

Dragon Fruit Peel Extract as Antioxdant Natural Cosmetic Using Rotary Evaporator

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ABSTRACT

The use of cosmetics for young people in the current era has become a trend in itself. Many cosmetic brand products on the market make people have to be literate about what content they contain. Generally, cosmetics with natural ingredients are the target of young people. Extraction of dragon fruit peel is an alternative to using waste to produce advanced materials in the field of natural cosmetics. The aims of this research is to determine the evaporation rate using a rotary evaporator by varying the amount of solvent and evaporation time in order to obtain the appropriate extract. The procedure of this research is by preparing the raw material used, namely dragon fruit peel waste. The dragon fruit peel that have been smooth are added with solvents using 70%, 60%, and 50% ethanol and 1% HCl for 24 hours with a certain ratio. After that it is filtered to get the maserate. Then the results of the macerate were put into the evaporator at a temperature of 80 - 90 °C for a certain time (10, 20, 30, and 40 minutes) and the rate of evaporation was observed. The results of the analysis will be used to determine the rate of evaporation and the quality of the dragon fruit peel extract obtained. From the evaporation results, the maximum evaporation rate was obtained at 40 minutes at a variation of 70% ethanol, which was 0.5 mL/minute. The dragon fruit peel's antioxidant content was obtained by an average of 92% - 93%.

Keywords: *Extraction, Dragon fruit peel, Antioxidant, Evaporation*

1. INTRODUCTION

Indonesia's population of 267 million people with a population of 130 people are women, making Indonesia a lucrative market for cosmetic products [1]. The Ministry of Industry noted that in 2017, as much as 95 percent of the national cosmetic industries are the small and medium industry (IKM) sector.

Consumption of dragon fruit in large levels will produce dragon fruit peel waste that is rarely used. Dragon fruit skin is widely used as fertilizer and food coloring. In fact, dragon fruit peel also has antioxidant capacity, antiproliferative effect [2], and as a

moisturizer in cosmetic products [3]. In red dragon fruit, peel's antioxidant activity is greater than fruit flesh, where the dragon fruit peel has antioxidant activity of 83.48% with an IC50 of 0.30 mg/mL [4].

The antioxidant nutrients in red dragon fruit are useful for preventing premature aging due to exposure to free radicals, preventing and eliminating acne so that dragon fruit peel waste can be an alternative for healthy cosmetics that can be used [5]. With proper processing, dragon fruit peel waste will be extracted and processed through an evaporation.

Extraction is separating materials process from the mixture using solvent. The extraction was stopped when equilibrium reached between solvent concentration and plant cell concentration.

Evaporation is a process that aims to concentrate a solution consisting of a volatile solvent and a non-volatile solute. One of the tools used in the evaporation process is a rotary evaporator. Rotary evaporator is vacuum system tool that functions in lower pressure around the sample liquid which will lower the boiling point of the liquid component or solution. The output from a rotary evaporator (the desired product) can usually be a solid or a concentrated solution. The advantage of this rotary evaporator is that it is superior in separation and does not damage the solvent if the separation occurs at high temperatures [6]

The red dragon fruit peel (*Hylocereus polyrhizus*) contains nutrients such as carbohydrate, fat, proteins and fiber. The fiber that contained in the skin of the red dragon fruit is about 46.7% [7]. It is higher than pears, oranges and peaches [7].

The extract of peel's dragon fruit has better antioxidant activity than the fruit extract because its higher phenolic content [8]. This is in accordance with research conducted by [4] which stated that in 1 mg/ml red dragon fruit peel was able to inhibit $83.48 \pm 5.03\%$ free radicals, while dragon fruit flesh was only able to inhibit free radicals by $27.45 \pm 1.02\%$.

Antioxidants function to resist the attack of free radicals, compounds that can cause degeneration so that they can prevent or inhibit the process damage due to oxidation of fats, proteins and nucleic acids. Antioxidants act as chemical cancer-preventing and inflammatory agents by reducing risk of death from cardiovascular causes [9].

Antioxidants activity are influenced by many factors such as lipid content, antioxidants concentration, temperature, oxygen tension, and chemical components of food in general such as protein and water. The process of antioxidant inhibition varies depending on the chemical structure and various mechanisms. In this mechanism the most important is the reaction with lipid free radicals, which form inactive products [10].

Chemically, antioxidants compound electron donors. Biologically, it can reduce the oxidants negative impact. Antioxidants work by inhibiting oxidant with donating one electron to other compound [11]. The body needs antioxidant to protect it from radical attack. Antioxidants level are chemical components that able to inhibit the oxidation damage.

2. EXPERIMENTAL PROCEDURE

2.1. Materials

The raw material is dragon fruit peel with weight of 10 gram which is procced with ethanol 50% - 70% and HCl 1%, maserased until 24 hours, separated into maserate and rafinate. The maserat is procced into extract dragon fruit peel with evaporation process in certain times, analized the evaporation rate and antioxidant number.

2.2. Equipments



Figure 1 Rotary Evaporator

The equipments used in this research are a set of tools for maceration and a set of rotary evaporation,

3. RESULTS AND DISCUSSION

The data for evaporation from raw material of 10 grams of dragon fruit peel with solvent concentrations variations 50%, 60%, and 70% and evaporation time of 10-40 minutes at an evaporation temperature maintained at 80-90 °C show in Table 1.

Table 1 shows that the longer evaporation time, the more volatile substances will be excreted. Substances that have a greater concentration and are more volatile, will also evaporate quickly. This is the same result which reported that with the long drying treatment, the longer the heating lasts, the faster evaporation of water in the material occurs so that the water content decreases [12].

Table 1. Result of Evaporation in Many Evaporation Time

Solvent Concentration (%)	Evaporation time (minutes)	Extract volume in (mL)	Extract volume out (mL)
50	10	100	98
	20	100	98
	30	100	98
	40	100	97
60	10	100	95
	20	100	93.2
	30	100	90
	40	100	86
70	10	100	98
	20	100	93
	30	100	90
	40	100	80

Analysis of antioxidant number in a solution of dragon fruit peel extract using the dpph method by determining the maximum absorption wavelength of DPPH.

Table 2 . Antioxidant Number Analysis in Dragon Fruit Peel Extract

Solvent Concentration (%)	Evaporation Time	Antioxidant Number (%)
50	10	93.435
	20	94.342
	30	93.155
	40	91.911
60	10	91.908
	20	93.157
	30	93.522
	40	90.508
70	10	92.375
	20	92.829
	30	93.577
	40	93.207

3.1. Effect of Evaporation Time on Evaporation Rate

Evaporation is a process that aims to evaporate volatile solvent and to concentrate non-volatile solute [12]. It is the process of thickening a solution by boiling or evaporating the solvent. Evaporation rate is expressed as the amount of water evaporated per hour [13]. The formula for finding the evaporation rate is:

$$v = \frac{V_o - V_t}{\Delta t} \tag{1}$$

Formula information :

- v = Rate of evaporation (volume/time)
- V_o = Initial Volume (volume)
- V_t = Final Volume (volume)
- Δt = Evaporation Time (time)

From the data processing can be plotted graph. The evaporation rate of dragon fruit peel extract can be described as shown below:

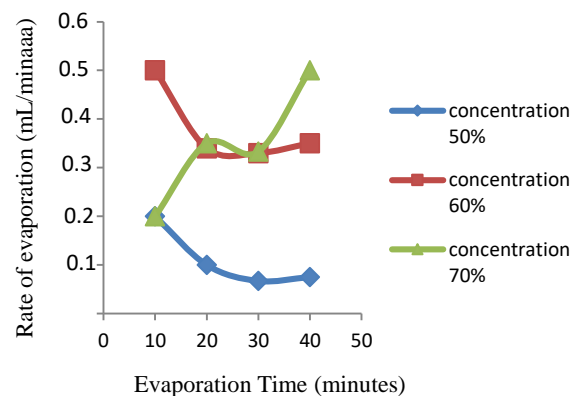


Figure 2. Effect of Evaporation Time in Various Solvent Concentrations on Evaporation Rate

Evaporation rate of ethanol in its separation with dragon fruit peel extract is quite influential. The higher the solvent concentration, the faster evaporation will occur. This can be seen from Figure 2, the solvent concentration of ethanol 70 % evaporates faster and tends to increase at the evaporation time of 40 minutes, which is 0.5 mL/minute.

The solvent using ethanol 60% and HCl 1% increased in the initial 10 minutes, this probably occurred when entering the extract into the evaporator, the heater had reached the desired temperature so that the evaporation rate was quite fast. In contrast to the

treatment with ethanol 70% and HCl 1% at 10 minutes, the heating was carried out while the heater was still cold. For the evaporation time of 20 and 30 minutes, the evaporation rate for ethanol 60% and 70% tends to be constant.

3.2. Effect of Solvent Concentration on Antioxidant Number

Antioxidants are nutritional and non-nutritive substances that are usually found in foodstuffs. Antioxidants prevent the occurrence of oxidative in the body. Antioxidants are radical scavengers, meaning they are able to work and repair body.

From one of the results of research conducted to prove the existence of differences in antioxidant activity which is influenced by the concentration of the solvent used. The difference in antioxidant activity in the extract was due to the difference in polarity of each solvent. In addition, the smaller the concentration of organic solvents used, the lower the costs incurred. However, increasing the concentration of organic solvents during extraction does not necessarily increase antioxidant activity. This makes the need for consideration in the choice of solvent concentration.

The results of this study indicate that evaporation length process and the concentration of the solvent affect the oxidation number of the extract as shown in Figure 3.

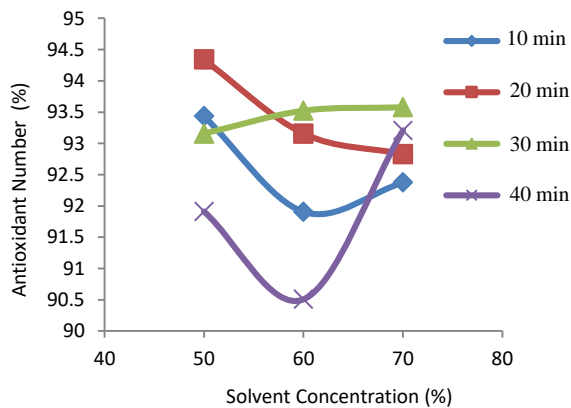


Figure 3. The Effect of Solvent Concentrations in Various Evaporation Times on Antioxidant Numbers in Dragon Fruit Peel Extract

Figure 3 shows that ethanol with a concentration of 70% and with the addition of 1% HCl the oxidant number tends to be more stable at various evaporation times. In contrast to extraction using 60% and 50% ethanol solvents with the addition of 1% HCl, the oxidant number obtained increased and decreased at each evaporation time. So that it can be concluded, the concentration that tends to be good as a solvent in

extracting dragon fruit peel with high antioxidant numbers and tends to be stable is using ethanol with a concentration of 70% and HCl 1%.

Ethanol 70% is a solvent that is more polar than ethanol 96% and more non-polar than ethanol 50% so that polar flavonoid compounds will tend to dissolve more in 70% ethanol. The higher the ethanol concentration, the lower the polarity of the solvent [14]. The more similar the polarity of the solvent with the polarity of the substances contained in the extracted material, the more components of the substance that can be extracted so that an increase in the yield can be obtained [15].

4. CONCLUSION

The highest evaporation rate of ethanol solvent in dragon skin extract was obtained at 0.5 mL/minute. Solvent concentration and evaporation time affect antioxidant value. The antioxidant number which tends to be stable is obtained at a solvent concentration of 70% ethanol: 1% HCl, which is an average of 93% at each evaporation time.

AUTHORS' CONTRIBUTIONS

All of the authors are involved in the process of producing dragon fruit peel extract. The first and corresponding author contribution is responsible for data processing and manuscript writing. The second author is responsible for sharing and consulting about the manuscript writing dan also about the process. The third, fourth, and fifth authors are responsible for analysis evaporation rate and funding arrangement. The sixth, seventh, and eight author are responsible for analysing the antioxidant number.

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