



FORMULATION OF BREADFULNESS LEAF EXTRACT GRANULES (*Artocarpus altilis*) USING THE WET GRANULATION METHOD

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Abstract

Breadfruit (*Artocarpus altilis*) is a local fruit that has high productivity because it is spread in various regions, especially Indonesia. Parts of the breadfruit plant can be utilized as medicine. One of the developments of breadfruit leaves is the manufacture of granules. Granule is a product resulting from the granulation process which will then be used as a tablet preparation. The purpose of this study was to design and evaluate breadfruit leaf extract in granule form as a preparation that is practical, stable, and effective in providing therapeutic benefits derived from the bioactive content of breadfruit leaves. The method used in this research is experimental. The results of the physical characteristics of the water content test obtained a value of 4%, the stationary angle test obtained a value of 24 °, the flow velocity test obtained a value of 2.72 grams / second, the compressibility test obtained a value of 20%. It can be concluded that the test results of the physical characteristics of the granule and the granule physical stability test meet the requirements.

Keywords: Breadfruit_Leaves;Granules;Wet_Granulation

INTRODUCTION

Indonesia has a variety of plants. This is influenced by the climate conditions of Indonesia which are very suitable for the growth of these plants. Various plants can live and grow well, many of which have the potential to be used as food ingredients. Indonesia has a variety of carbohydrate-producing plants. Including tubers such as sweet potatoes, cassava, ganyong, breadfruit, and various cereals such as corn and sorghum^[4].

Breadfruit (*Artocarpus altilis*) is a medicinal plant that has a diuretic effect due to its active ingredients. Breadfruit (*Artocarpus altilis*) contains calcium, potassium, riboflavin, and niacin^[7]. Granules are small grains used to make tablets and other medicines^[9]. Granules are the result of the granulation process before tablets are made. Granules are not only intermediate products in the tablet making process, but granules containing active substances are a separate pharmaceutical preparation^[1]. Wet granulation is a method commonly used for the manufacture of granulation preparations. Wet granulation is a granulation process that is widely used in the pharmaceutical industry^[1]. The advantages of wet granulation are that it can improve the compactness and

compressibility of powder, ensure good distribution and uniformity of content with a small amount of active ingredients, and prevent the segregation of mixed materials during the manufacturing process^[6]. The aim of this study was to design and evaluate breadfruit leaf extract in granular form as a practical, stable and effective preparation in providing therapeutic benefits derived from the bioactive content of breadfruit leaves.

METODE PENELITIAN

The method used in this study is an experimental research method carried out in the Natural Materials Technology Laboratory and Tablet Preparation Laboratory, Undergraduate Pharmacy Study Program, Medistra Indonesia College of Health Sciences.

1. Tools

Beaker glass, stirring rod, spatula, horn spoon, measuring cup, scales, rotary vacuum evaporator set, oven, desiccator, mortar and pestle, spatula, 16 mesh sieve, tripod, gauze, alcohol.

2. Ingredients

Breadfruit leaves (*Artocarpus altilis*), 96% ethanol, filter paper, breadfruit leaf extract, pvp, aerosol, talc, nipagin, magnesium stearate, ace disol, avicel, distilled water.

3. Making ethanol extract of breadfruit leaves (*Artocarpus altilis*)

The material extraction process was carried out by maceration with 96% ethanol solvent. Breadfruit leaf powder (*Artocarpus altilis*) as much as 250 grams was weighed and macerated in 1.5 liters of 96% ethanol solvent for 3 days. During the soaking period, the extract was stirred every day. The extract was then filtered through filter paper to separate the solution from the dregs (residue). Then remacerated in 1 liter of 96% ethanol for 2 days. The maceration results were filtered using filter paper. The filtrate obtained was concentrated in a rotary evaporator at 60°C and then evaporated in a water bath at 60°C to remove the solvent residue still remaining in the extract and a thick breadfruit leaf extract (*Artocarpus altilis*) was obtained^[3].

4. Granule Formulation

Tabel 1 Formula Granul ekstrak Daun Sukun (*Artocarpus altilis*)^[8]

No	Ingredients	Ratio (mg)
1	Ekstrak daun sukun	40
2	PVP	2
3	Aerosil	0,2
4	Talkum	4
5	Nipagin	0,2
6	Mg Stearat	4
7	Ac-Di-Sol	10
8	Avicel 102 ad	200

5. Making Breadfruit Leaf Extract Granules (*Artocarpus altilis*)

Weigh all the ingredients used according to the formulation. In a mortar, breadfruit leaf extract is dripped with 96% ethanol then nipagin, avicel, aerosil, and ac-di-sol are added until a homogeneous mass is obtained (mass 1). Next, in another mortar, add PVP dissolved in enough hot water and stir until homogeneous (mass 2). Mass 2 is mixed with mass 1, grind until homogeneous. After that, add magnesium stearate and talc, grind until a homogeneous mass is obtained. Then sieved with a mesh sieve number 16. After the granules are formed, the granules are oven-dried at a temperature of 40 for 24 hours. The dried granules are sieved again with a mesh sieve number 16. The characteristics of the granules obtained are then evaluated^[8].

6. Water Content Test

Water content testing, put 1 g of granules into the moisture balance and wait until the water content value of the granules is measured.

The good water content requirement for granules is 2% - 5%^[6].

7. Angle of Repose Test

Granules weighing approximately 50 g are fed through a funnel onto a sheet of graph paper. After the collection of granules forms a stable cone, the angle formed is measured. The requirement for a good angle of repose for granules is 20° - 40°. The angle of repose of granules can be calculated using the following formula^[6]:

$$\text{Silent angle} = \frac{\text{high}}{\text{diameter}}$$

8. Flow rate Test

The flow rate test is carried out by weighing 30 g of granules, then inserting them into the flow tester (with the bottom hole temporarily closed), opening the cover, and recording the time with a stopwatch for each granule that flows out. The requirement for a good flow rate is 4-10 grams/second or less than 10 grams/second. The flow rate of granules can be calculated using the following formula^[6]:

$$\text{Rate} = \frac{\text{gram}}{\text{seconds}}$$

9. Compressibility Test

Compressibility is done by weighing 50 g of granules, put them into a 100 ml measuring cup. The measuring cup containing the granules is tapped 300 times consistently or in the same place to ensure that the amount of granules is stable and does not decrease again. The compressibility requirement is less than 20%. The compressibility of the granules can be calculated using the following formula^[6]:

$$\text{Kompresibilitas} = \frac{\text{Densitas tapping} - \text{Densitas bulk}}{\text{Densitas tapping}} \times 100\%$$

Method of collecting data

This research method is experimental in nature and is carried out in the natural materials technology laboratory and tablet preparation laboratory, undergraduate pharmacy study program, Medistra Indonesia College of Health Sciences.

RESULTS AND DISCUSSION

A. Breadfruit Leaf Extraction Results (*Artocarpus altilis*)

Maceration extraction was carried out to extract active substances from breadfruit leaves (*Artocarpus altilis*). The solvent used was 96% ethanol. The sample used was 250 g of dried breadfruit leaf powder extracted

with 1.5 liters of 96% ethanol solvent for 3 days. During the soaking period, the extract was stirred every day. The extract was then filtered through filter paper to separate the solution from the dregs (residue). Then remaceration in 1 liter of 96% ethanol for 2 days. The remaceration process was carried out to maximize the extraction results obtained at the maceration stage. The maceration results were filtered using filter paper. The filtrate obtained was concentrated in a rotary evaporator at a temperature of 60 ° C, then evaporated in a water bath at a temperature of 60 ° C to remove solvent residues still remaining in the extract and a thick breadfruit leaf extract was obtained. Extraction was carried out by maceration. The maceration method was chosen because it is very simple and does not require heating. The extraction results were then concentrated using a rotary evaporator at a temperature of 40 °C, and the liquid extract was converted into a thick extract through an evaporation process. The rotary temperature of 40 °C was chosen to ensure that the compounds in the breadfruit leaf extract (*Artocarpus altilis*) were not lost during the extraction process. The extraction results from breadfruit leaves showed a yield of concentrated extract of 16.3%^[6].

B. Water Content Test

Water content testing, This test is carried out using a moisture balance tool. The requirement for good granule water content is 2-5%. The results of the water content test carried out showed that it met the requirements with a result of 4%^[6].

C. Angle of Repose Test

The angle of repose test is conducted to determine the characteristics of the flow properties of the granules. The collection of granules forms a stable cone. The flatter the

cone, the smaller the angle of repose. The requirement for a good angle of repose for granules is 20°-40°. The results of the tests carried out were calculated using the angle of repose formula. The results of the angle of repose test showed that the formulation met the requirements of 24°. The smaller the angle of the granules, or the flatter the granules, the better the granules will flow and be easier to compact into tablets^[6].

D. Flow Rate Test

Flow rate testing is to determine the characteristics of the granule flow to facilitate the tablet printing process. Good requirements are 4-10 grams/second or less than 10 grams/second. The results of the flow rate test carried out were calculated using the flow rate formula. The results of the flow test showed that the formulation met the requirements, which was 2.72 grams/second. Granules produced through wet granulation have a high water content, which increases friction between particles and reduces the flowability of the granules. Therefore, the flow rate decreases^[6].

E. Compressibility Test

Compressibility test is conducted to determine the ability of compacted powder material to form a compact mass after being given a certain pressure. Compressibility can also indicate the reduction in granule volume caused by tapping. The compression ratio requirement is less than 20%. The compressibility test results are calculated using the compressibility equation. The test results show that the formula compressibility index meets the requirements, which is 20%. The lower the bulk density achieved, the better the flow properties. The degree of compressibility is influenced by the size and shape of the granules [6].

CONCLUSION AND SUGGESTIONS

A. Conclusion

Based on the results of the research and discussion, it can be concluded that: Breadfruit leaf extract (*Artocarpus altilis*) can be formulated into a granular preparation. The formulation of the granular preparation of breadfruit leaf extract (*Artocarpus altilis*) has met the requirements based on water content test, angle of repose test, flow rate test, and compressibility test.

B. Suggestions

Based on the research that has been conducted, it can be suggested that::

1. It is recommended that further researchers produce tablet preparations from breadfruit leaf extract granules (*Artocarpus altilis*).
2. It is recommended that further researchers conduct biopharmaceutical and pharmacokinetic tests to determine the effectiveness of the preparation.

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