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FLOUR OF KLUTUK BANANA FRUIT: SELECTIVITY OF DRYING CONDITION

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ABSTRACT

Objective: The objective of this study was to investigate the optimized condition to dry the flour of Klutuk banana fruit extract (*Musa balbisiana* colla). **Methods:** The preparation of sample was done by drying the slices of banana Klutuk fruits in an oven at various temperature and drying time. Then continued with milling process into banana flour using grinding techniques. The obtained flour was dried using a validated oven with various temperature and length of drying time. The stability parameter of the flour was monitored from the water content value and the phytochemical presence. The secondary metabolites of the dried banana fruit and flour were analyzed using standard method. **Results:** The optimal drying condition was found when the oven temperature set at 50 ºC for 20 h. The select condition produced the highest of loss on weight percentage with the shortest time without causing a change in the content of phytochemical compounds in the extract. **Conclusion:** Drying klutuk banana fruit extract with oven was considered as a simple and inexpensive method to achieved the flour stability.

KEYWORDS: Klutuk, *Musa balbisiana* colla, flour, drying, oven.

INTRODUCTION

One of the plants used empirically as an anti-dysentery is the Klutuk banana (*Musa balbisiana* Colla). Until now, the use of the Klutuk banana is still very limited. In Indonesia, this affects the selling price of Klutuk bananas far below the price of other bananas such as Ambon banana, gold banana, Kepok banana and plantain.[1] Therefore, the Klutuk banana has a prospect to be a natural anti-dysentery with an affordable price. However, when viewed

from its perishable nature, it requires a strategy for processing Klutuk bananas into stable anti-dysenteric preparations for long-term storage using pharmaceutical formulation technology. One of the simple and easy to apply processing techniques is to process the Klutuk banana into flour.

The main reasons for processing bananas into banana flour are as follows: more durable in storage time, can be used as a flexible raw material, increase safety in distribution process, and become a practical material for processing.[2] Besides that, the advantage of making it as banana flour is the obtained of other additional nutrients, such as starch (84%), protein (6.8%), fat (0.3%), ash (0.5%) and food fiber (7.6 %).[3] However, as raw material product, banana flour as a raw material product, flour must have good quality because it is potentially exposed to contaminants from the environment during processing, storage and transport. As expected, contamination could occur on the surface of the flour. It has been reported that the flour milling process can reduce the level of contaminants by abrasion during the milling process.[4] However, it turned out that the milling process cannot ensure the safety of flour quality as free contaminants product. Another study reported that microbes are found in abundance and cause food-related diseases.[5] Adequate flour drying process can be an important effort to maintain the quality of flour from contaminants exposure. Considering that the water content can provide opportunities for microbial growth, especially fungi. Lowering the water content can inhibit microbial enzymes work. Factors affecting the success of drying are surface area, heating temperature, air flow velocity, and air pressure.[6] Therefore, in this research, the optimization of temperature and the drying time of banana klutuk fruit to obtain banana flour with moisture content below 10%, were evaluated.

MATERIALS AND METHODS

Samples

Klutuk banana fruits (*Musa balbisiana* Colla) was used in the age of approximately 3 months and harvested from Bandung, West Java, Indonesia. Plant sample was authenticated in Plant Taxonomy Laboratory of Biology Major, Faculty of Mathematics and Natural Science Padjadjaran University.

Oven validation

The oven was equipped with a calibrated thermometer that was positioned in the corners of the oven about 50 mm from the walls. Meanwhile, another calibrated thermometer was placed in the geometric center of the oven. Then, the oven was closed and the thermometer

was set and allowed to get the stable temperature. After the temperature has stabilized, the oven was opened and the temperatures on thermometer were recorded.

Preparation of flour production

Klutuk banana were cleaned and air dried at ambient temperature then peeled and separated between skins and fruits.[7] The fruits of Klutuk banana were cut into small pieces with 2-3 cm long, 2-3 cm width, and ± 1mm thick. Then the slices of fruit arranged on the alumunium foil before drying process.[8] The slices of fruit were wrapped in the alumunium foil and dried in oven at various temperature (30, 40, and 50° C) and drying time (15, 20, 24 and 40 h). The dried of banana fruits were milled into banana flour using grinding techniques. Then the flour was evaluated for its water content using loss and drying method measurement.

Loss on drying analysis

Loss on drying analysis was conducted to find out the drying temperature and time that produce the slice of dried fruit with the qualified of water content. Loss on drying test was conducted by weighing 1-2 g of dried fruits in bottle which had been heated on the setting temperature. After that, dried fruits were flattened in bottle by shaking the bottle, to get a layer 5-10 mm thick. Bottles that contained dried fruits were placed into the oven in an open state. Dried fruits were dried at the setting temperature until the weight fixed.[9] The dried fruits that have qualified water content, then milled using a blender and sieved using a 100 mesh thus obtained the flour of Klutuk banana fruit.[10]

Phytochemical screening

The systematic screening of banana flour was analyzed to determine bioactive substances such as alkaloids, flavonoids, tannins, quinones, saponins, steroids, and triterpenoids, in both simplisia and flour of Klutuk Banana Fruits, as the described method in Farnsworth study.[11]

RESULTS AND DISCUSSION

The drying process was the most important step in the processing of raw material from plants as it can affect the quality of the final products.[12] In this study, drying using an oven was selected to provide a better product quality than the direct rays drying method. Drying with oven was considered more advantageous because there will be a reduction in the levels of water in large quantities in a short time.[13] From the result, the difference temperature of validated oven was ranging between 0.5 – 1.5º C and need approximately 40-45 min to

achieve a stabil temperature, presented in Table 1. The weight of flour before and after drying was calculated to determine the percentage of lost weight, can be seen in Table 2.

Table 1: Validation Oven results.

Test temperature oven (ºC)	Thermometer temperature (ºC)	Time temperature stability (min)
30	30,5	40
40	41,5	45
50	51,5	45

Table 2: Percentage of lost weight in klutuk banana flour.

Temperature (ºC)	Drying time (h)	Lost weight (%)	Loss on drying (%)
30	15	15.89	92.64
	20	23.93	89.90
	24	38.03	86.91
	40	60.74	76.47
40	15	32.27	87.73
	20	51.13	82.83
	24	65.77	74.73
	40	90.29	10.92
50	15	66.40	62.01
	20	89.65	8.79
	24	88.65	6.21
	40	86.35	5.42

Based on these data, the percentage of lost weight was directly proportional to the increasing of the temperature and drying time. The greater drying temperature and the longer drying time was also increased the percentage of lost weight due to the drying process. The quality of flour product was also determined with due regard to the LOD value. Loss on drying test was conducted to find out the water content of Klutuk banana fruits. Stability of raw product can be assumed in good quality condition if it had a water content of less than 10 %.[14] Thus, the flour of Klutuk banana with drying temperature of 50ºC and in the shortest drying time for 20 min can be selected as the optimized drying condition.

In addition to water content, we must also pay attention to the stability of the phytochemical compounds in the flour. High temperature of heating for a longer time can cause damage to phytochemical compounds that are relied on as nutritious active substances. The result of phytochemical screening can be seen in Table 3. It was found that simplisia and banana flour did not have differences in secondary metabolites. This proves that the drying temperature and time was used in this study did not gave effect presence of secondary metabolites.

However, the stability of the presence of these compounds greatly affects the targeted antibacterial action of this Klutuk banana flour. The levels of each secondary metabolite in flour may affect the antidysentery effect of this banana flour.[15] Each phytochemical substance whether as single or in integration, has the activity of antibacterial with various working mechanism. Flavonoids act as antibacterial by forming complex compounds against extracellular proteins that interfere with integrity of bacterial cell membranes.[16] Tannins have antibacterial activity by destroying components of cell membranes, cell walls, enzymes, genetic material, and other protein components.[17] The lipophilic terpenoids has antibacterial activity by destroying the bacterial cell membrane, it will react with the active side of the membrane, dissolving the lipid constituent and increasing permeability.[18] Saponins can increase the permeability of bacterial membranes so as to alter membrane structure and function, causing membrane protein denaturation so that cell membranes will be damaged and lysis.[16]

Table 4: Phytochemical screening result.

Secondary metabolites	Results	
	Simplisia	Flour
Alkaloids	-	-
Quinones	+	+
Polyphenols	+	+
monoterpenoids	+	+
sesquiterpenoids	+	+
Tannins	+	+
Flavonoids	+	+
Steroid & Triterpenoid	-	-
Saponins	+	+

Note: (+) presence; (-) absence

CONCLUSION

Our results demonstrated that the optimal drying condition was found when the oven temperature set at 50 ºC for 20 h.

REFERENCES

1. Margono T. Anggur Buah Pisang Klutuk. Jakarta: Grasindo, 2000.
2. Widowati S. Prospek Tepung Sukun Untuk Berbagai Produk Makanan Olahan Dalam Upaya Menunjang Diversivikasi Pangan. Tesis. Bogor: Program Pasca Sarjana Institut Pertanian Bogor, 2003.

3. Pancheco-Delahaye, Maldonado R, Perez E, Schrueder M. (Production and Characterization of unripe plantain (*Musa paradisiaca* L.) Flours). J. Interciencia, 2008; 33(4): 290- 296.
4. Laca A, Mousia Z, Diaz M, Webb C, Pandiella SS. Distribution of Microbial Contamination Within Cereal Grains. J Food Eng, 2006; 72: 332.
5. Ozawa M, Seguchi M. (Relationship Between Pancake Springiness and Interaction Of Wheat Flour Components Caused By Dry Heating). Food Sci Technol Res, 2006; 12(3): 167-172.
6. Marliyati SA, Sulaeman A, Anwar F. Pengolahan Tingkat Rumah Tangga. Bogor: PAU Pangan dan Gizi, IPB, 1992.
7. Kusuma SAF, Irma E, Novianti. (Comparative Study on Antibacterial Activity of *Jatropha curcas* Linn. Leaves Extract and Neomycin Sulfate Against *Staphylococcus aureus* ATCC 25923). IJSEAS, 2017; 3(4): 114-119.
8. Histifarina, Rachman A, Rahadian D, Sukmaya. (Teknologi Pengolahan Tepung dari Berbagai Jenis Pisang Menggunakan Cara Pengeringan Matahari dan Mesin Pengering). Agrin, 2012; 16 (2).
9. Departemen Kesehatan RI. Farmakope Herbal Indonesia. Edisi I. Jakarta: Departemen Kesehatan Republik Indonesia, 2008.
10. Saragih B. (Analisis Mutu Tepung Bonggol Pisang dari Berbagai Varietas dan Umur Panen yang Berbeda). TIBBS Teknologi Industri Boga dan Busana, 2013; 9(1): 22-29.
11. Fansworth NR. (Biology and phytochemical screening of plants). J Pharm Sci, 1966; 55(3): 263-264.
12. Mahapatra, Nguyen. Dying Of Medical Plant. ISHS Acta Holticulturae 756: Internasional Symposium on Medical and Neutraceutical Plants, 2009.
13. Pramono S. Penanganan Pasca Panen Dan Pengaruhnya Terhadap Efek Terapi Obat Alami. Prosiding Seminar Nasional Tumbuhan Obat Indonesia XXVIII, 2006.
14. Herawati, Lilis N, Sumarto. Cara Produksi Simplisia yang Baik. Bogor: Seafast Center IPB, 2012.
15. Kusuma SAF, Ulfa TW, Ade Z. (Evaluation of antibacterial activity of Indonesian varieties sweet potato leaves extract from Cilembu against *Shigella S. dysenteriae* ATCC 13313). Asian J Pharm Clin Res, 2017; 10(2): 377-380.
16. Juliantina F, Citra DW, Nirwani B, Nurmasitoh T, Bowo T. Manfaat Sirih Merah (piper crocatum) Sebagai Agen Anti Bakterial terhadap Bakteri Gram Positif dan Gram Negatif. Jakarta: JKKI, 2009.

17. Sabir A. Aktivitas Antibakteri Flavonoid Propolis Trigona sp terhadap Bakteri Streptococcus mutans (in vitro). Jakarta: Majalah Kedokteran Gigi, 2005.
18. Mayanti T, Julaeha E, Putri Y. Isolasi dan Karakterisasi Senyawa Antibakteri dari Fraksi Etil Asetat Kulit Batang *Lansium Domesticum* Corr. Bandung: Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Padjadjaran, 2011.