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Effects of Drying Time on Yield and Moisture Content of "Sumahe" Powdered Drink Using Spray Dryer

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Abstract-As people today are becoming more health-conscious, various efforts have been made to keep up one's health, such as by consuming highly nutritious food and drinks. One of the nutritious food sources produced from bees is honey, bioactive compounds of polyphenols, glyoxal and methylglioxal. Honey could be used as a health drink by mixing with ginger. This health drink is also produced as powdered drink to simplify storing, reduce the use of plastic packaging, and to add product value to increase market share. The aim of this research was to analyze the effects of drying time for 5, 15, and 25 minutes with an addition of maltodextrin on the yield, density, and moisture content of "Sumahe" instant powdered drink, made from cow's milk, honey, and ginger. Preparation of a mixture of packaged milk (1L), honey (30 mL), ginger water (50 mL), and maltodextrin (220 mL = 20%(v/v). Analysis of the moisture content and density of the mixture. Drying process using spray dryer at inlet temperature of 125°C, outlet temperature of 80°C, which are varied drying time for 15, 15 and 25 minutes and varied heating time with oven for 15,30, and 60 minutes. The results showed that the longer the drying time, the lower the moisture content of the drink. Meanwhile, the longer the drying time, the higher the yield became. A taste test of "Sumahe" also indicated that from 25 minutes of drying time, most of the panelists rated the drink as tasteful and delicious.

Keywords: sumahe powder, ginger, honey, spray dryer, milk

Introduction

People today are becoming more health-conscious. Therefore, various efforts have been made to keep up one's health, such as by consuming highly nutritious food and drinks. One of the nutritious food sources produced from bees is honey. It is said in the Quran in Ayaat 69 of Surah An-Nahl that honey is a drink from bees' stomach that can be used for healing people. According to Oskouei, T.E and Najafi, M. (2013), honey is a byproduct of flower nectar and the upper aero-digestive tract of the honeybee, which is produced from a dehydration process inside the beehive. The complex chemical composition of honey has been used as food and medicine. Honey possesses an inhibitory effect on around 60 species of bacteria, fungi, and viruses. Moreover, it also serves as an antioxidant. A research by Alvarez-Suarez, J.M., et al. (2014) shows that the chemical composition of pure honey consisting of bioactive compounds of polyphenols, glyoxal and methylglioxal, are essentially important in treating human diseases. Honey could be used as a health drink by mixing with ginger. According to Abdul Sani, N.F., et al (2014), a mixture of Gelam honey and ginger has been proven to have antioxidant activity and anti-diabetic effect. There have been many drinks that incorporate honey in liquid form. Although it is easy to drink, a liquid honey drink has the disadvantage of requiring a high-volume bottle packaging. Further researches suggested to produce honey drinks in the form of powdered drink to simplify storing, reduce the use of plastic packaging, and to add product value to increase market share. A research by Nurhadi, B. et al (2012) showed that the processing of liquid honey into honey powder is difficult due to the high content of sugar which causes the stickiness of the dried honey. The production of honey powder requires emulsifier, anti-caking, and filler materials to increase transition temperature of the mixture and ease the drying process to prevent

stickiness. Honey powder is processed using vacuum and spray drying method, usually were characterized in terms of their chemical and physical properties, such as moisture content, pH, total and reducing sugar content, and others. The yield of honey powder using vacuum drying is higher than that using spray drying.

An addition of Arabic gum could increase the hygroscopicity of honey powder compared to maltodextrin. Furthermore, Arabic gum also increases the wettability and dispersing time of honey powder. Samborska, K. et al. (2015) studied honey spray drying with the addition of maltodextrin and Arabian gum as drying agents. Some of the examined parameters are the concentration of solution subjected to drying, the type and content of the drying agents upon the physical properties of the product. A honey content of more than 50% d.b. is obtained with the addition of maltodextrin and Arabic gum at inlet air temperature of 180°C, feed rate of 1 mL/s, and rotational speed of 39,000 rpm. The properties of honey powder were examined in terms of moisture content, density, Hausner ratio, hygroscopicity, and wettability. The use of Arabic gum produced a higher content of honey at 67% compared to the case of maltodextrin at 50%. However, the obtained powders with Arabic gum contained worse physical properties: higher hygroscopicity and cohesion, and also longer wetting time. The previously mentioned researches presented the advantages and disadvantages of honey powders. Among the disadvantages is the processing could cause stickiness, thus an addition of emulsifier and filler materials is necessary to increase the transition temperature. The spray drying method results in lower yield compared to the yield using the vacuum drying method, while using Arabic gum results in a higher yield of honey powder compared to maltodextrin. Therefore, it is necessary to research the production of honey powders by modifying the process and additional ingredients to prevent stickiness of honey powder, which is by producing instant honey drinks with an addition of cow's milk and Arabic gum emulsifier. Ginger (*Zingiber officinale)* is also added into the mixture as a flavor enhancer. The aim of this research was to identify the effects of drying time using spray dryer with an addition of maltodextrin on the yield, density and moisture content of "Sumahe" instant powdered drink, made from cow's milk, honey, and ginger.

Methodology

The following research used honey, plain cow's milk, and maltodextrin as the materials. Meanwhile, spray dryer, erlenmeyer flask, moisture analyzer and analytical balance were the research tools.

Methods of Research

The procedures that will be used in this research are:
Preparation of a mixture of packaged milk (1L), honey (30 mL), ginger water (50 mL), and maltodextrin (220 mL = 20%(v/v). As seen in Figure 1.

Figure 1: A mixture of milk, honey, ginger water, and maltodextrin

The analysis measured to get the characteristics of "SUMAHE" is by measuring water content and density. Moisture content was measured by drying "SUMAHE" into the oven at 110 ° C. Besides that, density is measured using picnometer. Table 1 presents the results of the initial characterization of a mixture containing packaged milk, honey, ginger, and maltodextrin.

Table 1. Results of the initial characterization of "Sumahe"

No	Parameter	Value	Method
1	Moisture Content (%)	28.8	Oven
2	Density (g/L)	1,0988	Pycnometer

Analysis of the moisture content and density of the mixture. Drying process using spray dryer (Figure 1) at inlet temperature of 125°C, outlet temperature of 80°C, which , which are varied drying time for 5,15, 25 minutes and varied heating time with oven for 15,30, and 45 minutes. The spray drying inlet temperature is close to the optimum spray drying inlet temperature to produce *Aloe vera* powder at 120°C from a research conducted by Hendrawati, T.Y. (2014)

Figure 2. Spray dryer

Analysis of moisture content, yield, and taste test are performed on "Sumahe" powdered milk drink which are obtained from spray drying method. A taste test is used to measure consumer's preference of the product by using a taste scale. The taste would be scaled as delicious, tasteful, bland, and distasteful. In the data processing, the scale is converted into a scale of 1 to 4 for 10 panelists.

Results and Discussion

The moisture content and density on "Sumahe" instant powdered drink is analyzed as shown in Table 2 and "Sumahe" powdered drink is illustrated in Figure 3. Table 2 and the product illustration in Figure 3 indicate the high constant value of density, due to the insignificant decrease in the volume of moisture content.

Table 2. Results of the analysis of physical properties of instant powdered drink using spray drying method

No	Heating Time (minute)	Drying Time I (5 minutes)		Drying Time II (15 minutes)		Drying Time III (25 minutes)	
		Moisture Content (%)	Density (g/L)	Moisture Content (%)	Density (g/L)	Moisture Content (%)	Density (g/L)
1	15	53.5	1.2788	13.7	1.2788	32.4	1.2788
2	30	13,5	1.2788	8.6	1.2788	28.9	1.2788
3	60	4.6	1.2788	4.4	1.2788	18.5	1.2788

Figure 3. Results of drying on the mixture of packaged milk, honey, ginger, and maltodextrin

The moisture content decreases after the water contained in a mixture of milk, honey, and ginger is evaporated from the heat. The following Figure 4 graphs the relation between heating time and moisture content on Drying Time I (5 minutes), II (15 minutes), and III (25 minutes).

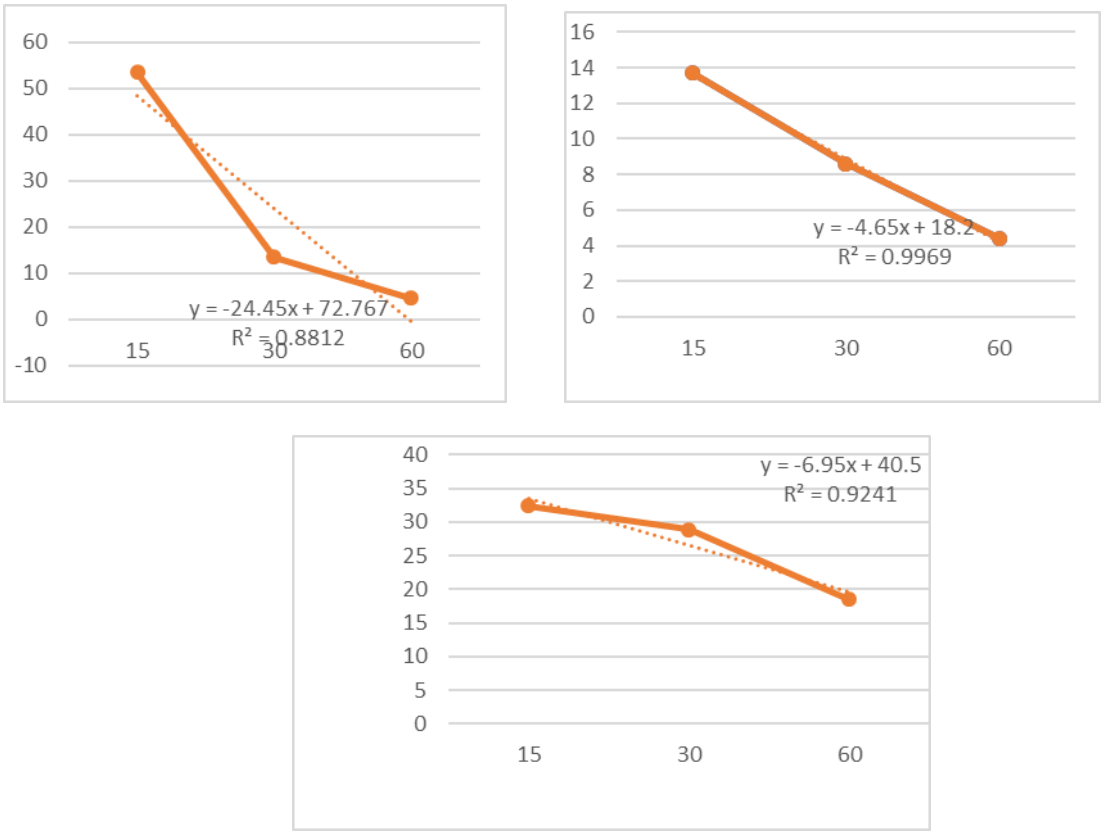

Figure 4. Graphs of the relation between heating time and moisture content on Drying Time I (5 minutes), II (15 minutes), and III (25 minutes).

Figure 4 shows a portion of product taken at 5 minute drying time indicating a decrease in moisture content with a slope of -24,63, 15 minute drying time with a slope of -4,6, and 25 minute drying time shows a curve with a slope of -6,9. The graphs show a significant decrease in moisture content at 5 minute drying time, compared to the case with 15 and 25 minute drying time. It is occurred because the nozzle space is still empty which results in decreasing evaporation process, because the heat spraying is disrupted by the powder that begins to form. The graphs show a significant increase in moisture content at 15 minute drying time, compared to the case with 25 minute drying time. It is occured because the pressure has decreased, this can occur due to reduced .

The yield change of "Sumahe" powder is shown in Figure 5.

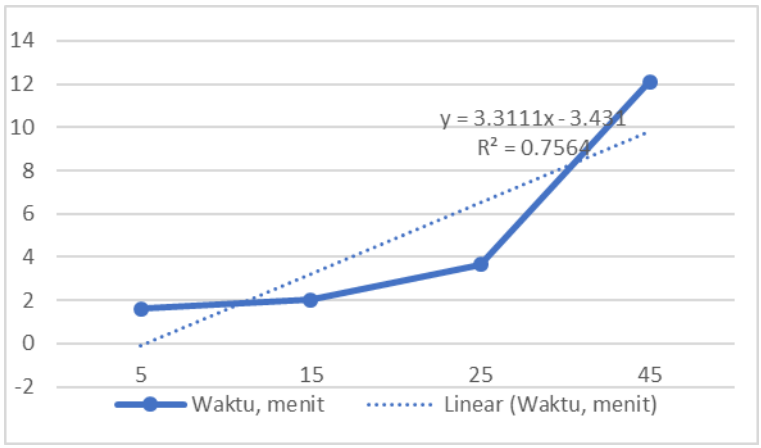

Figure 5. Relation between drying time and the yield

According to Figure 5, the higher the drying time the higher the yield would become, following the equation y = 3.3111 x- 3.461 and R^2 = 0.7564. The result shows a positive correlation between drying time and the yield.

Taste Test Results

In addition to the quantitative testing of the correlation of several variables, a preference test is also conducted by 20 panelists on the taste of "Sumahe" powdered drink. The taste test results are illustrated in Figure 6.

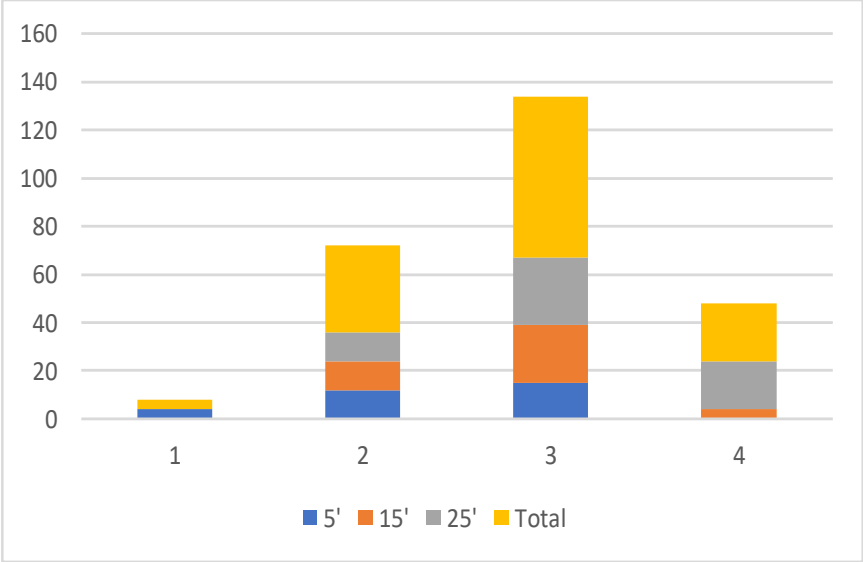

Figure 6. Bar diagram of the preference level of panelists on "Sumahe" powdered milk drink

Labels
1 = Distasteful
2 = Bland
3 = Tasteful
4 = Delicious

Figure 6 shows that at 5 minute drying time a majority of the panelists rated "Sumahe" powder as tasteful, while the remaining rated the drink as distasteful or bland. At 15 minute drying time, the panelists

rated it as distasteful, bland, and tasteful, while a minority rated delicious. Subsequently, at 25 minute drying time, a majority of the panelists rated "Sumahe" as tasteful and delicious.

Conclusion

The production of "Sumahe" powdered drink made from milk, honey and ginger using spray drying method is concluded as follows: The higher the drying time, the lower the moisture content of "Sumahe" powdered drink would become. The higher the drying time, the higher the yield of "Sumahe" powder. A taste test on "Sumahe" powdered drink indicates that at 25 minute drying time, most of the panelists rated the drink as tasteful and delicious.

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