The effect of blanching and drying temperature upon proximate composition of okra flour

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Abstract. Okra is one of the flagship products of Jember with its potential as a source of functional food due to its components. Okra’s components comprise protein and fat. However, Okra has been used in limited chores, take dishes for instance, through boiling, grilling and frying, not to mention that okra is a perishable food. Therefore, the methods to process Okra to become various types of food need to be developed such as transforming it into form of flour. This study aims to determine the effect of processing on proximate okra flour. It used Randomized Block Design with two factors. Blanching process was taken as the first factor, followed by drying temperature, 50°C, 60°C and 70°C. The results showed no significant interaction between blanching process and drying temperature on the precise content of Okra flour. Blanching process did not indicate a significant difference in the precise content of Okra flour. Boiling temperature will significantly reduce the moisture and carbohydrate of the flour content, and will also increase the ash, protein, and fat of the content of okra flour.

1. Introduction
Okra was firstly developed by PT Mitra Tani 27 in the district of Jember. So far, Okra has merely been used for daily needs such as soup, dried, grilled, and fried food. This way, the use of Okra becomes very limited. In addition, Okra belongs to perishable vegetable. Therefore, the process of Okra to be developed into various types of food such as flour needs to be taken into consideration. Furthermore, Okra flour will be more easily processed and / or developed into various types of some other food such as cookies, noodles, and bread.

The flour process goes through a high temperature drying method known as food preservation method by reducing the content of water so that it lives even longer. Decreased water content results in the decrease of microorganism activity. Drying Okra makes use of hot air (70°C), air velocity (1.5 m/s), freezing dryer (-30 ± 2°C), drying with the use of microwave (70 kPa), a combination between hot air drying and microwave drying (70°C for 2 hours with 1.5 m/s air flow velocity), the combination of freeze drying by vacuum drying using microwave, freeze dried for 10 hours then vacuum with a pressure of 70 kPa (1).

Instead of drying, the process of okra flour also uses blanching. This way aims to reduce microbes and anti-nutrient and increase the brightness of the product. Drying and blanching can affect the proximate content of Okra as it contains components with physiological functions so that Okra can potentially become the source of functional food. Okra also consists of protein up to 16.27%, fiber 11.63%, fat 10.57% and ash 9.63% (2). Moreover, Okra provides important sources of vitamin,
calcium, potassium and other minerals. The research aims to identify the effect of Okra flour processing on its proximate content.

2. Methods

2.1 Materials
Okra was obtained from PT Mitra Tani 27 in Jember Regency. It had similar age, maturity, size, color, and had no defects, then sent to the laboratory, washed, drained and cut crosswise.

2.2 The Preparation of Flour
The Okra was blanched on hot air (95±2°C) for 10 minutes before being dried. The drying was conducted on the dehydrator at 50°C, 60°C and 70°C until a fixed moisture content was reached. Whereas, some other Okra were not blanched but dried immediately, then the dried okra were ground to release 80 mesh sieve. The flour was packed and sealed in polypropylene plastic and stored in dry condition until used (3).

2.3 Proximate analysis
Okra flour was then analyzed for moisture content using oven method, ash and fat content using soxhlet method, protein content used Kjedahl method (4) and carbohydrate content was calculated by difference. All analyzes were conducted using duplication.

2.4 Statistics analysis
Determination was carried out in four replications and the error was reported as standard deviation. Data were subjected to analysis of variance (ANOVA). Significance was accepted at p<0,05.

3. Result and Discussion

The process of Okra flour was divided into two steps: blanching and drying. ANOVA analysis results showed no interaction between blanching and drying temperature on the proximate content of Okra flour. Therefore, it was examined through each factor to determine the effect between treatments.

3.1 Effect of blanching on the proximate content of okra flour
Blanching is a short process of mild heat treatment for texture modification, enzymes deactivation, number of microbes reduction, as flavour preservation, nutritional value and flavour (5). Blanching uses hot water in temperatures of 7-100°C with allotted time based on the use of materials. Compared to other blanching methods, it is an easier, cheaper and more efficient method. Nevertheless, the use of hot water can cause changes in the components and product sensory due to the leaching or damage of nutrient saved in hot water (6). Comparison between the blanched and proximate content of Okra flour and that of non-blanched one is displayed in Table 1.

| Proximate content | Without Blanching | With blanching |
|-------------------|-------------------|----------------|
| Moisture          | 9,01 ± 0,20       | 9,08 ± 0,17    |
| Ash               | 2,48 ± 0,06       | 2,49 ± 0,07    |
| Protein           | 11,56 ± 0,12      | 11,61 ± 0,13   |
| Fat               | 2,51 ± 0,11       | 2,57 ± 0,18    |
| Carbohydrate      | 74,42 ± 0,39      | 74,26± 0,23    |

Table 1 shows no significant effect indicated by blanching on the moisture, ash, protein, fat and carbohydrate content of okra flour. The Moisture content without blanching was 9.01% while with
blanching showed 9.08%. This is also indicated by other studies that moisture is not affected by blanching on plantain flour (7,8). Low moisture makes Okra material lives longer. According to (8), products with moisture above 12% have shorter life.

The ash of non-blanching Okra flour (2.48%) was not significantly different from that of blanching process (2.49%). Ash shows stable mineral of Okra during the blanching process. Blanching process also has no effect on plantain flour ash (8). Ash in Okra flour (2.48-2.49%) was higher than that in sweet potato flour (0.42-0.49%) (5), raw plantain flour (1.66-2.00%) (9), and on plantain flour (2.80-2.97%) (8). Carbohydrate in Okra flour only ranges from 74.26 to 74.42% and were not affected by blanching. Carbohydrate in Okra flour is lower than dried sweet potato flour (78-83%) (10), plantain flour (81.63-82.40%) (8). Blanching process on okra flour did not give a significant effect on changes in proximate content of okra flour. Therefore, blanching process can be applied for Okra flour. Blanching is an important step of fruit and vegetable processing. Blanching is aimed to reduce anti-nutrient content and number of microbes, to deactivate the enzymes and to increase the brightness of Okra flour. In addition, some other studies showed that blanching provide many advantages as it can reduce processing cost for plantain and banana flour through the increase of efficiency of drying. (5)

3.2 Effect of drying temperature on the proximate content of okra flour

Drying through dehydrator aims to extend the life of the product by reducing the product moisture. It aims to inhibit microbial growth and enzyme activity. As indicated in blanching, the use of heat during the drying process can cause changes in the components and sequences of the product. The comparison of drying temperature difference to Okra flour components is displayed in Table 2.

| Table 2. The effect of drying temperature differences on the proximate content of Okra flour (%wb) |
|---------------------------------------------------------------|
| Proximate content | 50 | 60 | 70 |
| Moisture          | 9.20 ± 0.03a | 9.09 ± 0.03b | 8.84 ± 0.08c |
| Ash               | 2.41 ± 0.05a | 2.51 ± 0.05b | 2.54 ± 0.04b |
| Protein           | 11.44 ± 0.03a | 11.59 ± 0.05b | 11.72 ± 0.13c |
| Fat               | 2.38 ± 0.04a | 2.45 ± 0.05b | 2.78 ± 0.04c |
| Carbohydrate      | 74.56 ± 0.10a | 74.35 ± 0.13b | 74.11 ± 0.17c |

Table 2 shows that the drying temperature has a significant effect on moisture, ash, protein, fat and carbohydrate of Okra flour. Heat used in drying causes more water to evaporate from the flour so the moisture will likely decrease (9.20%, 9.09%, 8.84%). Blanching comes before drying. During the Blanching process, starch gelatinization occurs, then starch granules will surely swell. The swelling of the starch on Okra flour will increase the permeable properties of the cell wall so that much water is absorbed and evaporated. When moisture in the product decreases other components such as ash content, protein content and fat content (shown in Table 2) will increase. However, increased levels of ash, protein and fat will reduce carbohydrate content in Okra flour.

Okra drying process occurs for 30 hours at a temperature of 50°C, 25 hours at a drying temperature of 60°C and 20 hours at a drying temperature of 70°C. The moisture in Okra is a type of water bound to the material. The water has a binding energy sufficiently strong to be released from the material so that it requires a long drying time. In addition, the moisture of Okra is adequately high so that it takes a long time to reach constant moisture.

3. Conclusion

Blanching has no significant effect on proximate Okra flour. Whereas, drying temperature has a significant effect on water, protein, fat, carbohydrate of Okra flour. Further research needs to be conducted focusing on functional properties of Okra flour applied in food products.
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5. References
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