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The Effect of Temperature and Drying Time on the Characteristic of Reddish Grey Fruit Instant Powder (*Sizyqium cumini*)

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Abstract: The aim of this research was to show the effect of temperature and drying time on reddish grey fruit instant powder. Completely randomize design with 2 factors had been used. The factors were drying temperature, A (A_1 = 60°C and A_2 = 70°C) and drying time, B (B_1 = 3 h and B_2 = 4 h). The result showed, the drying at temperature 60°C during 3 h was the best product. The composition of the instant powder are 5.76 mg/100 g vitamin C; 4.54% moisture content; 8.50% water-insoluble compound; 28.06% sugar content; 0.52% crude fiber and 0.24% total anthocyanin. The value of liquor color is 4.09, flavor is 3.33 and taste is 3.45.

Key words: Instant powder, reddish grey fruit, anthocyanin, vitamin C

INTRODUCTION

Free radicals are molecules or atoms with an unpaired electron. The unpaired electron results in a high level of reactivity because the free radical seeks another electron to fulfill a pair. Free radicals are a natural byproduct of cellular metabolism, but are also generated by the external action of ultraviolet radiation, toxic substances, ozone, cigarette smoke, microbial attacks and even intensive exercise (Kanter, 1998). Antioxidant is compounds that inhibit or delay the oxidation of other molecules by inhibiting the initiation or propagation of oxidizing chain reactions. There are two basic categories of antioxidants: synthetic and natural. In general, synthetic antioxidants are compounds with a phenolic structure of various degrees of alkyl substitution, whereas natural antioxidants can be phenolic compounds (tocopherols, flavonoids and phenolic acids), nitrogen compounds (alkaloids, chlorophyll derivatives, amino acids and amines), or carotenoids as well as ascorbic acid (Velioglu *et al*., 1998).

Reddish grey fruit (*Syzygium cumini*) is a tree of tribe of Myrtaceae. The fruit form is elliptical until circular with lustrous slippery flimsy husk, purple carmine until black appearance. White kernel, yellow grey color until rather red purple and have bitter taste until sour with light sweet.

A purple old of Reddish grey fruit, containing high anthocyanin. Anthocyanin is an important flavonoid, because they having the character as antioxidant so that can prevent damage which because of light radiation of UV and besides as antioxidant, anthocyanin also represent one of the natural colorant dissolve in water. Matured Reddish grey fruit is usually eaten in a state of fresh. If kernel eaten, will cause purple at mouth cavity and tongue.

Fig. 1: Reddish grey fruit

Fruit of Reddish grey ordinary planted in lawn or grow wildly. The Fruit contain a lot of water and have cheap price. During the time the fruit do not be optimal exploited. In order to improving economic value and lengthen to keep the fruit, so that obtained an interesting and nutritious product for consumer appetite, is to process the fruit become juice.

According to Hidayat *et al*. (2005), juice can be differentiated to the three types pursuant to its form that is liquid juice, powder juice and carbonated juice. One of the product type which liked by many society is product

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in the form of instant powder. The form of Instant powder is powder and easy dissolves in water and practical in serve. Reddish grey fruit can be used as raw material in making of instant juice which easy to transport and thereby expected production cost become cheaper.

Additional materials which needed in making of beverage of instant are dextrin, protein, citrate acid and sugar. The making of Reddish grey juice is very easy and use simple tool. The process is started by swirling foamy the materials until foam was formed, next dried and grill.

According to Kumalaningsih *et al*. (2005), the making of soursop instant juice (*Annona muricata*) with draining of spume done at temperature 50°C requiring time during 5-6 h. At the making of aloe instant juice used 50-60°C during 5-6 h. While according to Hidayat *et al*. (2005) making of orange instant juice used drying at temperature 60°C during 6 h.

At preresearch, have been tried to make powder of Reddish grey instant by using temperature 50°C during 5-6 h but the instant powder not run dry, so that temperature boosted up to become 60°C and 70°C.

High temperature can cause the loss of volatile compounds like aroma and quicken reaction of browning process in food materials, while too low temperature can cause drying process more longer so that possibility the happening of damage (Kumalaningsih *et al*., 2005).

The objectives: The objective of this Research was to know the effect of temperature and drying time toward the characteristic of Reddish grey fruit instant powder.

MATERIALS AND METHODS

Raw material which used in the making of Reddish grey fruit instant powder is the fruit of Reddish grey with old purple color from Gunung Pangilun, Padang and West Sumatra, Indonesia. We also used sugar, dextrin, protein and citrate acid.

Chemicals: Iod solutions 0.01 N, distilled water, solution of luff, starch solution 1%, HCl 6.76%, potassium sulphate 10%, Natrium Thio sulphate 0.1 N, potassium of iodide 20%, Condensed HCl, NaOH 20%, H_2SO_4 25%, amylum 0.5%, Condensed H_2SO_4, KCl, $CH_3CO_2NA.3H_2O$, K_2SO_4, Na Acetate and Alcohol. Equipment needed in this research were dryer cabinet, blender, mixer, plastic, knife, brass, cloth filter, aluminium spoon, sieve 60 mesh. Appliance used Erlenmeyer, measure glass, drip pipette, pH metre and oven.

Statistical analysis: The data was analyzed by using the Completely Randomized Design consists of 2 factors and each factor consists of 2 levels. Three times replication to every treatment. A: A_1 = 60°C and of A_2 = 70°C and Drying time B: B_1 = 3 h and B_2 = 4 h. The data was analyzed by using F test at level 5% and continued with Duncan's New Multiple Range Test (DNMRT).

Reddish grey fruit instant powder: After washing the fruit, separated the pulp and seed. And then blend the pulp with addition of water and filtered the solution. Juice of reddish grey which have mixed with dextrin, citrate and protein in mixer during 15 min until foamed. Formed spume in decanting in brass to be dried. Dried at 60°C and 70°C for 3 and 4 h. Dried the extract in flimsy plate, then blend with addition of sugar. Afterwards filtered the powder with 60 mesh sieve. The powder was packaged by using polyethylene.

Determination of vitamin C (Sudarmadji *et al*., 1997) of Reddish grey fruit juice and the instant powder: Dissolved 10 g of material in 100 ml distilled water. From 25 ml extract ad 2 ml starch solution 1%. Then was added with iod solution 0.01 N until blue appearance. Every 1 ml 0.01 N of iod, equivalent to 0.88 mg ascorbic acid. Vitamin C formula:

$$\text{Mg ascorbic acid/100 g} = \frac{\text{ml iod 0.01N x 0.88 x Diluted x 100}}{\text{Sample weight}}$$

Determination of moisture content by using oven method (Sudarmadji *et al*., 1997)

Water-insoluble compound (SNI 01-2891-1992): Dissolved 20 g instant powder of Reddish grey in 200 ml distilled water and then filtered. The residue was dried until the weight constant.

$$\text{Water-insoluble compound} = \frac{\text{Weight of residu (g)}}{\text{Sample weight}} \text{ x } 100\%$$

Determination of sugar content by using Luff Schroll method (Sudarmadji *et al*., 1997): Dissolved 2 gram of Reddish grey fruit instant powder in 250 ml distillate water and then filtrated. 50 ml extract was added with 10 ml HCl 6.76% and then boiled at 60-70°C for 10 min. After decreasing the temperature the solution add with NaOH 20%, shake for 12 times. Dissolve 25 ml luff solution for 10 min. After condensing add with 25 ml H_2SO_4 25% and 15 ml KI 20%. Titrated with thio 0.1 N with amylum 0.5% until the color of the solution was white.

Determination of crude fiber (Sudarmadji *et al*., 1997): Dissolved 2 g of reddish grew fruit instant powder in 200 ml H_2SO_4 (1.25 g H_2SO_4/100 ml = 0.255 N H_2SO_4) boiled for 30 min. Filtered and washed the residue until neutral. Washed the residue with 200 ml of boiled NaOH (1.25 g NaOH/100 ml = 0.313 N NaOH) and stirred for 30 min. Washed the residue with K_2SO_4 100% and washed with boiled distilled water and then with 15 ml alcohol 95%. Dried in 110°C for 1-2 h.

Residue weight = Weight of crude fiber

Total anthocyanin with pH differential method (Giusti and Wrolstad, 2001)

Total anthocyanin concentration: Dissolved the sample with KCl (pH 1) for 15 min and Na-acetate (pH 4.5) for 5 min. Measured every solution in 510 and 700 nm with buffer pH 1 and buffer pH 4.5 as standard.

$$A = (A_{510} - A_{700})_{pH\ 1.0} - (A_{510} - A_{700})_{pH\ 4.5}$$

Total anthocyanin formula:

$$\text{Total anthocyanin} = \frac{A}{\varepsilon \times L} \times MW \times DF \times \frac{V}{Wt} \times 100\%$$

Explanation:

ε = Absorptivity molar Sianidin-3-glukosida = 26900 L/(mol.cm)
L = Kuvet width = 1 cm
MW = Molecule weight of Sianidin-3-glukosida = 449.2 g/mol
DF = Dilluted factor
V = Volume (L)
Wt = Sample weight (g)

Sensory evaluation: Sensory evaluation was done by 15 panelists. Each powder dissolved with water (1:6). Put the liquor in glass to saw the color. The panelist gave value for the taste, color and flavor.

RESULTS AND DISCUSSION

Raw material: The Reddish grey fruit juice contained 21.07 mg /100 g vitamin C and 0.85% total anthocyanin.

Product: The results indicate that there was no interaction between temperature and duration of drying on vitamin C content, moisture content, fiber content, water-insoluble compound and sugar content of Reddish grey fruit instant powder. But temperature of drying and the duration were significantly different in the vitamin C content and moisture content of the instant but not significantly different on crude fiber content, water-insoluble compound and sugar content (Table 1).

Table 1 showed that higher temperature and longer time of drying resulted progressively lower vitamin C and moisture content in instant powder. Compared with vitamin C of Reddish grey fruit juice, its degradation very high where the level of vitamin C in the fresh juice was 21.07 mg/100 g. After drying to become instant powder its range from 3.39 to 5.76 mg/100 g. According to Winarno (1997) the character of vitamin C is easy to broke; very dissolve in water, vitamin of C oxidized easy and the process quickened by heat, light, alkali, enzyme, oxidated by copper and iron. The oxidation can be inhibit in low pH and low temperature.

There are two kinds of Vitamin C that are L-Ascorbic acid and L-Dehidroascorbic. Ascorbic acid is easy oxidized by reversible to become L-Dehidroascorbic acid, is chemically very unstable and can experience of furthermore change become acid of L-Diketogulonic that have no activity as Vitamin C (Winarno, 1992).

Crude fiber was a compound which cannot hydrolyzed by alkali which consist of cellulose, lignin and pentosan. The result showed that 60°C and 70°C during 3 and 4 h have no effect on crude fiber value of reddish grey fruit instant powder.

Table 1 showed that sugar content of reddish grey fruit instant powder range from 26.56 to 28.06%. No significant difference for sugar content among the treatment, this matter caused by the amount of sugar enhanced the same amount that is 50% from yielded powder weight.

Sugar content for each reddish grey fruit instant powder has fulfilled standard quality of SII 0364-80 maximal 45%. The purposed of were to neutralized the bitter taste from the beverage.

Table 1 shows that there were no interaction between temperature and drying time toward part that insoluble in water.

Anthocyanin: From statistical data, there were no interaction between temperature and drying time to anthocyanin of instant powder of the reddish grey fruit, but there was significantly difference among the treatment (Table 2).

Table 2 showed that high temperature, decreased the total anthocyanin and longer time for drying, getting lower the total anthocyanin. Same results showed by Tanchev (1983), for anthocyanin color loss in various fruits heated at higher processing temperatures (78, 88, 98 and 108°C). Temperature had a major influence on the degradation kinetics. Anthocyanins possess two benzene rings joined by a linear three carbon chain (C2,

Table 1: Vitamin C, moisture content, fiber content, water-insoluble compound and sugar content of reddish grey instant powder at different temperature and time of drying

Treatment	Vitamin C (mg/100 g)	Moisture content (%)	Crude fiber content (%)	Water-insoluble compound (%)	Sugar content (%)
Drying temperature					
60°	5.76a	4.54a	0.52a	8.50a	28.06a
70°	4.53b	3.32b	0.58a	8.33a	27.27a
Drying time					
3 h	5.69a	3.85a	0.55a	8.50a	26.56a
4 h	3.39b	2.67b	0.54a	8.33a	27.52a

The number was followed by the same alphabet, is not significantly different at α = 5% by using DNMRT

Table 2: Total anthocyanin at different temperature and drying time

Treatment	Total anthocyanin (%)
Drying temperature	
60°	0.24a
70°	0.17b
Drying time	
3 h	0.22a
4 h	0.15b

The number was followed by the same alphabet, is not significantly different at α = 5% by using DNMRT

Table 3: The color and flavor of instant powder at different temperature and drying time

Treatment	Color	Flavor
Drying temperature		
60°	4.42a	3.36a
70°	3.33b	3.09a
Drying time		
3 h	3.67a	3.27a
4 h	3.33a	2.82a

The number was followed by the same alphabet, is not significantly different at α = 5% by using DNMRT

C3, C4), represented as the C6-C3-C6 system. Anthocyanins are polyhydroxylated or polymethoxylated glycosides of anthocyanidins (aglycone of corresponding anthocyanin) which are oxygenated derivatives of 2-phenylbenzopyrylium or flavylium salts and approximately 400 individual anthocyanins have been identified in nature (Brouilard, 1982; Matheus *et al*., 2001). Anthocyanins are glycosides of polyhydroxy 2-phenylbenzopyrylium cations belonging to a larger group of flavonoids, a subgroup of polyphenol (Wu *et al*., 2002). Anthocyanin is a major secondary metabolite in plants, may be red, purple, or brown in color and have beneficial effects in humans (Joseph *et al*., 1998; Wrolstad, 2011). Anthocyanin exhibits high levels of antioxidant activity, holding a promise for the development of natural colorants and antioxidants (Abdel-Aal *et al*., 2008).

Sensory evaluation

Instant powder: The statistical results showed that no interaction between temperature and drying time toward color and flavor of instant powder, but the temperature have significantly different towards the color of powder but not significantly different on the flavor of the instant powder (Table 3).

The result showed that no interaction between temperature and drying time towards color, flavor and taste of liquor, but the effect of drying temperature towards color of liquor was significantly different, but not significantly different towards flavor and taste. Drying time have no significant difference towards color, flavor and taste of instant powder.

The value from panelist for color of instant powder was 3.33-4.42 with purple appearance until pink. For liquor the value were 3.00-4.09 with red until pink appearance. Different color of instant powder was caused by drying temperature and time. High temperature and time, the color of instant powder changed from purple to pink. The purple caused by the anthocyanin content in instant powder. According to Markakis, 1982, cited by Indrayani (2008), the decrease of color caused by the decomposition of anthocyanin from aglycon to calcone (colorless). The color of food product was the main interested for consumers and the value is very subjective (Soekarto, 1981). Flavor and taste showed that there were no significant difference between drying temperature and drying time.

Table 4: Color, flavor and taste of liquor of instant powder of reddish grey fruit at different temperature and drying time

Treatment	Color of liquor	Flavor of liquor	Taste of liquor
Drying temperature			
60°	4.09a	3.33a	3.45a
70°	3.27b	3.33a	3.45a
Drying time			
3 h	3.73a	3.42a	3.18a
4 h	3.00a	3.17a	2.82a
KK	23.46%	18.16%	18.16

The number was followed by the same alphabet, is not significantly different at α = 5% by using DNMRT

Conclusion: The effect of temperature and drying time on vitamin C, moisture content and total anthocyanin are different significantly, but there are no significant difference on water-insoluble compound, sugar content and crude fiber of Reddish grey fruit instant powder. According to sensory evaluation to liquor and instant powder of Reddish grey fruit instant powder, the best product was at temperature 60°C with 3 h of drying time with vitamin C 5.76 mg/100 g, moisture content 4.54%, water-insoluble compound 8.50%, sugar content 28.06%, crude fiber 0.52% and total anthocyanin 0.24%.

Appendix 1:

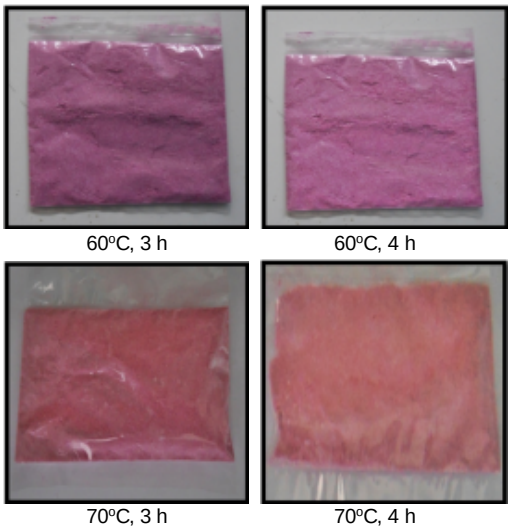

Fig. 1: Instant powder

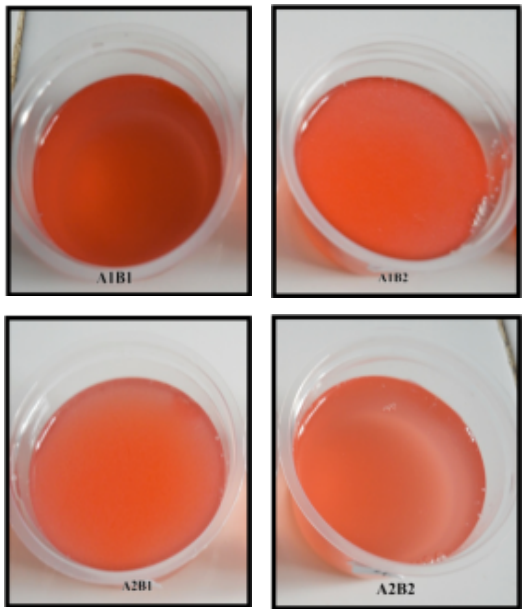

Fig. 2: Instant drink

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