Physicochemical characteristics of muffin from composite flour (mocaf, breadfruit, jackfruit seeds, and durian seeds)

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Abstract. This study aims to determine the formulation of composite flour from mocaf, breadfruit flour, jackfruit seed flour, and durian seed flour in making good quality muffin. Making muffins with composite flour formulations (mocaf, breadfruit flour, jackfruit seed flour, and durian seed flour) (P): 50%:40%:5%:5%, 50%:30%:10%:10%, 50%:20%:15%:15%, 50%:10%:20%:20%, 100% jackfruit seed flour, 100% durian seed flour, 100% breadfruit flour, 100% mocaf, and 100% wheat flour. The resulting muffins were analyzed for specific volume, ash content, protein content, fat content, carbohydrate content, and crude fiber content. The final result of the study showed that the composite flour formulation (mocaf, breadfruit flour, jackfruit seed flour, and durian seed flour) (50%:30%:10%:10%) produced the good quality muffin by deGarmo method.

1. Introduction

The utilization of local food ingredients as flour has been widely used in the manufacture of bakery products, such as egg rolls [1,2], brownies [3], food bars [4], crackers [5], donuts [6], and cookies [7]. Composite flour is flour which is a combination of various types of raw materials with the aim of substituting the initial raw material, namely flour. Materials that are considered waste such as jackfruit seeds and durian seeds can be processed into flour and then made into composite flour along with local ingredients such as breadfruit and cassava.

Muffins are bakery products (quick breads) made without the addition of developer ingredients or not by fermentation. Muffins are characteristically the surface of the crust symmetrical on and cracked golden brown in color, pores of uniform size and lightweight [8]. Basically, the flour used in making muffins is low or medium protein flour. This is what underlies the author to utilize local raw materials such as mocaf, breadfruit, jackfruit, and durian seed. The innovation of composite flour as a raw material in making muffins is expected to resemble the quality of muffins in general and efforts to increase local commodities for more diverse products.

2. Methodology

We did the research in December 2019 at the Laboratories of Faculty of Agriculture, USU, Medan. Durian seeds obtained from Sibolang Durian, jackfruit seeds obtained from the Kabanjahe area, breadfruit obtained from Setia Budi and mocaf obtained from Tuntungan, Medan. The chemicals used to analysis the products are ethanol, aquadest, hexan, and sulfuric acid.
We did nine comparisons (mixture of mocaf, breadfruit flour, jackfruit seed flour, and durian seed flour) namely P1 = 50% : 40% : 5% : 5%; P2 = 50% : 30% : 10% : 10%; P3 = 50% : 20% : 15% : 15%; P4 = 50% : 10% : 20% : 20%; P5 = 100% jackfruit seed flour; P6 = 100% durian seed flour; P7 = 100% breadfruit flour; P8 = 100% mocaf; P9 = 100% wheat flour. Each treatments was made in 3 replications. Analysis of specific volume using seed displacement method [9], ash content using dry ashing [10], fat content using boiling flask method [11], protein content using kjeldahl method [12], crude fiber method [13], and carbohydrate using by different method [14]. The best composite muffin was determine by deGarmo method [15].

3. Result and Discussion

3.1. Specific volume

P1, which was 1.88 mL/g was the highest and the lowest P7 which was 1.33 mL/g. The expansion of the muffins was affected by the flour, each flour gave different results [16]. The expansion of muffin also influenced by the expanding. The agent of expanding affects the volume and structure of the cell [17].

![Figure 1. Comparison of CF (mocaf, breadfruit, jackfruit seeds, and durian seeds) to the value of specific volume. *CF: Composite Flour](image)

3.2. Ash content

From Figure 2, we can see that the more flour of durian seeds, the higher the ash content, durian seed flour has a high ash content compared to other raw materials. The ash content shows the mineral content [18].
3.3. Fat content
The highest of fat content at P6 with a value of 23.744%, while the lowest was P8 which is 19.662%. Fat content of mocaf was 0.905%, breadfruit flour was 0.990%, durian seed flour was 3.249% and jackfruit seed flour was 1.304%.

3.4. Protein content
The muffins with composite flour ingredients (P1-P4) had protein content values that almost resembled muffins flour, namely 8.287-8.447%. The greater the proportion of durian seed flour and jackfruit seed flour, the higher the protein content of muffin the resulting.
Figure 4. Comparison of CF (mocaf, breadfruit, jackfruit seeds, and durian seeds) to the value of protein content

3.5. Crude fiber content
Muffin P8 has the highest crude fiber content at 2,506%, while muffin P6 had the lowest at 0,920%. Mocaf and jackfruit seed flour had a higher fiber, the addition of them could increasing the crude fiber to muffin the resulting.

Figure 5. Comparison of CF (mocaf, breadfruit, jackfruit seeds, and durian seeds) to the value of crude fiber content

3.6. Carbohydrate Content
Muffin P8 has the highest carbohydrate content at 47,404%, while muffin P9 has the lowest carbohydrate content at 38,836%. The chemical composition of composite flour is strongly influenced by the chemical composition of the basic ingredients which also affects the chemical composition of the resulting food product [19]. The higher the levels of other nutritional components such as water, protein, fat and ash content, the lower the carbohydrate content [20].
Figure 6. Comparison of CF (mocaf, breadfruit, jackfruit seeds, and durian seeds) to the value of carbohydrate content

4. Conclusion
The best formulation for muffin namely P2 = 50% : 30% : 10% : 10% (best composite flour of mocaf, breadfruit, jackfruit seeds, and durian seeds).

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