be offered to overcome problems related to local natural resources in Ngijo Village, Gunungpati, Semarang which have not been utilized properly, is by processing them into products that have higher economic value, i.e., processing cassava into mocaf flour. By diversifying processed cassava products, they potentially become products that can be sold and have an impact on improving the community’s economy.

2. Targets and Output

The participants in this service activity were the PKK (Family Welfare Program) group in Ngijo Village, Gunungpati, Semarang. The training activities are expected to encourage the formation of MSMEs in food processing made from cassava so that they can directly create new jobs and have an impact on improving the community’s economy thoroughly.

3. Method

The activity series conducted includes an initial survey to know the potential resources in the village that can be developed. From the initial survey, it was discovered that the potential local resources available are cassava roots. The first visit aimed to offer cooperation with the PKK (Family Welfare Program) group in Ngijo. Next, the practice was carried out to find the right procedures for processing cassava into mocaf.

The next activity was training and assistance in making mocaf to the PKK (Family Welfare Program) group. This activity consisted of a presentation about mocaf flour products and how the flour was made from cassava roots. Participants were allowed to ask questions regarding the existing problems or obstacles related to the processing of cassava into mocaf. The final activity was assistance to the participants who were interested in initiating the production of cassava on a micro-scale enterprise.

Process for Making Mocaf (Modified Cassava Flour)

The raw material used in making mocaf flour was cassava roots. Before being processed, cassava was peeled and separated from the peel, which was cut into chips. The preparation process of raw material is shown in Figure 1.

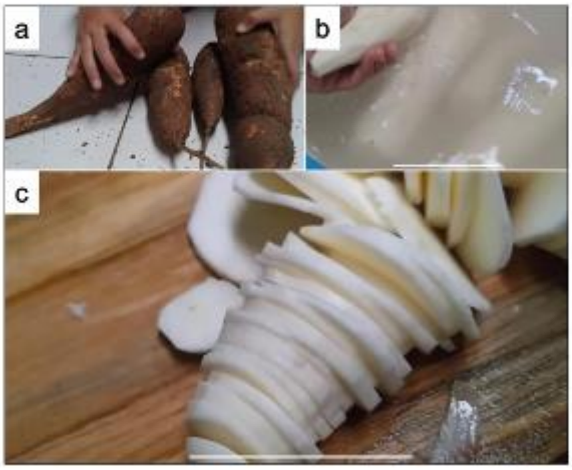

Figure 1. (a) Preparation of cassava raw materials through (b) the washing process and (c) cutting into chips

The cleaned cassava chips were fermented using a mocaf starter which contains lactic acid bacteria (LAB). Fermentation was carried out by soaking the cassava chip in water to which mocaf starter has been added in a ratio of 1:1000 mL (starter to water ratio). This fermentation process is a modification stage to reduce the cyanide acid (HCN) content in raw cassava roots. Cyanide acid is a chemical compound that is toxic if consumed in excess amounts by humans. It was found in cassava that there are cells that contain enzymes to break down cyanogenic glycosides which can produce toxic HCN [14]. The level of HCN content that is too high can be reduced by fermentation. Modification of starch flour by fermentation is an enzymatic method that is known to be safe and environmentally friendly [15]. The fermentation process was carried out in a closed container for 72 hours at room temperature under anaerobic conditions (Figure 2). The success of the fermentation process is shown by the presence of foam that appears which is the result of the activity of microorganisms (Figure 2b).

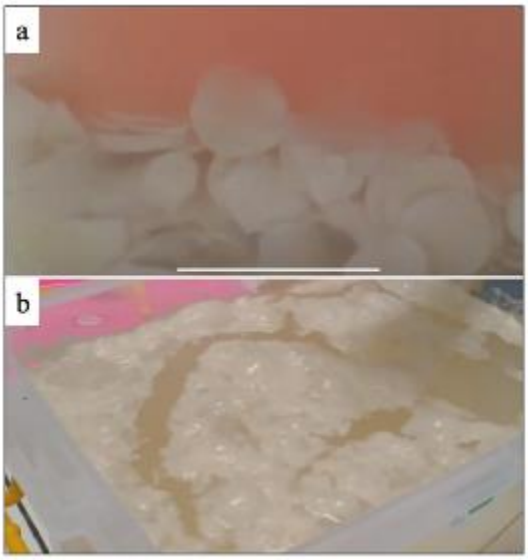

Figure 2. (a) Initial condition of fermentation and (b) after fermentation for 72 hours.

After the fermentation stage, washing was carried out to remove the relatively acidic fermentation liquid. This washing can reduce the sour smell of the flour produced. Then, drying was carried out to remove the water content in the cassava chips. According to the Indonesian National Standard (SNI), the maximum water content in cassava flour is 12% w/w [14]. Drying carried out at temperature of 50°C in an oven for ± 24 hours produced modified cassava chips with a dryness level suitable for the milling process. The fineness level of the flour produced according to SNI is a minimum of 90% of the flour produced passing an 80 mesh sieve [16]. The dried cassava chips and the resulting flour are shown in Figure 3.

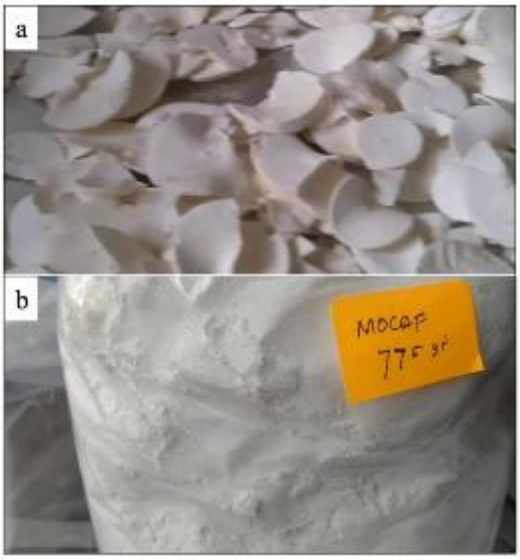

Figure 3. (a) Dried mocaf chips and (b) the mocaf flour produced after the milling process)

Content of Mocaf Flour

To determine the content of the flour produced, the analysis carried out includes tests for water content, mineral content, fat, protein, carbohydrates, crude fiber, and cyanide acid content (HCN). Control of the quality and safety of the flour produced refers to SNI 01-2997-1996 for cassava flour and SNI 7622:2011 for mocaf flour [16], [17]. The quality requirements according to SNI are presented in Tabel 1.

Table 1. Quality requirements for cassava flour and mocaf flour according to SNI

Tests	Unit	Quality requirements	
		Cassava Flour	*Mocaf* Flour
Conditions			
odor	-	Typical cassava	Normal
taste	-	Typical cassava	-
color	-	White	White
Foreign objects	-	none	none
Insect	-	none	none
Type of starch	-	Typical cassava	-
Ash content, % w/w		Max. 1,5	Max. 1,5
Water content, % w/w		Max. 12	Max. 13
Crude fiber, % w/w		Max. 4	Max. 2,0
Cyanide acid (HCN)	mg/kg	Max. 40	Max. 10
Fineness			
Pass through a 100 mesh sieve, % w/w		-	Min. 90
Pass through an 80 mesh sieve, % w/w		Min. 90	100
Starch, % w/w	-	Min. 75	-
Metal contamination			
Lead (Pb)	mg/kg	Max. 1,0	Max. 0,3
Copper (Cu)	mg/kg	Max. 10,0	-
Zinc (Zn)	mg/kg	Max. 40,0	-
Mercury (Hg)	mg/kg	Max. 0,05	Max. 0,05
Arsenic (As)	mg/kg	Max. 0,5	Max. 0,5
Cadmium (Cd)	mg/kg	Max. 0,2	Max. 0,2
Microbe contamination			
Total plate count	colony/g	Max. 1,0 x10^6	Max. 1 x 10^6
E.Coli	APM/g	Max. 10	Max. 10
Bacillus cereus	colony/g	Max. 1,0 x 10^4	< 1 x 10^4
mold	colony/g	-	Max. 1 x10^4

The comparison of the analysis results of cassava flour and modified cassava flour (mocaf) is shown in Table 2.

Table 2. Test results for cassava flour and mocaf flour

Analysis	Analytical Method	Analysis Results (%wt)	
		Cassava Flour	*Mocaf Flour*
Water	Thermogravimetry	15.13	18.11
Mineral	Dry method	0.39	0.30
Fat	Soxhlet	1.03	1.12
Protein	Kjeldahl	1.21	1.21
Carbohydrate	*By Different*	82.26	79.28
Crude fiber	Hydrolysis using strong acid and strong base	6.57	5.44
HCN	Spectrophotometry	9.75 ppm	5.70 ppm

From the results of analysis using various methods as shown in Table 2, it is known that the flour content tested has met the SNI quality requirements. The water content is higher than the quality requirements, but this does not significantly reduce the quality of the flour produced. The solution to reduce the water content can be done by increasing the drying duration and periodically checking the humidity level during the drying process. The HCN content of the obtained mocaf flour is relatively low and meets SNI quality requirements. It can be further seen that the reduction in HCN levels in flour processed through fermentation reached approximately 50% compared to HCN levels in cassava flour processed conventionally.

Training on Making Mocaf Flour for the PKK (Family Welfare Program) Group in Ngijo Village

After going through the research stage, the community service program was carried out in the form of training in making mocaf flour at the PKK (Family Welfare Program) group in Ngijo Village, Gunungpati, Semarang which was held on July 8, 2023. In this activity, the community was trained to make mocaf flour. This flour was used as a mixture for producing noodles. The addition of mocaf flour in making noodles was 1:4 of the total wheat flour used. The texture of the noodles produced is relatively the same as noodles in general. From the organoleptic tests, it was found that there was a slight characteristic taste of cassava in the noodles produced, but it did not change the overall taste of the noodles. The mocaf flour and the processed noodle products are presented in Figure 4.

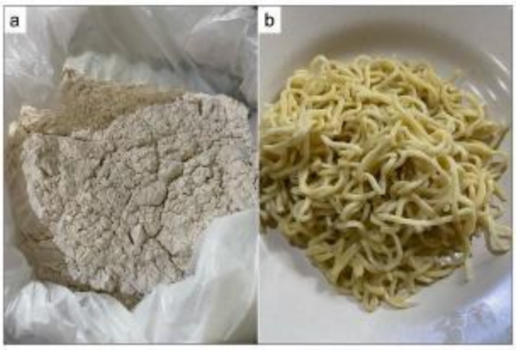

Figure 4. (a) Mocaf flour and (b) the processed noodles

This training activity, which was attended by 31 participants, received a positive response from the participants who were PKK members. Documentation of training activities is presented in Figure 5.

Figure 5. Training activity on making mocaf flour for the PKK group in Ngijo Village, Gunungpati, Semarang

From this training, it is expected that the community will have expertise in processing local resources into products that have economic value. This activity can encourage the community to initiate the formation of MSMEs to process cassava into mocaf flour and various diversification of processed products.

4. Conclusion

The present community service was conducted to train a group of PKK (Family Welfare Program) in Ngijo Village, Gunungpati, Semarang to produce mocaf flour from cassava roots. The training activity was expected to encourage the members of PKK to initiate the formation of MSMEs in food processing, thereby it may provide a new job and improve the circular economy.

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