Cupcake from composite flour based on natural local resources (modified breadfruit, purple sweet potato, mocaf, saga seed)

E Oktriandi¹, M Nurminah¹²* and Z Lubis¹

¹Department of Food Science and Technology, Faculty of Agriculture, Universitas Sumatera Utara, Medan 20155, Indonesia
²Center for the Study of Tubers and Roots, Faculty of Agriculture, Universitas Sumatera Utara, Medan 20155, Indonesia

*E-mail: miminurminah@usu.ac.id

Abstract. Cupcakes is a kind of bakery that consist wheat flour, sugar, butter, and egg. We made cupcakes from composite flour that based on Indonesian local resources. A factorial completely randomized design, cupcakes using formulations of 4 flour, consist one factor (P: comparison composite flour consist: modified bread flour : purple sweet potato flour : mocaf : saga seed flour): P1 (50% : 30% : 20% : 0%); P2 (45% : 35% : 15% : 5%); P3 (40% : 40% : 10% : 10%); P4 (35% : 45% : 5% : 15%); P5 (100% modified breadfruit flour); P6 (100% purple sweet potato flour); P7 (100% mocaf); P8 (100% wheat flour). The research showed that the mixture of 4 flour P1 (50%: 30%: 20%: 0%) produced the best quality cupcakes.

1. Introduction
Cupcake is a cake product that can be served as a dessert and appetizer. Cupcakes come from dough from the main ingredients of butter, sugar, eggs, and wheat flour, which are then given topping with various and shapes, ranging from whip cream, butter cream, frosting, cooking chocolate and edible image. This is what makes cupcake products have a product identity and attracts consumers by offering delicious flavors and product variations, thus making it very important in their development. Cupcakes are one of the foods that are very popular and favored by all Indonesian people. But in Indonesia there are still many people who depend on using wheat flour as a base for making cupcakes, especially at this time related to the use of local food ingredients as an alternative to raw materials for making cupcake products [1].

The using of wheat flour in the manufacture of food processing is highly dependent on Indonesian society. The high level of wheat imports in fulfilling the raw materials for wheat flour in Indonesia is a difficult problem that must be resolved immediately. Wheat imports increased by 4% from 5.74 million tonnes in 2017 to 5.97 million tonnes in 2018. This issue is a concern because it can affect a wide range of state opinions [2]. The use of purple sweet potato is still small, even though purple sweet potato has carbohydrates, dietary fiber and anthocyanins, so that can be used as functional food because they contain quite high anthocyanins [3]. The development of using durian seeds contain high nutritional value such as protein, fat, fiber and carbohydrates so that they become a potential alternative to be used as flour [4]. The development of the use of local raw materials such as jackfruit seed flour which is still rarely used, jackfruit seeds have relatively high content such as protein, fat, fiber and carbohydrates [5].
Utilization of the use of saga seeds that are still small, saga seeds have a high enough protein content so that they have the potential to be processed into various nutritious food preparations such as making saga seed flour [6]. The use of local raw materials is orange sweet potato which contains beta-carotene which is high enough that it has the potential to be processed into flour [7].

2. Materials and Methods
We did research at the Foodstuff Chemical Analysis Laboratory, Universitas Sumatera Utara, Medan. We got mocaf from B innovation, purple sweet potato from market in jalan Pancing, saga seeds (Love Garden), breadfruit from the Loyal Budi market, Medan.

Cupcake making is done with composite flour weighed. Add 20g egg and 30g sugar, mixer on speed (scale 3) for 5 minutes. Enter the composite flour according to the treatment, then mix 50g full cream liquid milk and 50g liquid margarine so that it becomes a dough. Then, mixing it with 1.5g baking powder and 0.5g vanilla, after mixing all the ingredients, stirring with a mixer (scale 1) for 7 minutes. The basic cupcake dough is ready, then put it in the cupcake mold. Enter into the pan, then bake at 150°C for 30 minutes, cool down for 30 minutes. Do packaging using a tightly closed mica.

We made four controls and four comparative treatments in this research, namely:

- \( P_1 = 50: 30: 20: 0 \)
- \( P_2 = 45:35: 15: 5 \)
- \( P_3 = 40: 40: 10: 10 \)
- \( P_4 = 35: 45: 5: 15 \)
- \( P_5 = 100\% \) modified breadfruit flour
- \( P_6 = 100\% \) purple sweet potato flour
- \( P_7 = 100\% \) mocaf
- \( P_8 = 100\% \) wheat flour (Control)

Each treatment was carried out 3 replications (total: 24 samples). Analysis consist protein content was performed using K-jeldahl [8], fat content with Soxhlet [8], crude fiber content [9], specific volume using displacement testing method [10] color (a Minolta chromameter, type CR 200), we using the de-Garmo for best cupcakes [11].

3. Results and discussion
3.1. Protein content
Research result shows that cupcake \( P_8 \) (10.04) and \( P_6 \) (7.11) has the highest and lowest protein content. The main ingredient in making \( P_8 \) cupcakes of 100% wheat flour was wheat which is high in protein, while \( P_6 \) had the lowest protein content when compared to wheat flour because purple sweet potato does not contain protein [12].

![Figure 1. Comparison of composite flour formulations with cupcake protein content](image-url)
3.2. Fat Content
The ratio of composite flour produces fat content with a value that is not too different in each formulation treatment, this can be seen from the P1-P8 value. The highest and lowest of cupcake fat content were at P4 (24.93%) and P8 (18.41%) [13]. Cake is a dessert food that can be consumed by all Indonesian people which has an average fat content of 19.8 grams / 100 grams. So it can be said that the fat content in the composite flour cupcakes is greater than the control cupcakes with 100% wheat flour.

![Figure 2. Comparison of composite flour formulations with cupcake fat content](image)

3.3. Crude Fiber Content
Cupcake had the highest (P1=2.73%) and lowest crude fiber content (P7= 1.22%). We saw that the greater the proportion of the addition of flour formulation, the higher the crude fiber content of the cupcake produced, while mocaf flour and wheat flour are not sources of crude fiber because crude fiber is a part that must be removed and separated [15].

![Figure 3. Comparison of composite flour formulations with cupcake crude fiber content](image)

3.4. Specific Volume
The cupcake P8 has the highest specific volume (1.76). Gluten in wheat can form a net frame that binds to one another and captures gas so that it does not come out of the product so that the product expands and the volume increases [16]. There was no gluten in P2 so it cannot expand, so the value of specific volume is low.
3.5. L Value (Brightness)

The cupcake P₁ has the highest L * value, namely 52.92 and cupcake P₈ has the lowest L * value, which is 46.16. Cupcakes with P₁ composite flour have the highest value, namely 53.92, this is because the P₁ cupcakes are made from 50% modified breadfruit flour and 40% purple sweet potato flour so that they have the highest brightness level than P₂, P₃, P₄. The L * value indicates that the L notation brightness has a value (0) to 100 (white), where the greater the L value, the brighter the sample will be.

4. Conclusion

Composite flour from 4 flour that from local resource in Indonesia can be made cupcakes. The formulation of composite flour P₁ (50%: 30%: 20%: 0%) produces the best quality cupcakes.

References
[1] halifa I H, Barakat H A, El-Mansy and Soliman S A 2015 Food and Nutrition Sciences 6 83
[2] Central Bureau of Statistics 2018 Wheat Imports in Semester I 2018 (Central Bureau of Statistics: Jakarta)
[3] Nurminah M, Ginting S and Sitorus C J 2019 IOP Publishing 1755 012029.
[4] Sembiring A T B, Nurminah M and Nainggolan R J 2019 IOP Publishing 1755 012107
[5] Gaol R A L, Nurminah M and Nainggolan R J 2019 IOP Publishing 1088 012109
[6] Manik N E, Nurminah M and Ginting S 2019 IOP Publishing 1755 012108
[7] Isnaini R, Nurminah M and Lubis Z 2019 IOP Publishing 1755 012110
[8] Association of Analytical Chemist 1995 Official Methods of Analysis (AOAC Publisher: Washington DC)
[9] Yananta A P 2003 Process Improvement of Minor Bulbs Flour (IPB Faculty of Agricultural Technology: Bogor)
[10] Hutching J B 1999 Food Color and Apearance (Aspen publisher Inc: Maryland)
[11] De Garmo E P, Sullivan W G and Canada J R 1984. Engineering Economy (Macmilan Pub. Co : New York)
[12] Pratiwiningsih T I 1984 Characteristics of saga seeds (Adananthera pavonina L.) (Faculty of Agricultural Technology, Bogor Agricultural University: Bogor)
[13] Sutikno 2009 Non-Soybean Tempe Available in https://Sutikno.Blog.Uns.air conditioning.id/2009/04/28
[14] Benson R C 1988 Muffins. Proceedings of the Annual Meeting of the American Society of Rerotian Engineers 92
[15] Pradipta and Putri 2015 Journal of Food and Agroindustry 3 793
[16] Wijayanti 2007 Substitution of Wheat Flour (Triticum aestivum) With Garut Flour (Maranta arundinaceae L) In Making Fresh Bread (Gajah Mada University Agricultural Technology: Yogyakarta)
[17] Ulyarti and Fortuna D 2016 Jambi University Research Journal Science Series 18 1