



CONFERENCE PROGRAMS AND ABSTRACT

**The 3rd FIRST 2019 INTERNATIONAL CONFERENCE
FORUM IN RESEARCH, SCIENCE, AND TECHNOLOGY
OCTOBER 09-10, 2019
*Palembang, Province of South Sumatera
Indonesia***

Organized by :



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PREFACE

The 3rd FIRST 2019 (Forum in Research, Science, and Technology) International Conference was initiated and organized by State Polytechnic of Sriwijaya in collaboration with Management and Science, University (MSU), Malaysia and National Chin-Yi University of Technology, Taiwan. The theme of the conference was “Integration of Advanced Technology to Enhance Social Welfare”. The 3rd FIRST 2019 International Conference facilitated the participants from all over the world to meet face to face to open chances in establishing connection and collaboration among them. It was not only for the researchers in academics, but also in industries and governments. This conference became an effective media to link the researchers from many parts of the world conference, for exchanging, sharing, following up and discussing the results of the latest research, industry’s needs, and government regulatory policies. The 3rd FIRST 2019 International Conference became worthwhile platform for researchers to present their finding in the areas on multidisciplinary of Engineering and Science (Track 1), Computer Science and ICT (Track 2), and Social Science (Track 3). It has also provided an opportunity for the professionals and researchers to learn and share about the latest development and research in those 3 tracks.

The 3rd FIRST 2019 International Conference attracted so many authors not only from Indonesia but also from other countries, such as Japan, Taiwan, and Malaysia. There were 180 papers were accepted in the 3rd FIRST 2019 International Conference, including 89 papers for Track 1 (Engineering and Science), 46 papers for Track 2 (Computer Science and ICT), and 45 papers for Track 3 (Social Science). In The 3rd FIRST 2019 International Conference, there were 4 keynote speakers and 2 invited speakers. As the keynote speakers, there were Prof. Yasushi Kiyoki, Ph. D from KEIO University, Japan, Prof. Nurul Taufiqu Rochman, M. Eng, Ph. D, From LIPI, Indonesia, Prof. Tjiptohadi Sawarjuwono, M. Ec., Ph. D., Ak, from Universitas Airlangga, Indonesia, and Prof. Win-Jet Luo, from National Chin-Yi University of Technology, Taiwan. As the invited speakers, there were Dr. R. Wisnu Nurcahyo, DVM from Universitas Gadjah Mada, Indonesia, and Assoc. Prof. Dr. Intan Zaurah binti Mat Darus from Universiti Teknologi, Malaysia. The 3rd FIRST 2019 International Conference committee would like to say thank you very much for all the participants and their respected institutions that have supported for the success of the 3rd FIRST 2019 International Conference, and also for all of the guess and sponsors of the 3rd FIRST 2019 International Conference.

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Effect of Temperature and Starter Concentration on the Fermentation Process in Making MOCAF

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Abstract. This research aims to determine the optimum conditions with variations in temperature and concentration of Lactic Acid Bacteria (BAL) starter in fermentation in the process of making mocaf flour. Fermentation of cassava is carried out using a fermenter equipped with a thermo controller and tubular heater. Heater is used to increase the temperature connected to the temperature controller (thermo controller) so that the fermentation process runs in optimum conditions and get good quality of mocaf flour according to SNI 7622-2011 standards. The fermentation process was carried out anaerobically with and varying the temperature of 30 and 33°C and the concentration of the lactic acid bacteria starter were 0.06%, 0.12%, 0.18%, 0.24% and 0.3% with fermentation time during 24 hours. The results showed optimum conditions of cassava fermentation at a temperature of 33°C and lactic acid bacteria starter concentration of 0.3% obtained mocaf flour protein levels of 12.87%.

1. Introduction

An increase in demand for the domestic food industry makes Indonesia must bring in wheat from abroad as a basic ingredient of wheat flour, but it can be reduced by finding other alternatives to substitute wheat, such as cassava. Cassava can be processed into MOCAF (Modified Cassava Flour). Mocaf is cassava flour which has been modified by fermentation treatment, so that cassava flour is produced with characteristics similar to wheat so that it can be used as a substitute for wheat flour or 30-100% flour mixture and can reduce the cost of flour consumption by 20-30% [1]. In general the process of making mocaf flour includes several processes namely weighing, stripping, cutting, soaking (fermentation), drying, and grinding [2].

The fermentation stage is one of the most important stages for making mocaf flour to distinguish it from ordinary cassava flour. Mocaf flour has competitiveness that has a high added value by using the principles of biotechnology of BAL (Lactic Acid Bacteria) fermentation techniques. This technology is inspired by the original technology of cassava and cassava sour starch from Brazil [3]. According to Rofiq and Subagio (2009) growing microbes produce enzymes that can destroy cassava cell walls, resulting in changes in starch granules. This causes the characteristics of the flour produced in the form of increased rehydration power, and ease of dissolving and the taste of mocaf becomes neutral by covering up to 70% cassava flavor [4].

Fermenters are the place of the fermentation process to produce the desired product. Fermenters used in making mocaf flour operates in batch anaerobic conditions because lactic acid bacteria are anaerobic (live without oxygen) [5]. Batch fermenters are used because during the



fermentation process there are no incoming feeds or outgoing products. Murdani (2015) research in the fermentation process is still using the traditional method which is fermentation in a soaking tub. This method is less efficient because it can cause contaminants that can interfere with the fermentation process, based on the results of fermentation studies using a Bimo-CF starter concentration of 0.1% for 12 hours fermentation obtained a pH value of 4.76, a water content of 9.05%, a protein content of 1.7% [6].

The growth of microorganisms is influenced by temperature because changes in environmental temperature can affect the stability of the temperature in the fermenter. Then a temperature control system is needed in the fermentor wall to maintain its stability in the form of a heating element or heater. Because if the temperature is too low or too high it can affect the growth of microorganisms in it and cause the process in the fermentor to stop. The carried out research is fermented tofu liquid waste into biogas by using bacterial seeds from cow dung that has been diluted with anaerobic type fermenting batch system without stirring with a temperature control system. Based on the research results obtained with a set point of 35°C, the time needed to reach the set point from 25°C is 1900 seconds while without heating element, increasing the temperature from 20°C to 26°C takes 3600 seconds. At 1 day fermentation time, it was obtained pH 5.9 and 2 days pH 5.6 [7].

Therefore, an ideal fermentor tool can be used as one of the fermentation technologies to obtain SNI quality of mocaf flour. The fermenter is equipped with a temperature sensor and a temperature controller or heater (the temperature during the fermentation remains optimal and is made specifically for the mocaf flour fermentation process. Process conditions are batch anaerobic. Lactic acid bacterial starter used is Bimo-CF starter, the advantages of these bacteria can be used directly without preparation [8].

2. Research Methode

In this study, cassava was chopped and fermented for 24 hours (1 day) using a Bimo-CF starter brand lactic acid bacteria starter. After fermentation, it is washed and dried in a rotary dryer for 2.5 hours at 60°C. Cassava which has been dried is ground into flour using a disc mill and sieved using 80 mesh vibrating screener. Sifting was completed then carried out the testing of protein levels using the Kjeldahl method. The research variables to be taken consisted of fixed and non-permanent variables. Variables include temperature (30 and 33°C) and Lactic Acid Bacteria starter (0.06%, 0.12%, 0.18%, 0.24% and 0.3%) while the fixed variable is cassava as much as 10 kg (without skin).

The tools and materials used in this research must be prepared in advance so that during the study there are no obstacles due to lack of tools and materials.

Tools for fermentation are mocaf fermenters, analytical balance, and watch glass. Tools to test protein levels are kjedhal flask, burette, water bath, rubber ball, measuring pipette, funnel, measuring flask, erlenmeyer, beaker, spatula, and desiccator.

The ingredients for fermentation are 10 kg cassava without skin with BAL starter and water with BAL starter concentrations namely 0.06%, 0.12%, 0.18%, 0.24% and 0.3%. Materials for testing protein levels are HCl, K₂SO₄, CuSO₄ and H₂SO₄, NaOH-Na₂S₂O₃, NaOH and Methyl Blue Indicators.

The procedure of this study consisted of raw material preparation, fermentation, flouring process and protein content testing.

Cassava is cleaned first and chopped before fermentation. Prepare 11 kg of cassava then peel it (10 kg without skin), wash the cassava thoroughly and drain it. Then, cut the cassava into chips with a thickness of 1-3 mm and let it be weighed. Wash cassava and drain it again.

Sterilize the fermenter before use, sterilize the fermented mocaf by entering 30 L of water and heated to 40°C for 2 hours. Weighing 10 kg of chipped cassava. Add 10.8 gr of Lactic Acid Bacteria starter to 10.8 L of water for a concentration of 0.06%, 21.6 gr to 21.6 L of water for a concentration of 0.12%, 32.4 gr to 32.4 L of water for a concentration of 0.18%, 43.2 gr to 43.2 L of water for a concentration of 0.24%, while for 0.3% add 54 gr of Lactic Acid Bacteria starter to 54 L of water. Let the cassava being fermented using mocaf fermenter with temperature variations of 30 and 33°C set on the thermo controller. Fermentation time is 24 hours.

The thermo controller is turned off, the fermented liquid is removed and the cassava (chips) is removed from the fermenter. Washing fermented cassava (chips). Let it dried using a rotary dryer with temperature of 60°C for 2.5 hours. Subsequently, the flour mill is flattened and sieved using a vibrating screener. Record data on the characteristics of fermented products (mocaf flour) in the form of protein content.

This test is carried out by the Kjeldahl method [9]: Prepare a sample of 3 grams put into the Kjeldahl flask. Add 5 gr of K_2SO_4 , 0.5 gr of $CuSO_4$, 12 ml of concentrated H_2SO_4 and add boiling stone. Heat to a boil until it is clear greenish to 400°C, acidic is applied using an acid suction unit. Let it cooled, add some water about 50 ml slowly. Transferring flask contents to a distillation apparatus. Put the 125 ml Erlenmeyer containing 5 ml of H_3BO_4 solution and 2 drops of the indicator under the condenser. The tip of the condenser must be submerged in H_3BO_4 . Add 8-10 ml of NaOH- $Na_2S_2O_3$ solution, then do the distillation to accommodate about 15 ml distillate. Dilute the erlenmeyer contents to about 50 ml and then titrate with 0.02 N HCL until the color changes to pink. Doing with blank determination (the sample is replaced with aquades).

3. Results and discussion

This study uses a mocaf fermenter equipped with a thermo controller. During fermentation the temperature is set at 30 and 33 ° C. Temperature is set to be in the optimum growth condition of lactic acid bacteria at 30-37 ° C. The lactic acid bacteria starter used is Bimo-CF starter. After fermentation proceed to the drying and flouring stages. Mocaf flour is formed to test the protein content. Application of the amount of protein in food is carried out based on empirical application (indirect), namely through the determination of the nitrogen content that is in the ingredients. Nitrogen content was determined using the Kjeldahl method [10]. The results of the analysis of mocaf flour protein levels can be seen in Figure 1.

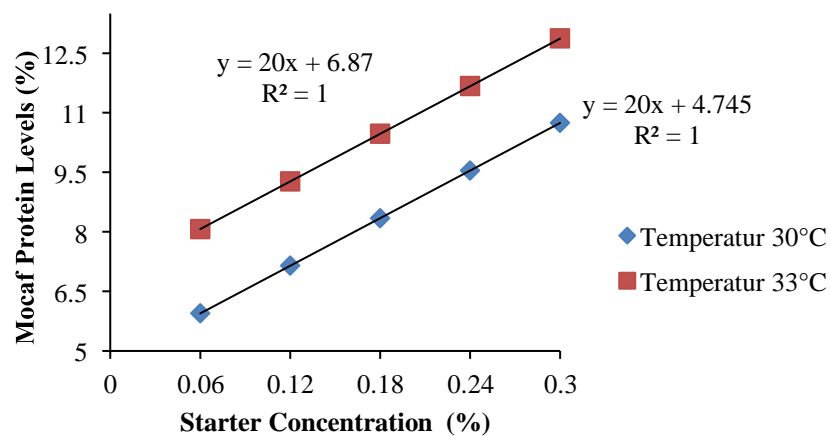


Figure 1. Effect of BAL Starter Concentration on Mocaf Flour Protein Levels

In Figure 1 it can be seen that the mocaf flour protein level has increased from the initial cassava protein level. Initial cassava protein levels were 1.062%. The highest mocaf flour protein levels were found in fermentation with a BAL starter concentration of 0.3%, a temperature of 33 ° C at 12.87% while a temperature of 30°C was only at 10.745% and the lowest at a concentration of a BAL starter at 0.06% at a temperature of 30°C is 5,945% while 33°C is 8.07%. The more starters of lactic acid bacteria and the higher the fermentation temperature used the higher the protein content obtained because during the fermentation process, Lactic Acid Bacteria produce a lot of protease enzymes so that it can increase the protein content in the ingredients [10]. Protease will hydrolyze proteins into simple peptides [11]. The amount of protein has increased due to an increase in the number of microorganisms that act as single cell proteins (SCP), ie proteins obtained from microorganisms [10].

4. Conclusion

The optimum condition of cassava fermentation during the 24 hour fermentation time by controlling the temperature of 33°C and using a starter of lactic acid bacteria branded starter Bimo-CF mocaf flour protein content of 12.87%. The amount of protein has increased due to the increase in the number of microorganisms that act as a single cell protein (SCP), which is a protein obtained from microbes.

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