Effect of Blanching Method and Soaking Solution on the Properties of Potato Flour Produced from Variety Granola

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Abstract. Potato is one of important agricultural commodities in Indonesia. The widely variety cultivated in Indonesia is Granola, almost 90 % of total area. The tuber is appropriate for table potato and not for processing one. On the other hand, the supply for processing tubers in Indonesia is less than its demand. Therefore, an alternative treatment is required for using variety Granola as raw material for processed product. Appropriate pretreatments are necessary to be applied to produce the flour from this variety. This research aims to examine the properties of potato flour as affected by several pretreatments during flour production from potato variety Granola. Potato tuber variety Granola was obtained from the farmers in Wonosobo, Central Java as one of potato producer in Indonesia. The pretreatments were type of soaking solution (water, solution of citric acid 2% and Lactic Acid Bacteria 0.1%) and type of blanching (without blanching, hot water blanching and steam blanching). Observed parameters were content of moisture, ash, starch, reducing sugar, and color parameter. The result indicates that combination of pretreatment using citric acid solution and steam blanching results better flours properties among others, particularly on the color parameter/brightness of the flour. The color of potato flour from variety Granola is yellow, which the bright color means more interesting for consumers. In addition, reducing sugars content of flour from this treatment is lower than control, but a disadvantage result also obtained from this treatment that is decreasing starch content of flour. Further research is required to improve flour properties to conform to the standard in Indonesia.

Keyword: potato flour, blanching, quality, Granola

1. Introduction

Potato flour is commonly produced from high starch tubers in order to obtain high rendement of the end product. However, table potatoes can be utilized as raw material of flour production and used as main ingredient for makin bread [1]. Indonesia is one of the exporter for potato tubers variety Granola due to dominant cultivation of this variety. Due to inherent characteric of variety Granola, the tuber is not appropriate for processing [2]. Therefore, diversification on processing potato tuber variety Granola is required due to abundat supply during harvesting. Flour is one of the recommended alternative forms as a partly finished good since it will last longer once it is stored or it can extend the shelf life, easy to be mixed (made as composite), nutrient-rich product (fortification), easy to be formed, and it can be cooked faster as the demand of modern life that is completely practical. Flour is widely used by the community for making bread, cake, and noodle. Previous research reported that the potao flour is appropriate for making of bread [3], steamed bread, traditional food from China (1, 4, 5] and potato chips as well [6].

The process of producing the potato flour include peeling the tubers, slicing process, soaking, blanching, drying, grinding, and sieving. One of the problems encountered in producing potato flour

is the enzymatic browning reaction. It changes the color of flour into brown and it is less preferred by the customers. The browning process will decrease the quality of the product and it declines the consumer's interest [1]. The color of potato flour can be maintained by pretreatment when processing is carried out. The pretreatment is in form of soaking and blanching. The blanching treatment in potato is done using steam blanching method and it produces French fries with the best chemical and sensory characteristic [5].

Besides blanching treatment, the pretreatment that can prevent the enzymatic browning reaction is soaking. The soaking solution that are usually used for preventing from browning are sodium metabisulfite, table salt (NaCl), and citric acid or ascorbic acid. Those soaking solutions have been widely used in some researches [7,8]. The previous research reported that addition of citric acid declined the browning reaction level in tuber slices, meanwhile, the tuber with no application of the treatment showed a faster browning reaction [9]. In addition, the soaking solution that can be used for preventing from browning is Lactic Acid Bacteria (LAB). It is usually used in MOCAF (Modified Cassava Flour) flour production. The Lactic Acid Bacteria (LAB) is a group of bacteria that produce lactic acid as the main product of carbohydrate or sugar fermentation [10]. They states that the duration of fermentation time using LAB will influenece the color of MOCAF. Moreover, the flour produced using LAB was brighter color than the cassava flour without soaking process.

Previous research by [1] reported that they can produce flour from table potatoes, variety May Queen. Furthermore, they can use the flour on making bread that accepted by the panelists. Therefore, producing flour from potato variety Granola should be invesitigate by applying appropriate additional treatments in order to conform to standard in Indonesia (SNI). The aim of this research was to find out the influence of the blanching method and soaking solution toward the physical and chemical characteristic of potato flour.

2. Materials and methods

This research used an experimental method with completely randomized block design. The factors that were examined including in form of water (P1), citric acid (P2), and LAB (P3) and the factors for blanching treatment i.e. without blanching (B1), hot water blanching (B2), and steam blanching (B3). Each treatment was repeated three times. The variables that were observed in this research were physical and chemical characteristic comprising water content, ash content, starch content, reducing sugar content, and the brightness level of flour. The data that had been collected was analyzed using analysis of variance (F-test). If the result showed that there was a difference, Duncan's Multiple Range Test (DMRT) should be done at a significance level of 5% afterward.

3. Result and discussion

Moisture Content

The result of the analysis of variance showed that the soaking solution and the interaction of the soaking solution to the blanching type had no significant impact on the moisture content of potato flour. Meanwhile, the blanching type had a significant impact on the moisture content of potato flour. The moisture content of potato flour at various types of blanching is presented in Figure 1.

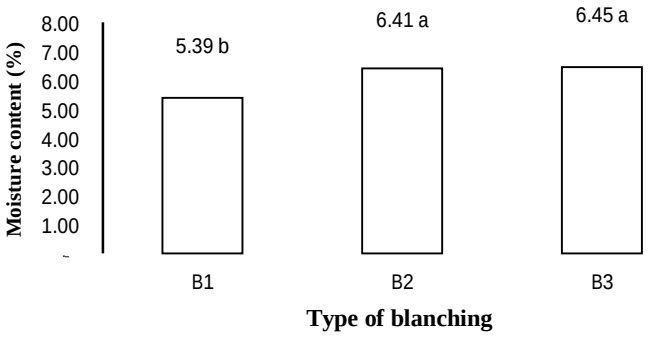

Figure 1. Effect of type of blanching on moisture content
Description: The numbers followed by the different letters are significant different at α 5 %.
B1 = without blanching B2 = hot water blanching, B3 = steam blanching

It was shown that moisture contents of potato flour resulted from steam blanching and hot water blanching treatments were higher than the moisture content of potato flour using 'without blanching' treatment. It happened because when the blanching was done, the moisture would be absorbed into the material so that it could increase the moisture content of potato flour. The blanching process caused the starch in the material to swollen. Thereby, it resulted in a higher ability to absorb moisture.

The hot water blanching treatment could cause the direct contact between the material and the water so that the cell permeability was gradually bigger and it resulted in the cell that could not hold the water and the water would be diffused out [11]. The moisture content in food materials needed to be established because the higher the moisture content was, the higher possibility of the food material would be broken and it could not last long.

The soaking solution and the interaction between the soaking solution and the blanching type (PxB) gave no significant impact on the moisture content of potato flour. The moisture contents of potato flour resulted from the soaking using water, citric acid, and LAB was 5.82%, 6.14%, and 6.29% respectively. The moisture content of potato flour resulted by the interaction of soaking solutionand blanching type was around 5.03% to 6.89%.

Ash Content

The result of the analysis of variance also showed that the blanching type gave a significant impact on the ash content of potato flour. The ash content of potato flour in various types of blanching treatment are presented in Figure 2.

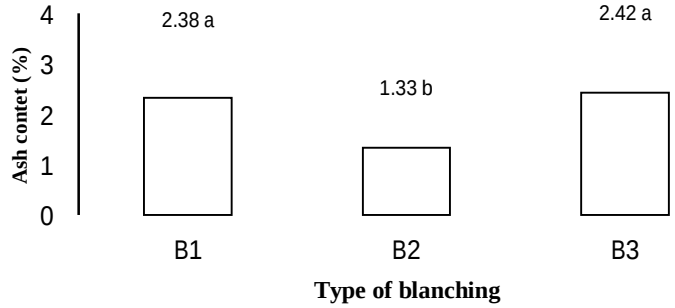

Figure 2. Effect of type of blanching on ash content
Description: The numbers followed by the different letters are significant different at α 5 %.
B1 = without blanching B2 = hot water blanching, B3 = steam blanching

Based on Figure 2, it shows that the ash content of potato flour with the application of hot water blanching treatment is lower than those with the application of steam blanching treatment and 'without blanching' treatment. It likely happened due to the mineral loss when the process of hot water blanching since it was dissolved into water. The dissolved component would be dissolved during the blanching process. In the blanching process, some mineral was dissolved into the solvent media. The previous research by [11] clearly showed that the effect of blanching on the gelatinization of the starch and broken down of the cell structure. The potato flour resulted from steam blanching process and 'without blanching' process had no much difference in ash content. It likely happened because there was no mineral loss in potato during steam blanching process and 'without blanching' process. The mineral salt was not significantly influenced by the chemical and physical treatment during the processing stage.

Starch Content

The starch content of potato flour produced from the combination of soaking solutionand blanching type is presented in Figure 3.

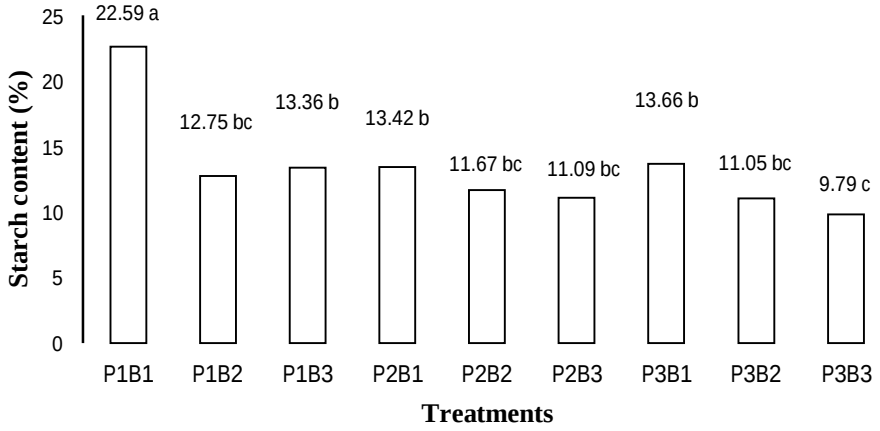

Figure 3. Effect of soaking solution and type of blanching on starch content
Description: The numbers followed by the different letters are significant different at α 5 %.
P1 = water, P2= citric acid, P3= LAB
B1 = without blanching B2 = hot water blanching, B3 = steam blanching

The interaction between the soaking solutionand the blanching type had a significant impact on the starch content of potato flour. Figure 4 shows that the starch content of potato flour is around 9.79% to 22.79%. The combination of soaking using LAB and steam blanching had the lowest of starch content. It was because of the starch hydrolysis process. Hence, the amount of starch produced was less during the soaking process using LAB and steam blanching were conducted. The soaking using LAB could hydrolyze the starch and there was a chemical change that was enzymatic i.e. hydrolyzing starch into simple saccharides by the enzyme during the increased temperature until it reached the temperature of steaming [10].

Brightness Level

The result of the analysis of variance showed that the solvent, blanching type, and the interaction between both of them gave a significant impact on the brightness level of potato flour. It was because the potato slices were put into the hot water so that resulted in more inactivation of enzymes. The more inactivated enzyme was, the less possibility of enzymatic browning reaction would. Thereby, the intensity of brown color significantly decreased (Metsdagh et al., 2008; 11]. The average value of brightness level in potato flour using the combination of soaking and blanching type as the treatment is presented in Figure 4.

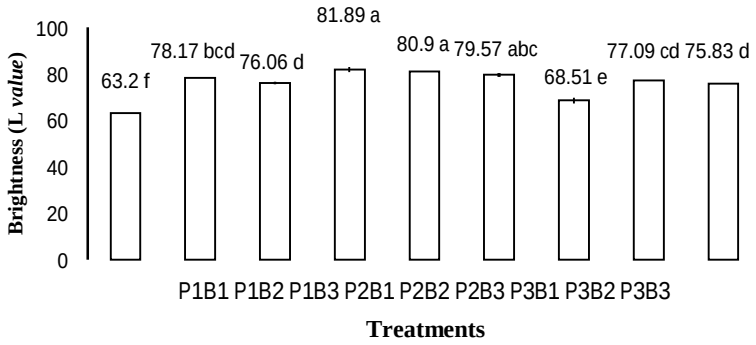

Figure 4. Effect of soaking solution and type of blanching on brightness
Description: The numbers followed by the different letters are significant different at α 5 %.
P1 = water, P2= citric acid, P3= LAB
B1 = without blanching B2 = hot water blanching, B3 = steam blanching

Figure 4 shows that the brightness level value in potato flour is around 63.2 to 81.89. The soaking and blanching treatment could inhibit the browning reaction of the materials that resulted in low brightness level in flour. The blanching treatment could result in brighter food material. Metsdagh et al. (2008) reported that blanching contribute on decreasing reducing sugar content, therefore, the french fries and potato chips have brighter color. Moreover, [11] who conducted blanching as pretreatment on yam flours concluded that this treatment is efective on inhibiting enzymatic browning.

This result is in aggreement with previous research that soaking it in acid would inhibit the browning reaction as the result of phenolase enzyme activity [7, 8].

4. Conclusion

The result indicates that combination of pretreatment using citric acid solution and steam blanching results better flours properties among others, particularly on the color parameter/brightness of the flour. The color of potato flour from variety Granola is yellow, which the bright color means more interesting for consumers. In addition, reducing sugars content of flour from this treatment is lower than control, but a disadvantage result also obtained from this treatment that is decreasing starch content of flour. Further research is required to improve flour properties to conform to the standard in Indonesia.

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