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Effect of Drying Method on Proximate Content, Physical Properties and Antioxidant Activities of Powder Gading, Manggala, and Lumut Snake Fruit Kernel

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Abstract

Sun drying is usually used during drying snake fruit kernel powder processing before roasting. However, powder productions become hampered during raining season due to its highly weather-depended. Cabinet drying can possibly be feasible alternative. The aim of research was to compare and describe the effect of sun drying and cabinet drying on proximate content, physical properties, and antioxidant activity of snake fruit kernel powder from Gading, Pondoh Manggala, and Pondoh Lumut varieties.

Each of snake fruit kernel from Gading, Pondoh Manggala, and Pondoh Lumut, was divided and dried under two conditions, i.e. 3 days sun drying and cabinet drying at a temperaure of 60°C for 18 hours. Then dried kernel was roasted at a temperature of 180°C for 30 minutes, grinded, sifted using 40 mesh sieve to obtain snake fruit kernel powder. Samples were analyzed for their proximate content, solubility, total soluble solid and antioxidant activity.

Results of the study showed that there was no significant difference among variables: chemical composition and solubility, but antioxidant activity and total soluble solid were significantly different. Total soluble solid of cabinet-dried snake fruit kernel powder was more higher than that of sun-dried, however antioxidant activity was more lower.

Keywords: *cabinet drying, kernel powder, snake fruit, sun drying, variety*

1. INTRODUCTION

Snake fruit or salacca is one commodity of tropical fruit from Indonesia. Snake fruit has edible portion around 56-65% and the rest is waste in the form of peel and kernel. Snake fruit kernel has portion 25-30% while peel around 10-14% of total weight (Supriyadi *et al*., 2002). Based on the comparison of the amount, snake fruit kernel has greater potential to utilized rather than peel. There are some kind of snake fruit variety, like pondoh Manggala, pondoh Lumut, pondoh Super, Gading, etc.

During this time, utilization of waste have not been done optimally. Peel and kernel of snake fruit usually only used as craft materials. Donoasih, Donokerto village, Turi district, Sleman regency of Yogyakarta (Anonim[a], 2014) and South Tapanuli, North Sumatera (Anonim[b], 2014), already utilize snake fruit kernel into an alternative drink coffee subtitute. Snake fruit kernel powder preferred because it tastes good and has a specific flavor.

According Pulido *et al*., (2003) and Svilaas *et al*, (2004), coffee which has been roasted is a source of antioxidant. Maillard reaction as long as coffee roasting can increase the antioxidant activity (Andueza *et al*., 2004; Lopes-Galilea *et al*., 2006; Lopez-Galilea *et al*., 2008). Zhuang and Sun (2011). Bailley and Won Um (1992) stated that the Maillard reaction products (MRPs) can act as antioxidants.

Sun drying is usually used for drying snake fruit kernel before roasting. However, powder production become hampered during raininy season due to its highly weather-depended. Cabinet drying can possibly be feasible alternative. Cabinet drying is a process that was using mechanical drier. The aim of the research was conducted to compare and describe the effect of sun drying and cabinet drying on proximate content, physical properties, and antioxidant

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activity of snake fruit kernel powder from Gading, pondoh Manggala, and pondoh Lumut variety.

2. MATERIAL AND METHODS

Materials used in this research are Gading, pondoh Manggala, and pondoh Lumut snake fruit kernel, originating from Donoasih, Donokerto village, Turi district, Sleman regency of Yogyakarta. Chemicals for analysis are H_2SO_4 concentrated, boric acid, HCl, NaOH, Folin reagent, Pb-acetate, Na-oxalate, methanol, ethanol, acetate acid, Nelson solution, DPPH solution, etc. Equipment is used for this research are cabinet drier temperature 60^0C, manual roaster, blender "*Kirin*", sieve 40 mesh, laboratory equipment such as analytical balance "*Shimadzu AW 120*", Oven "*Memmert V30*", Muffle Furnace, Soxhlet Extractor, and Kjeltec Distillation Unit.

2.1. Sample Preparation

Snake fruit kernel was washed to remove dirt. After that snake fruit kernel was cut into 4 section using a knife and then it was devided into two portions, one portion was dried by cabinet drier at temperature of 60^0C for 18 hours and other was dried by sun drying for 3 days. Pieces of dried snake fruit kernel were roasted using manual roaster at the temperature of 180^0C for 30 minutes. After roasting snake fruit kernel was milled and sieved at 40 mesh. Snake fruit kernel powder was analyzed for proximats content, total soluble solids and antioxidant activity.

2.2.Analytical Methods

Analysis of water content, ash content, fat, protein and carbohydrate (by difference) and total soluble solid were performed based on AOAC methods (2005). Determination of antioxidant activity was conducted according to DPPH method by Mun Wai, *et. al.,* (2013) with modification.

2.3. Experimental Design and Data Analysis

This research was conducted using a completely randomized design with 2 factors, i.e. varietes of snake fruit and drying method. Data were analyzed by Duncan's Multiple Range Test if the result with ANOVA method shows a significant difference at α=5%.

3. RESULTS

3.1. Proximate Content of Snake Fruit

The content of ash and protein of fresh snake fruit kernel is ilustrated in Table 1, while the content of fat and carbohydrate is shown in Table 2. The content of ash and protein of powder snake fruit kernel is shown in Table 3, while the content of fat and carbohydrate is shown in Table 4.

Table 1. Ash and Protein Content of Fresh Snake Fruit Kernel

No	Varieties of Snake Fruit	Ash (%db)	Protein (%db)
1	Gading	0.43^b	91.07^b
2	Pondoh Manggala	0.46^b	91.65^b
3	Pondoh Lumut	0.30^a	90.60^a

Values in the same column followed by the same letter show no significant difference at a significance level of 5 %.

Table 2. Fat and Carbohydrate Content of Fresh Snake Fruit Kernel

No	Varieties of Snake Fruit	Fat (%db)	Carbohydrate (%db)
1	Gading	0.43^b	91.07^b
2	Pondoh Manggala	0.46^b	91.65^b
3	Pondoh Lumut	0.30^a	90.60^a

Values in the same column followed by the same letter show no significant difference at a significance level of 5 %.

Table 3. Ash and Protein Content of Powder Snake Fruit Kernel

No	Varieties of Snake Fruit	Drying Method	Ash (%db)	Protein (%db)
1	Gading	Cabinet Drying	3.26^a	3.19^a
2	Pondoh Manggala		3.51^b	3.23^a
3	Pondoh Lumut		3.53^{bc}	3.73^b
4	Gading		3.36^a	3.34^a

5	Pondoh Manggala	Sun Drying	3.34^{a}	3.38^{a}
6	Pondoh Lumut		3.62^{c}	3.85^{b}

Values in the same column followed by the same letter show no significant difference at a significance level of 5 %.

Table 4. Fat and Carbohydrate Content of Powder Snake Fruit Kernel

No	Varieties of snake Fruit	Drying Method	Fat (%db)	Carbohydrate (%db)
1	Gading	Cabinet Drying	0.78^{cd}	92.77^{c}
2	Pondoh Manggala		0.70^{bc}	92.56^{bc}
3	Pondoh Lumut		0.42^{a}	92.33^{b}
4	Gading	Sun Drying	0.77^{cd}	92.53^{bc}
5	Pondoh Manggala		0.81^{d}	92.47^{bc}
6	Pondoh Lumut		0.68^{b}	91.83^{a}

Values in the same column followed by the same letter show no significant difference at a significance level of 5 %.

3.2. Total Soluble Solid

The result analysis of total soluble solid of powder snake fruit kernel is shown in Table 5.

Table 5. Total Soluble Solid of Powder Snake Fruit Kernel

No	Varieties of Snake Fruit	Drying Method	Total soluble solid (% db)
1	Gading	Cabinet Drying	25.69^{b}
2	Pondoh Manggala		25.53^{b}
3	Pondoh Lumut		26.28^{b}
4	Gading	Sun Drying	21.74^{a}
5	Pondoh Manggala		20.68^{a}
6	Pondoh Lumut		21.81^{a}

Values followed by the same letter show no significant difference at a significance level of 5 %.

3.3. Antioxidant activity

Result the analysis of antioxidant activity of fresh snake fruit kernel and powder snake fruit kernel is illustrated in Table 6 and Table 7, respectively.

Table 6. Antioxidant Activity of Fresh Snake Fruit Kernel

No	Varities of Snake Fruit	Antioxidant Activity ((% DPPH)
1	Gading	14.22^{c}
2	Pondoh Manggala	11.79^{b}
3	Pondoh Lumut	8.94^{a}

Values followed by the same letter show no significant difference at a significance level of 5 %.

Table 7. Antioxidant Activity of Powder Snake Fruit Kernel

No	Varities of Snake Fruit	Drying Method	Atioxidant Activity (% DPPH)
1	Gading	Cabinet Drying	86.17^{b}
2	Pondoh Manggala		88.49^{c}
3	Poondoh Lumut		81.30^{a}
4	Gading	Sun Drying	89.61^{c}
5	Pondoh Manggala		89.28^{c}
6	Pondoh Lumut		86.85^{b}

Values followed by the same letter show no significant difference at a significance level of 5 %.

4. DISCUSSION

4.1. Proximate Analysis

The results show that the carbohydrate content of fresh snake fruit kernel was very high, while the ash, fat and protein were low. It corresponds to research conducted by Anggrahini et al., (2014) which shows the content of carbohydrate of pondoh hitam snake fruit kernel was 89.87 (%db), madu snack fruit kernel was 90.43 (%db) and pondoh super snake fruit kernel was 90.68 (%db). Different varieties of snake fruit indicated different in the carbohydrate content.

Ash content related to mineral content. In this case, mineral can not be damaged and destructed by the heat. Therefore, heating temperature in principle has no effect on the ash content of powder snake fruit kernel. The fat content increase during the course of roasting. Fathoni (2014) and Indriati (2015) indicated that there was cellulose in the snake fruit kernel. Increasing of fat content in the powder snake fruit kernel due to cellulose of snake fruit kernel was degradated during roasting, made lipid extraction of powder snake fruit kernel more easily. According to Charisma (2013), roasting may decrease cellulose and mannose as well as reduce crude fiber. The protein content of snake fruit kernel decreased after roasting. Decreasing in protein content of powder snake fruit kernel was due to the use of protein for Maillard reaction. According Anonim (2013) the Maillard reaction in the product depend on the protein and sugar content of product.

4.2. Total Soluble Solid

Total soluble solid of powder snake fruit kernel that was dried by sun drying was lower than those of cabinet drying. This is due to the Maillard reaction product powder snake fruit kernel that was dried by sun drying higher than those of cabinet drying, because the color of powder snake fruit kernel that was dried by cabinet drying was more light than powder snake fruit kernel that was dried by sun drying. The name of the Maillard reaction product was melanoidin. Melanoidin is a insoluble componens. Yuanita (2009) explains that the binding of protein and saccharides in cooking, may form insoluble melanoidin, called compound Maillard. However, the varieties of snake fruit was not affecting the total soluble solid.

4.3. Antioxidant Activity

The antioxidant activities were significanly difference of Pondoh Manggala, Pondoh Lumut and Gading. This is due to the total antioxidant component in the snake fruit kernel was different. Origin and varieties of snake fruit play a role in Maillard reaction. Antioxidant activity also indicated on the snake fruit kernel because the snake fruit kernel contains phenolic compounds (Anggrahini, 2015; Fathoni, 2014; Indriati, 2015) and other componens which are not yet known.

Antioxidant activity in snake fruit kernel increased after proces in form powder. At first, the antioxidant activity of snake fruit kernel fresh less than 15 % DPPH (Table 6) then in form of powder increase to be higher than 81 % DPPH (Table 7). This increasing of antioxidant activity could be caused by the Maillard reaction. Bae et al. (2014) stated that the heating process using high temperature can cause oxidation of phenol and the non-enzymatic browning reaction such as Maillard reaction. Maillard reaction product (MRPs) which are capable of acting as an antioxidant (Zhuang and Sun, 2011; Bailey and Won Um, 1992). Antioxidant activity of powder snake fruit kernel that was dried by sun drying was higher than those of cabinet drying. This is due to the Maillard reaction product in powder snake fruit kernel that was dried by sun drying higher than those of cabinet drying.

5. CONCLUSION

Based on the research, it can concluded that carbohydrate was the highest compound (90.60 – 91.65 %db) and the lowest compound was fat (0.30 – 0.46 %db) in snake fruit kernel. Variety of snake fruit affect the proximate content. Total soluble solid of powder snake fruit kernel that was dried by sun drying was lower than those of cabinet drying, whille the antioxidant activity was higher.

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