

# The Effects of Fillers Concentration to Passion Fruit Granules Quality of Freeze Drying Results

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## Abstract

Freeze drying is started with the process of freezing the material then continued with a control pressure of vacuum conditions and at temperatures below the freezing point in order to change phase from a solid into a vapor (sublimation process). The sublimation process ended when the material becomes supersaturated and begins to crystallize. The aimed of this research was to study the effects of variation of lactose concentration as fillers on the quality of passion fruit granules of freeze drying results. Research done by adding fillers into the passion fruit pulp on variation of concentrations of 10, 20, 30, 40, and 50%, then dried using vacuum freeze dryer. The parameters observed were moisture content after drying. The experimental design used was complete random design single factor with three replicates. The results showed that the variation of filler concentration had different significantly to moisture content of passion fruit granules of freeze drying results. The higher of the filler concentration of added, the lower of moisture contents of passion fruit granules was produced.

**Key words:** passion fruit, granules, lactose, freeze dryer

## 1. Introduction

Passion fruit (*Passiflora edulis*) including of Indonesia's tropical fruit has a high economic value. This fruit can be consumed fresh or food processing and consumer like it because it contains a fairly complete nutrients such as beta carotene, potassium, fiber, and vitamin C. It can decrease high blood pressure so it is very beneficial for human health (Pruthi, 2009; Karsinah et al., 2013).

Since passion fruit has been processed into syrup which is the gift Famous in South Sulawesi (Tanjung, 2010). generally, these extracts are packaged in glass bottles, neither practice to distributed, heavy and break easily, nor it meet the standards of ISO 9000 as exports extract due to used packaging materials that are not green friendly.

The right solution to overcome these problems is processing passion fruit pulp become granules by drying. Food dried have more advantages than wet extracts. In addition to having is longer because of low water levels, as well as more practical to stored and distributed. While the wet extract has a

high water levels due to the bacteria to multiply easily if it stored in a long time, so there will be decrease in quality (Winarno, 1997).

As with other fruits, passion fruit is potential to process into dried extract that can be used as raw material for processed food extracts diversification, such as effervescent. However, the problems is often arise during the processing of the fruits is less quality either physical or chemical fruit (Ansar et al., 2004; Sopian et al., 2005).

Passion fruit dried into powder using a spray dryer (Ansar et al., 2004). However, the yield obtained very little because many particles are still sticky on the cyclone dryer. Color, aroma, and flavor extracts also changes due to the influence of dryers' temperature is high (80°C).

Hariady (2013) explained that the foodstuff that are sensitive to high temperature, so the most effective and efficient methods is the freeze drying vacuum systems. Freeze drying does not use high temperature for evaporate of moisture of materials. The Method of freeze drying is done by maintaining fixed vacuum dryer room and control the pressure and the temperature below triple point to speed up the process of sublimation. So that the changes physical and chemical to ingredients of freeze drying results are not much changed.

Some researchers have revealed that the quality of extract of freeze drying results are influenced by the type of material, filler material with filler ratio, time and drying temperature (Guido, 2013; Sembiring, 2009; and Shahidi and Han, 1993). The addition of filler into the thick extract of passion fruit before it drained granules s can produce expected can produced dried food extracts that according to standard. Based on this fact, it is the purpose of research is to know the effect of the variation of concentration of lactose as material filler of passion fruit granules quality of freeze drying results.

## **2. Methodology**

Research has been done in the laboratory of Food Chemistry and Biochemistry of Mataram University in March-May 2015. Passion fruit pulp is used as the raw materials. It is from farmers in Malino, South Sulawesi. While lactose is used as filler material. The equipment are used was the pulper sieve, vacuum freeze dryer, rote vapor, freezer and oven.

Research procedure consists of 3 stages. The first stage is the creation of passion fruit pulp. Fruit sorted then it washed. Furthermore the fruit cut become  $\frac{1}{4}$  section and then flesh of the fruit pried

using a spoon. The separation of seeds and the flesh of the fruit were done using the pulper sieve. Then fruit pulp is stored into the freezer to wait the next process.

The second stage is processing the fruit into thick extract pulp. Pulp fruit is weighed then added lactose as filler material with variations in concentrations of 10, 20, 30, 40, and 50%. Fruit pulp and filler are mixed and then stirred for 15 minutes using a rote vapor. Then the mixture is frozen into the freezer then dried using vacuum freezer dryer for 48 hours.

The third stage is the measurement of the moisture contents using the oven method (AOAC, 1995). This study is used a Complete Randomized Design with 5 treatment variations. The data results were analyzed using the analysis of variance. If the value of F-count is greater than the F-table means there is a significant difference, so have to tests further using the test DMRT (Duncan's Multiple Range Test) at 5% significance level.

### 3. Results and Discussion

Mechanism of freeze drying process starts with the freezing of the material, then the material is put into the dryer. Some of the chemical and physical characteristics of freeze drying results that need to be analyzed, however in this paper, was more focused on the analysis of the final water content after drying. The measurement of moisture content is very important to determine the quality of a food extract. The high moisture content in dried food extracts may result the growth of mushroom that producing mycotoxin which is very dangerous to human health. The Results of the measurement of moisture content of granules of passion fruit after freeze drying is presented in table 1.

Table 1. Water content of passion fruit granules after drying

| No. | Lactose Concentrations (%) | Moisture Content (%) |
|-----|----------------------------|----------------------|
| 1   | 10                         | 22.3                 |
| 2   | 20                         | 21.7                 |
| 3   | 30                         | 19.1                 |
| 4   | 40                         | 16.4                 |
| 5   | 50                         | 14.5                 |

Based on table 1 that the higher the concentration of filler added, the lower the moisture content of dried extract the resulting end. Addition of a lactose filler into the viscous extract is dried before it

can also lower Sticky and shorten the drying time. The addition of filler materials to give greater opportunities to tie the water contained in the extract, so that the water evaporates faster. Thus, the time is short and quality of the resulting dried extract standardized SNI approach to moisture content of granules (under 14.5%). Drying of freeze dryer more secure against the risk of degradation of the compounds in the material because the temperature used for the drying process is very low (Sumaryono, 1996).

The filler materials on concentration 10% have low power to bind the water, so the process of evaporation of moisture content is also slow. The result is the process of drying materials longer. It affects the quality of passion fruit granules is produced because drying time too long, so decreasing the quality of ingredients. The other way, the higher the concentration of filler added to the thick extract of passion fruit, the shorter drying time, so that the damage the quality of extracts can be minimized. According to Master (1979) the addition of filler material can shorten the drying process and prevent the damage to the material because a short drying time.

The addition of 30% lactose, moisture content of dried extracts is produced still fairly high, clot easily, and hygroscopic. While the concentration 40%, ranges between 15-17%, but it's still hygroscopic, so when it contact with air directly bind the water back.

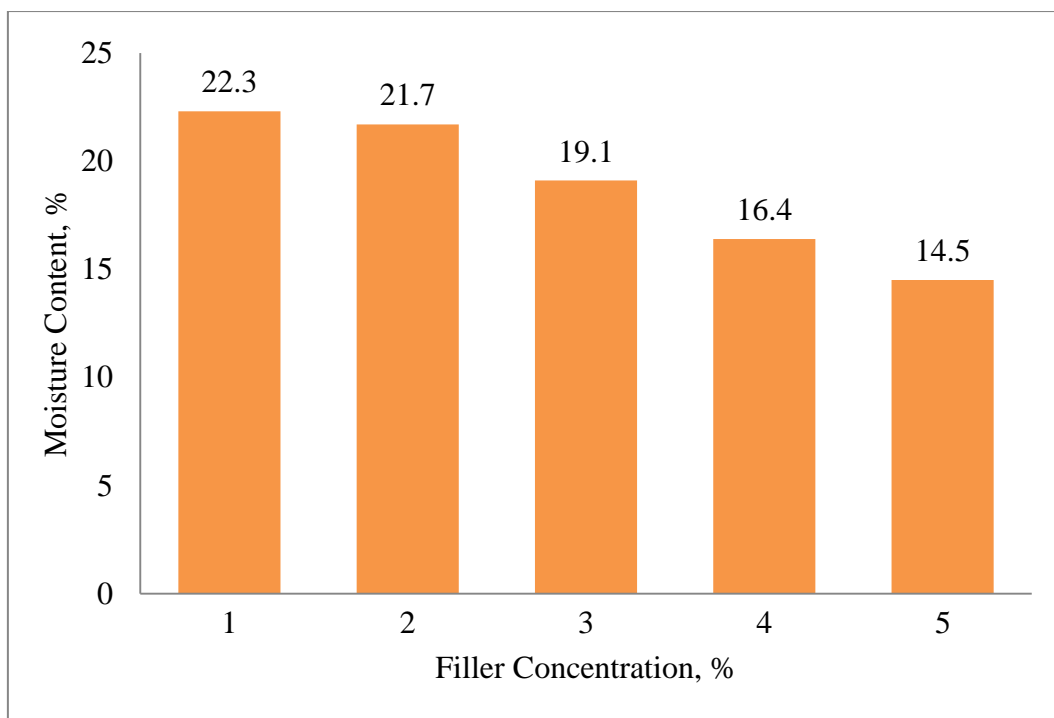


Figure1. The influences of filler concentration with moisture content of passion fruit granules

The optimal concentration of filler material is 50% based on moisture content and the speed to granules. This is in accordance with the benefits of encapsulation that according to Shahidi and Han (1993) is to maintain the stability of materials and speed up drying.

The statistics analysis showed that significantly, the variation of filler concentration is influences to the water content of dried extracts were produced (Figure 1). The higher of filler concentration filler are used, the lower the moisture content is produced. Using high filler concentration that can bind water in a thick extract of passion fruit, so that the moisture content of materials is evaporated quickly.

Based on analysis of variance derived F-value tables (3.885) is larger than F-count down (0.003) at 5% significance level. This suggests that the use of filler is influenced significantly to the water content of passion fruit granules of freeze drying results. To find out the most influential treatment conducted further DMRT analysis (table 2).

Table 2. Result of DMRT analysis

| Filler Concentration (%) | Replication |       |       | Average*)  |
|--------------------------|-------------|-------|-------|------------|
|                          | I           | II    | III   |            |
| 10                       | 22.32       | 21.38 | 22.15 | 21.95 abcd |
| 20                       | 21.75       | 21.67 | 21.53 | 21.65 bcd  |
| 30                       | 19.14       | 19.66 | 19.34 | 19.38 cde  |
| 40                       | 16.23       | 16.45 | 16.92 | 16.53 de   |
| 50                       | 14.52       | 14.73 | 13.26 | 14.17 e    |

\*) The same of notation showed not different significantly

Moisture content of materials has an important role to maintaining the self-life extracts. According to Winarno (2004) water contents in food stuffs were determined acceptability, freshness, and endurance extract against attacks microbes. Evaporation of moisture contents during drying is determined by temperature, humidity, and air velocity and air flow. According to Brooker et al. (1974), the rate of drying can occur quickly take place if the high dryer temperature and low air humidity. For the process of freeze drying, according to Muchtadi (2002), dried material is first frozen and then proceed with drying using pressure and low temperature, so that the moisture content have become ice directly into sublimation process.

Passion fruit granules characteristics that resulted from this frozen shaped porous, so it lighter. This opinion is accordance with the expressed by Hariadi (2013) that granules s is a very light weight, so it can reduce shipping and transportation cost. In addition the porosity of the material also can be easy the process of extracts rehydration, so simplify the process to consume.

#### **4. Conclusions and Implications**

The variation of filler concentration was effected significantly to the moisture content of passion fruit granules of drying results. The higher the filler concentration, the lower of the moisture content of passion fruit granules was produced. The best treatment is using filler concentration are 50% to produce an average final moisture content of passion fruit granules are 14.17%.

For further study is needed the research about the effects of filler to changes of vitamin C to passion fruit granules of freeze drying results.

#### **Acknowledgments**

The authors thanks to the Ditlitabmas DIKTI for the support fund have been granted through the skim STRANAS year in 2015, so this research can be carried out properly. Similarly to all participant who have helped this activities, he says thank you.

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