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# Dry Suspension Formulation of Jackfruit Ethanol Extract (*Artocarpus heterophyllus* Lam.) using Arenga Gum as Suspending Agent

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**Abstract.** Jackfruit (*Artocarpus heterophyllus* Lam.) contains phytochemicals such as flavonoids, tannins, saponins, alkaloids, polyphenols, and steroids. Jackfruit has a high moisture content and seasonal fruiting so it needs to be made as a preparation for dry suspension. Dry suspension requires a suspending agent material to increase viscosity and slow down sedimentation. Arenga gum can be used as a binding material obtained from palm seeds. The purpose of this study was to make a dry suspension of jackfruit by using arenga gum as a binder. The results showed all three formulate had good results. The resulting evaluation results show that the determination of the angle of repose for the formula 1 30.31°, formula 2 29.99° and formula 3 28.21°, for the test flow time formula 1 7.85 seconds formula 2 8 seconds and formula 3 4.81 seconds, for viscosity test formula 1 27.99 cP, formula 2 55 cP and formula 3 95 cP, for volume sedimentation test formula 1 0.35 mL, formula 2 0.55 mL and formula 3 0.9 mL, for formula type weight test 1 9.09%, formula 2 6% and formula 3 14.5%, for organoleptic test has good results because there is no significant change, for dry suspension moisture test formula 1 0.13%, formula 2 0.36% and formula 3 0.2%, for viscosity stability test and organoleptic test are qualified.

**Keywords:** Arenga gum, jackfruit flesh, dry suspension, suspending agent, ethanol extract.

## INTRODUCTION

Jackfruit is one of the main commodities of fruits in Indonesia with a level of nutrients and chemical content that is useful and diverse. According to, studies on the content of phytochemical compounds of jackfruit show the presence of active compounds flavonoids, tannins, saponins, alkaloids, polyphenols, steroids, where these compounds can lower blood glucose levels. This is in line with research, flavonoids are reported to have antidiabetic activity capable of regenerating pancreatic  $\beta$  cells on langerhans island.<sup>1,2</sup>

Jackfruit also contains cellulose in the form of amorphous solids, white, insoluble in water and common organic solvents. The shortcomings of jackfruit flesh is if stored or silenced for too long the fruit is easy to rot and can not be consumed for a long period of time.<sup>3</sup>

Therefore, jackfruit is more suitable formulated in dry suspension preparations, dry suspension is a solid mixture that is added water at the time of drinking, preparations are generally made unstable and insoluble medicinal materials in the carrier of water, such as ampicillin, amoxicillin, and others. In order for the mixture after added water formed a homogeneous dispersion, then in the formula used suspending agent material. The

composition of dry suspension usually consists of suspending agent, preservatives, wetting, sweetener, flavor enhancer or aroma buffer and dye.<sup>4</sup>

Suspending agent is a material used to increase viscosity and slow sedimentation so as to produce a stable suspension. Suspending agent is divided into several groups. The first group is polysaccharides consisting of gom acacia, tragakan, Na-alginat, starch, carrageenan, xanthan gum, and guar gum. Guar gum is one of the polysaccharides that can be used as a drug delivery to the colon which is the target center. In the food industry, guar gum usually acts as a thickener. In pharmaceutical guar gum has been proposed to be a means of carrying drugs with a controlled release and has a goal towards the intestines as the target.<sup>5,6</sup>

Galactomannan also contains guar gum by modifying galactomannan. Galactomannan is a natural polysaccharides commonly used in the food and medicine industry, and has also been widely used as a stabilizer, emulsifier, and thickener. Galactomannan can also be obtained from sugar palm fruit plant (*Arenga pinnata*).<sup>6</sup> This article aims to find out if jackfruit flesh ethanol extract (*Artocarpus heterophyllus* Lam.) can be formulated into dry suspension preparations and find out if arenga gum can be used as a suspending agent. The formulation problem that wants to be answered is whether the extract of jackfruit flesh ethanol (*Artocarpus heterophyllus* Lam.) can be formulated into dry suspension preparations and can arenga gum be used as a suspending agent. This research is also expected to be useful as an information material about dry suspension levels using arenga gum as a suspending agent.

## RESEARCH METHODOLOGY

### Tools And Materials

The tools used include: Scales, digital balances, temperature dryer cabinets 40-50°C, blenders (SiJempol®), water bathers, pH meters (Hanna Instrument®), vaporizer cups, stirring rods, Viscometers NDJ-5S, Densitor Tabs, desiccator, laboratory glassware (Iwaki Pyrex®).

While the ingredients used in this study are jackfruit flesh, sugar palm fruit, sucrose, lactose, nipagin, aquadest, ethanol (p.a), Na-alginat, hydrochloric acid 0.5 N, hydrochloric acid 2 N, potassium iodide, Bouchardate, Dragendorf, Mayer, Molish, sodium hydroxide 2 N, lead (II) acetate 0.4 M, iron (III) chloride 10%, Lieberman-Bourchard, sodium picrate, nitric acid 0.5 N, Fehling A, Fehling B.

### Working Procedure

#### *Collection of Plant Materials*

The collection of plant material is done purposively, i.e. without comparing with similar plant materials from other locations. The plant material used is jackfruit flash (*Artocarpus heterophyllus* Lam.) obtained from Setia Budi fruits market, Medan, north Sumatra.

#### *Plant Identification*

Plant identification was conducted at the "Herbarium Bogoriense" Botanical Field of the Center for Biological Research of the Indonesian Institute of Sciences (LIPI)-Cibinong Science Center, Jl. Raya Jakarta – Bogor KM. 46 Cibinong 16911 Bogor.

#### *Simplicia Preparation*

This study used 3.5 kg of jackfruit flesh. The first stage is jackfruit flesh washed clean and chopped thinly then put in the dryer cabinet at a temperature of 40°C until dry. dried jackfruit flash is characterized easily broken. dried jackfruit flash is mashed using a blender to obtain the flash powder of jackfruit, then the powder obtained weighed in its entirety and then stored in a well-closed container.<sup>7</sup>

## Extraction Method

The extract used in this study uses a maceration method using ethanol solvent (p.a). Weighed 300 grams of jackfruit flash simplicia and then macerated in a dark-colored glass container using ethanol solvent (p.a) until the whole simplicia is submerged. Closed and stored at room temperature for 3x24 hours. After that simplicia that has been submerged is transferred into the container and evaporated, then the extract that is still left in the bottle is added again solvent and let stand also for 2x24 hours. After that obtained a clear final maserat results. Maserate results are collected and then evaporated in a vaporizer cup at room temperature until a viscous extract is obtained. Then weighed the weight of the extract and put in a tightly closed container.<sup>8</sup>

## Macroscopic Examination

Macroscopic examination is performed by observing the external morphology of size, shape, color, smell and taste of jackfruit flash simplicia (*Artocarpus heterophyllus* Lam.).<sup>9</sup>

## Water Content of Simplicia

The sample weighed 2 grams, put in a cup. The sample and cup are then preheated using the oven  $\pm$  30 minutes then refrigerated using a desiccator and weighed. The analysis continues to repeat until it reaches a constant weight of a small weighing difference or 0.2 mg. Moisture content is calculated using the formula:<sup>10</sup>

$$\text{Moisture content} = \frac{(\text{Sample weight (beginning - end)})}{(\text{Initial weight of empty cup weight})} \times 100 \quad (1)$$

## Phytochemical Screening

Phytochemical screening was conducted in the Phytochemical Laboratory of Tjut Nyak Dhien University, jackfruit flash extract (*Artocarpus heterophyllus* Lam.) was conducted examination including examination of chemical compounds of alkaloida group, flavonoids, terpenoida, saponins and tannins.

## Arenga Gum Preparation

A total of 1 kg of the sample is cleaned and mashed with a blender for  $\pm$  3–5 minutes with the addition of 1:10 water and warmed 5 minutes in a water bath, then stored in the refrigerator for 24 hours. The obtained supernatan is stored in the refrigerator for 24 hours, then added ethanol 96% compared to 1: 2 then stored in the refrigerator for 24 hours. The formed sediment is filtered, then washed with ethanol p.a. The sediment is dried in a decomposator.<sup>6</sup>

## Dry Suspension Preparation

The manufacture of granulated dry suspension granulat is made according to the method of making tablets with wet granulation process. The suspension material is arenga gum developed with water, after the mass expands mixed with other materials until obtained a homogeneous mass, then dried in the dryer cabinet at a temperature of 50°C. Furthermore the mass is powdered evaluation is done against dry suspension granulates and suspensions. Evaluation of dry suspension; includes determining particle size and flow rate, while evaluations are performed on liquid suspensions; includes determination of sedimentation volume, determination of pH, volume of sedimentation, redispersion, measurement of ampicillin levels and viscosity.<sup>11</sup>

TABLE 1. Formulation

Composition	Concentration (%)		
	F1	F2	F3
JFEE	2,5	2,5	2,5
Sucrose	10	10	10
Lactose	16,84	16,74	16,46
Nipagin	0,36	0,36	0,36
Arenga gum	0,3	0,4	0,5

Information :

JFEE = Jackfruit Flesh Ethanol Extract

### *Testing on Dry Suspension Includes: Determination of Angle of Repose And Flow Time*

The powder is put in the funnel until it is full, then the mouthpiece cover is opened and the granules are left to flow out until the paper used as a horizontal base is covered by a heap of powder of a certain height. Then measured the peak of the powder heap and the diameter of the base circle of the heap, a angle of repose between 20° - 40° indicates good flow properties. The angle of repose is calculated by the formula as follows:

$$\text{Tg } 2\sqrt{=}\frac{2h}{a} \quad (2)$$

Information:

h = Height of powder scale (cm)

D = Powder heap diameter (cm)

√ = Angle of repose (0)

While the timing of the flow is done by weighing each powder formula as much as 30 grams and then inserted into the mouthpiece whose bottom hole is closed and at the bottom of the funnel given a paper base. Once the granules are well filled and flattened, close the mouthpiece open until the granules begin to slide. The time it takes for the powder to come out of the funnel is recorded. For powders or granules, the flow time is good if it has a flow time of no more than 10 seconds.<sup>12</sup>

### *Viscosity Measurement*

Measurement of dry suspension viscosity is performed after substitution using NDJ-5S viscometer tool at 6 rpm. Performed at least 3 replications. Inserted the preparation in the beaker glass, dipped spindle that has been attached into the liquid until the lower end is submerged and the buffer reaches the base of the beaker. The use of spindles must be adjusted to the viscosity of a material to be tested viscosity. The larger the spindle number, the smaller the physical shape. Spindle number 1 for liquids with low viscosity/dilute and larger spindle number for higher viscosity liquid or more viscous, pressed on the back, set spindle number to be used which is adjusted to the viscosity of the liquid as well as speed, pressed the on button on the front and read the number that appears.<sup>12</sup>

### *Preparation pH Monitoring*

Evaluation of pH preparations using pH meters. Reconstititional dry suspension preparations are incorporated into the erlenmeyer. Dip the previously calibrated pH meter into the suspension preparation. Allow a few minutes until the pH meter is perfectly submerged. Observe and record the pH.<sup>12</sup>

### *Sedimentation Volume Determination*

In the evaluation of the sedimentation volume test, it was carried out to determine that the precipitate formed must be easily re-dispersed by shaking, while in order to produce a homogeneous system, the measurement of the volume of the precipitate and the ease of dispersing formed the two most common basic evaluation procedures. To evaluate the sedimentation volume, a 10 ml measuring cup was used. The way of implementation is a sample of dry suspension that has been substituted shaken to homogeneous. Put in a measuring glass to the limit of the mark. Observed high sedimentation formed. This evaluation is done for 1 month.<sup>12</sup>

### *Type Weighting*

Determination of real type weights is carried out by weighing a certain amount of granules. Then put in a measuring glass 50 ml and recorded its volume. A good real weight is 0.2 - 0.6 g/mL. Calculated the weight of the real type of granules with the following equation 1:<sup>13</sup>

$$P = \frac{W}{V} \quad (3a)$$

Information:

P = Real type weight

W = Granule weight

V = Volume granules

A number of granules are put in a measuring glass, noted in volume. Furthermore, the determination is done by tapping a 100-beat and then recorded the volume. The weight of a good density is 0.2 - 0.6 g/mL.

$$P_n = \frac{W}{V_n} \quad (3b)$$

Information:

$P_n$  = Weight type mammoth  
 $W$  = Granule weight  
 $V_n$  = Volume granules

Compressibility :

$$\frac{(P_n - P)}{P_n} \times 100\% \quad (3c)$$

Information:

$P$  = Real type weight  
 $P_n$  = Weight of type mammoth

### *Organoleptic Examination*

The data collected on organoleptic examination include the color, odor and consistency of dry suspension preparations after reconstitution.<sup>12</sup>

### *Dry Suspension Moisture Testing*

Moisture content data is obtained by means of sample weight before drying reduced by the weight of the sample after drying, then divided by the weight of the sample before drying and multiplied by one hundred percent. The obtained data is used as a parameter of the water content present in the dry.<sup>12</sup>

### *Stability Test*

Suspension stability evaluation is carried out in two stages, namely stability evaluation for dry suspension with parameters of water content test (Lost on Drying), angle of repose, compressed type weight and true density.

As well as stability evaluation for wet suspension, which is done by Freeze-thaw method, accelerated storage in forced conditions is done by storing the suspension that has previously been reconstitution with water at two extreme temperatures, namely at a temperature of 4°C that is put in the refrigerator and 40°C in the heating cabinet alternately 24 hours for 6 cycles with organoleptic test parameters, test homogeneity, viscosity and flow type and pH value.<sup>12</sup>

## **RESULTS OF DISCUSSION**

### **Plant Identification Results**

The results of plant identification conducted at the Indonesian Institute of Sciences (LIPI) Bogor – Center for Biological Research is a jackfruit flash plant with the name (*Artocarpus heterophyllus* Lam.) family Moraceae.

### **Simplicia Results**

In this study using fresh jackfruit flash (*Artocarpus heterophyllus* Lam.) 3.5 kg was done by cutting and drying in the dryer cabinet 40-50°C to dry, jackfruit flash is said to have dried when it is brittle, then blended into powder. Weighed obtained powder simplicia jackfruit flash 675 grams and stored in a closed container.

### **Extract Acquisition Results**

Based on the results of the exposure of 300 grams of simplicia powder from jackfruit flash (*Artocarpus heterophyllus* Lam.) by maceration method using ethanol rationing (p.a) obtained a viscous extract of 45.21 grams of brown color.

## Macroscopic Examination Results

The result of macroscopic examination simplicia jackfruit flash is blackish brown, smells distinctive and tastes sweet. Standardization of a simplisisa is the fulfillment of the requirements as a medicinal material and becomes the determination of values for various parameters of the product. Simplicia to be used as raw materials for medicine must meet the requirements listed in the monograph issued by the Ministry of Health (Materi Medika Indonesia). Some characterizations carried out each provide a purpose so that it is expected to meet the requirements of simplicia as the raw material of the drug.

## Simplicia Moisture Test Results

Thus, the removal of moisture content up to a certain amount is useful to extend the durability of the material during storage. Simplicia is considered safe enough if it has a water content of less than 10%.

In this study, the water content of simplicia was 6.5%. Simplicia was considered safe enough, so the water content results in this experiment met the requirements.

## Phytochemical Screening Results

Phytochemical screening of simplicia powder is performed to determine the chemical compounds contained in simplicia can be seen in the following table:

**TABLE 2.** Phytochemical screening of simplicia powder from jackfruit flash (*Artocarpus heterophyllus* Lam.)

No.	Phytochemical Screening	Test Results		Conclusion
		References	Observation	
1.	Alkaloid	Showing a positive result is characterized by the formation of yellow, red, and brown deposits in each reagent. <sup>14</sup>	The first tube is black, the second tube is orange, the third tube is orange.	(+)
2.	Flavonoid	The formation of red color which is a characteristic of the presence of flavonoids. <sup>14</sup>	Yellow and red colors are formed.	(+)
3.	Steroid and Triterpenoid	A blue ring that looks greenish indicates steroids and a brownish or purple ring formed at the solution boundary indicates a triterpenoid. <sup>7</sup>	Purple and blue rings formed	(+)
4.	Saponin	Foam formation as high as 1–10 cm which stable for not less than 10 minutes. <sup>7</sup>	Foam is formed	(+)
5.	Tannin	Showing positive results with the change of color to blackish green. <sup>14</sup>	Formed greenish black.	(+)
6.	Glycosides	A brick red precipitate is formed. <sup>14</sup>	No brick red precipitate is formed.	(-)
7.	Antrakuinon Glycosides	The properties of the group of antrakuinon compounds will give characteristic colors of red, violet, green or purple with bases. <sup>14</sup>	No color formed.	(-)
8.	Cyanogenic glycosides	A blood red color forms on the filter paper. <sup>14</sup>	It's not formed.	(-)

Information:

(+) = Contains the compound in question

(-) = Does not contain the compound in question

Phytochemical screening results of simplicia powder from jackfruit flash (*Artocarpus heterophyllus* Lam.) Containing alkaloid compounds, flavonoids, triterpenoids and steroids, tannins and saponins, Based on Table II group of alkaloid chemical compounds give positive results of orange dragendrof, orange mayer, flavonoids give

positive red results after the addition of Mg powder or Zn powder with concentrated hydrochloric acid, steroid testing gives positive results with yellow deposits, saponins give positive results where yellow deposits are formed, and tannin testing also gave a positive result with blackish green color with the addition of iron reagent solution (III) chloride

## DISCUSSION

### Testing on Dry Suspension Includes: Determination of Angle of Repose And Flow Time

**TABLE 3.** The Results Calculation of Angle of Repose from Suspension Formulation of Dried Jackfruit Flash Ethanol Extract (*Artocarpus heterophyllus* Lam.) and Arenga Gum as Suspension Material with Some Concentration of Suspension

Replication	Angle of Repose ( $\Phi$ )			
	Formula 0	Formula 1	Formula 2	Formula 3
1	34.21°	31.47°	28.69°30.78°30.51°	28.19°
2	35.03°	30.61°		28.44°
3	33.16°	28.85°		28.00°
<b>Average</b>	34.13°	30.31°	29.99°	28.21°

**TABLE 4.** The Result of The Calculation of Flow Time From The Suspension Formulation of Dried Jackfruit Flash Ethanol Extract (*Artocarpus heterophyllus* Lam.) and Arenga Gum as Suspension Material with Some Concentration of Suspension

Replication	Flow Time (seconds)			
	Formula 0	Formula 1	Formula 2	Formula 3
1	6.00	6.73	8.37	4.91
2	6.38	8.57	7.68	5.00
3	6.78	8.27	8.00	4.52
<b>Average</b>	6.38	7.85	8.00	4.81

### Viscosity Determination

**TABLE 5.** Result of Calculation of Viscosity Formulation Dry Suspension Extract of Jackfruit Flash Ethanol (*Artocarpus heterophyllus* Lam.) and Arenga Gum as Suspension Material using Viscomometer at 6 rpm

Condition	Viscosity			
	Formula 0	Formula 1	Formula 2	Formula 3
Before	60	36	73	70
After	42	27.99	55	95

### Determination of Ph Preparations

**TABLE 6.** pH Measurement of Dry Suspension Formulation of Jackfruit Flash Ethanol Extract (*Artocarpus heterophyllus* Lam.) and Arenga Gum as Suspending Material

Condition	Replication	pH			
		Formula 0	Formula 1	Formula 2	Formula 3
Before	1	5.2	3.7	3.5	3.7
	2	5.1	3.4	3.4	3.4
	3	5.0	3.3	3.4	3.5
After	1	4.3	3.4	3.1	3.2
	2	4.2	3.4	3.1	3.3
	3	4.3	3.4	3.3	3.3



## Sedimentation Volume Measurement

**TABLE 7.** Measurement of Sedimentation Volume Formulation Dry Suspension Extract of Jackfruit Flash Ethanol (*Artocarpus heterophyllus* Lam.) and Arenga Gum as Suspending Material

Formula	Sedimentation Volume (mL)	Total Suspension Volume (mL)	Sedimentation Volume
0	10	1.5	0,15
1	10	3.5	0,35
2	10	5,5	0,55
3	10	9,0	0,90

## Type Weighting

**TABLE 8.** Result of Calculation of Type Weight from Suspension Formulation of Dried Jackfruit Flash Ethanol Extract (*Artocarpus heterophyllus* Lam.) and Arenga Gum as Suspending Material with Some Concentration of Suspension

Formula	Real Density (g/ml)	Compressed Type Weight (g/ml)	Carr Index(%)
0	0,47	0,52	9,61
1	0,50	0,55	9,09
2	0,47	0,50	6
3	0,47	0,55	14,5

## Organoleptic Testing

**TABLE 9.** Organoleptical Calculation Results from Suspension Formulation of Dried Jackfruit Flash Ethanol Extract (*Artocarpus Heterophyllus* Lam.) and Arenga Gum as Suspending Material with Some Concentration of Suspension

Types of Suspension Materials	Type of Inspection	Condition	
		Before	After
Formula 0	Smell	Typical aromatic	Typical aromatic
	Color	Brownish	Brownish
	Consistency	A bit thick	A bit thick
Formula 1	Smell	Typical aromatic	Typical aromatic
	Color	Brownish yellow	Brownish yellow
	Consistency	A bit thick	A bit thick
Formula 2	Smell	Typical aromatic	Typical aromatic
	Color	Brownish yellow	Brownish yellow
	Consistency	A bit thick	A bit thick
Formula 3	Smell	Typical aromatic	Typical aromatic
	Color	Brownish yellow	Brownish yellow
	Consistency	thick	Thick

## Dry Suspension Moisture Inspection

**TABLE 10.** Result of Calculation of Moisture Content From Dry Suspension Formulation of Jackfruit Flash Ethanol Extract (*Artocarpus heterophyllus* Lam.) And Arenga Gum as a Suspension Material. With Some Concentration Suspension

Moisture Content (%)			
Formula 0	Formula 1	Formula 2	Formula 3
2 %	0.13 %	0.36 %	1.2 %

### Testing on Dry Suspension Includes: Determination of Angle of Repose and Flow Time

#### 1. Determination of Angle of Repose

The determination of the angle of repose aims to provide qualitative value of the internal cohesion force and the resistance effect that may be used in powder mixing, tablet printing or entry into the shell or container. The angle of repose between 20°- 40° indicates good flow properties. From this research shows that all formulate meet the standard of angular repose test.

#### 2. Flow Time

Powder or granules, the flow time is good when it has a flow time of no more than 10 seconds. In this study all granules at the time of testing there was no flow time that exceeded 10 seconds, the results obtained that the four dry suspension formulate did not show any difference in the timing of the suspension flow.

### Viscosity Measurement

On the evaluation of viscosity test is done to find out the viscosity of the suspension preparation fluid with standart results obtained 37 cP-396 cP. Therefore, this study shows the results that all four dry suspension viscosity formulates are eligible.

### Suspension pH Determination

pH determination aims to determine the pH of dry suspension preparations. Based on this study obtained results that the pH of the four formulations of dry suspension is acidic, standard pH suspension between 5-7. This can be interpreted that dry suspension preparations are chemically unstable in acidic atmospheres and cannot provide the desired therapeutic effect because it cannot be properly absorbed by the stomach.

### Sedimentation Volume Determination

In the evaluation of the Sedimentation Volume Test, it is carried out to find out that the precipitate formed must be easily re-dispersed by shaking, while in order to produce a homogeneous system, the measurement of deposit volume and easy dispersion forms the two most common basic evaluation procedures. Sedimentation test that meets the standard is < 5 cm. From the results of the study obtained that the sedimentation volume of the three dry suspension formulate is 0.15 ; 0,35 ; 0.55 and 0.9.

### Type Weighting

True and compressed density measurement aims to provide information about the amount of air entering during the manufacture of a preparation. In addition, this measurement also helps in determining the number of pores present in the suspension particles. The evaluation results showed that the average type weights in each formula 0,1,2 and 3 were 9.6%, 9.09%, 6% and 14.5%. The density depends on the shape of the particles. When the granule size increases, the bulk speed decreases. Small granules are more able to form compact masses than large granules.

### Organoleptic Test

Organoleptic testing aims to provide data on the color, smell and consistency of the overall suspension formulation. Organoleptic testing showed no change in the color, smell and consistency of all three formulate during forced conditions.

## Dry Suspension Moisture Testing

Water content testing aims to see the water content contained in the suspension powder. The results of the study obtained that all formulate meet the requirements of water content test that is above 0% to slightly below 10%.

## Stability Testing

Suspension stability testing is conducted after being reconstitution using mineral water. Wet suspension testing is conducted with accelerated storage using the Freeze-thaw method, where the wet suspension is stored at two extreme temperatures, namely at 5°C in the refrigerator and 35°C in the heating cabinet alternately 12 hours each for 10 cycles. At the time of this stability test only viscosity test and organoleptic test are stable.

## CONCLUSION

Jackfruit ethanol extract can be used as a dry suspension preparation because ingredients such as arenga gum, Na-alginate, lactose, nipagin, sucrose at the time of grinding easily homogeneous and when sifted easily form granulat and arenga gum can be used as a suspending agent material and good concentration used in dry suspension it can occur because dry suspension meets the requirements of simplisia moisture testing, organoleptic test, dry suspension moisture content test, angle of repose and flow time, type weight determination, viscosity test and sedimentation volume determination.

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