Formulation And Physical Quality Of Effervescent Granules Containing Rambutan (Nephelium lappaceum L) Peel Dried Extract

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ABSTRACT

Rambutan (Nephelium lappaceum L), known as a fruit plant, is also used as a medicinal plant. The parts used include pericarp (fruit peel). Rambutan peel has a high antioxidant content, but it has not been widely used and is only considered as waste. The aim of this study was to make an effervescent granule formulation from dried extract of rambutan peel which can be used as an antioxidant health drink, according to the results of previous studies on the effects of rambutan peels. Effervescent granules were made in 3 formulas with variations of PEG 6000 which functioned as granule binder. After that the granule formula was made by the dry method and physical quality testing was carried out including organoleptic test, water content, flow rate and angle of repose, density of granule, time to disperse and pH measurement of solution. The results showed that the water content for formulas A, B and C were 0.64%, 0.24% and 0.38% respectively. Results of flow velocity test of formulas A, B and C respectively are 9.82 seconds, 8.22 seconds and 8.64 seconds. Angle of repose for formulas A, B and C are 29,98o, 29,98o and 29,98o, respectively. Densities for formulas A, B and C are 0.8898 g/ml, 1.1183 g/ml and 1.5325 g/ml, respectively. The dispersion times for formulas A, B and C are 128 seconds, 107 seconds and 112 seconds, respectively. While the average pH of the granule solution for formulas A, B and C respectively was pH 6.91, pH 7.01 and pH 6.85. From the overall tests carried out on the effervescent granules of rambutan peel, it was shown that the three granule formulas met the physical quality requirements of granules, and the formula with the best physical quality among the three was formula B. This is evident from the pH value closest to neutral pH, dispersion time the fastest, the most fast flow rate and the least water content.

Keywords: *Effervescent Granule, PEG 6000, Rambutan peel dried extract*

INTRODUCTION

Food intake that exceeds energy expenditure can cause obesity because it will be metabolized continuously so as to produce free radicals in amounts that exceed normal limits, while the antioxidants in the body are unable to capture all the free radicals produced. Obesity can be caused by an increase in free radicals in the body (Dambal and Kumari, 2012).

Antioxidants are substances that are very useful to eliminate the effects of free radicals which have the property of damaging healthy cells. Oxidant levels in the body will certainly be higher especially if the body is too often exposed to pollution also if the body often consumes unhealthy foods such as fast food which lately are increasingly available. Demands for healthy drinks and food are now increasingly high along with the increasing level of education and public awareness of healthy living.

In nature, there are lots of fruits that contain antioxidants. One of them is *Nephelium lappaceum* L. or better known as rambutan, which is a tropical fruit spread in Southeast Asia. This fruit is a seasonal fruit and is very popular because of its sweet and low fat taste. The skin of the fruit is so hairy that it is known as rambutan. In Indonesia, there are several types of rambutans which are usually named according to their area of origin.

Rambutan (*Nephelium lappaceum* L.), known as a fruit plant in its development, is also used as a medicinal plant. The parts used include pericarp (fruit peel). Rambutan's peel has a high antioxidant content, but it has not been widely used and is only considered as waste.

Based on the research of Thitilertdecha, et al (2010), the phenolic components of rambutan peels include geraniin, corilagin, both of which are flavonoid groups, and elagic acid from the tannin group. Rambutan peel extract has an IC50 of 20, 39 μg / dl which means that with 20, 39 μg / dl can suppress 50% of DPPH free radicals (Wulandari and Lestari, 2012).

Based on the results of these studies the utilization of rambutan peel waste as an antioxidant has great potential to be developed, one of which is in the form of

effervescent granules. Effervescent granules are an alternative to developing soft drink products that are attractive and provide variety in the presentation of traditional drinks as well as practical storage and transportation compared to ordinary soft drinks in liquid form. The advantage of drinking effervescent granules compared to ordinary drinks is the ability to produce carbon dioxide (CO2) gas which gives a fresh taste as in soda water. Drinks in the form of granules have advantages, namely the stability of the product and its mass is smaller and can meet demand on a large scale (Susilo, 2005).

Polyethylene glycol in an effervescent granule formulation is used as a binder to glue the powder into granules and is preferred over other binders because it can improve the flow of granules for the better (Rowe, 2009). The choice of binder must be adjusted to the active substance and in the right amount in order to obtain the desired binding quality but does not affect the quality of the granule disintegration and dissolution of the active substance.

From the background described, the problem is whether rambutan fruit skin can be used as a component of effervescent drinks in the form of effervescent granules.

The general objective of this study was to make an effervescent granule formula from rambutan (*Nephelium lappaceum* L) peel dry extract. while the Special Purpose of this study was to compare the physical qualities of the effervescent granule formula from rambutan (*Nephelium lappaceum* L) peel dry extract with variations of polyethyleneglycol 6000 as binder.

This research is the development of health drink dosage form in the form of effervescent granules by utilizing rambutan (*Nephelium lappaceum* L) peel which has been mostly used as waste.

MATERIAL AND METHOD

This research was a laboratory research with a simple experimental technique that was done by formulating effervescent granules from Rambutan (*Nephelium lappaceum* L.) peel dry extract then testing several physical quality parameters. The research was conducted at the Pharmacy Technology Laboratory of the Department of Pharmacy, Makassar Health Polytechnic

Tools used: slugging tools, dryers, glass beakers, stirring rods, glass funnels, Erlenmeyer, measuring cups, grinders, mixers, ovens, 18 and mesh 60 mesh screens, picnometers, digital scales

Materials used: Citric Acid, Tartaric Acid, Aspartame, Ethanol, Glucose, Mannitol, Sodium Bicarbonate, Rambutan Fruit Skin, Polyethylene glycol 6000.

The population of this study was rambutan (*Nephelium lappaceum* L) peel obtained in the city of Makassar. The research sample was the peel of rambutan (*Nephelium lappaceum* L) which was made in the form of dried watery extract

Research Procedure

Sampling and Processing

Rambutan (*Nephelium lappaceum* L.) samples were obtained from fruit sellers in the city of Makassar

The peel of rambutan fruit is wet sorted and then washed with flowing water until it is clean and free of dirt

The Making of Rambutan Peel Dry Extract

Rambutan peel is weighed as much as 2 kg and then juiced using a juicer with the addition of water 0.5: 1. After extracting the essence of rambutan peel, it is then filtered.

The liquid extract of rambutan peel added with glucose as much as 60% then stirred until dissolved. The juice is dried using an oven dryer at a temperature of 60 ° C for ± 8 hours until it thickens. After the juice is thick, the juice is stirred and the oven is turned off and left until the juice of the fruit peel will dry out by itself. After getting dried juice, grind until it becomes a powder. The powder is crushed using a grinder and then sifted using a 60 mesh sieve. The results of the sieve are then placed in an airtight container.

Manufacture of effervescent granules

Table 1. Formula of Rambutan Peel Effervescent Granule

Components	Formula (%)		
	A	B	C
Rambutan's peel Dried extract	10	10	10
Effervesscent mix :			
▪ Natrium bikarbonat	16,0	16,0	16,0
▪ Asam Sitrat	5,0	5,0	5,0
▪ Asam Tartrat	5,162	5,162	5,162
Aspartam	1,5	1,5	1,5
Polietilenglikol 6000	1	1,5	2
Mannitol	11,338	10,838	10,338
Esens (Pengaroma)	qs	qs	qs
Total	100	100	100

Dry method is used. The citric acid is crushed and then sieved with an 18 mesh sieve and then added tartric acid and mixed until homogeneous. After that, aspartame and mannitol are added, while stirring until homogeneous. Then add the dried extract of rambutan's peel and stir it evenly. The mass mixture is put into the oven for one and a half hours at 50ºC. After that sodium bicarbonate was added and half the mass of Polyethylene glycol 6000 was then dislugged and sieved with mesh 18. Essence (scented) dissolved in ethanol then sprayed onto granules. The resulting granules are stored in a dry place at temperatures below 25ºC in airtight containers that are not permeable to moisture.

Physical Quality Test of Efferent Granules

Organoleptic Test

Seen directly from the shape, color, smell and taste of the granules produced. Shape, the color produced as far as possible is the same between one another.

Moisture content

A number of granules are placed in the dish and then put into the exicator which contains silica gel for 4 hours. Water content can be calculated using the formula:

$$Moisture\ content = \frac{initial\ weight\ of\ granules - final\ weight\ of\ granules}{initial\ weight\ of\ granules} X\ 100\ \%$$

The moisture content of efferent granules with herbal ingredients is a maximum of 0.4-0.7% (Lestari & Natalia, 2007).

Flow speed and angle of repose

The working procedure for obtaining good quality granules is that a number of granules are inserted into a funnel which is closed at the bottom. Open slowly until all the granules come out of the funnel and form a pile on the graph paper. The granule flow is good if the time needed to drain 100 grams ≤ 10 seconds (Anshory et al. 2008).

The angle of repose (α) is obtained by measuring the height and diameter of the formed granule stack, using the formula:

$$\tan \alpha = \frac{h}{r}$$

If the angle of repose formed ≤ 30º states that the preparation can flow freely, and if the angle formed ≥ 40º states that the preparation has an unfavorable flow rate. From the value of the angle of repose it can indicate the acceptability of the flow properties possessed by a material (Ansel, 2012).

Density Test

The Density test is actually testing the quality of the granule by comparing the mass with the volume of the granule.

Weight empty picnometer (25,0 ml) with a cover that is clean and dry (**a** gram) than fii it with liquid paraffin utill the fullmark (if the liquid is closed it will leave no air bubbles) then close clean and weigh (**b** gram). Cleaned by granules from fines, weigh in 1 gram of picnometer then put liquid paraffin into it until it is full and free of air bubbles and weigh (c gram). True density calculated

$$Density\ of\ Parafin = \frac{B - A\ (gram)}{Piknometer\ Volume} = x\ g/ml$$

$$True\ density = \frac{1\ g}{25\ ml - \frac{C - A)\ - 1\ g}{Density\ of Parafin}} = x\ g/ml$$

Dispersion time

Test method by entering a number of granules per formula into 200 mL aquadest at a temperature of 15-25ºC. Soluble time was calculated using a stopwatch starting from the dipped granule in the aquadest until all the granules were dissolved and the bubbles around the container began to disappear. The time to dissolve efferent granules ranges from 1-2 minutes. If the granule is well dispersed in water with a time of ≤ 5 minutes, then the

preparation meets the requirements at the time of dissolution. (Anshory, et al., 2007).

Average pH Test

To determine the homogeneity of the acid component and the granule base, the pH of the granule that has been dissolved in water is measured using a pH meter. The granules to be pH measured are weighed as much as 4 grams from several places from the granule container and then dissolved in 150 ml of water then after the granules dissolve all immediately measure the pH of the solution. Measurements were made 3 times (triplo).

Data Analysis

Data from several tests carried out were collected and then analyzed and compared with the literature requirements to determine the physical properties of effervescent granules of rambutan peels. The results of testing the physical quality parameters of effervescent granule formulas are presented narratively by comparing the results of the physical quality testing of granules formulated with the physical quality requirements of effervescent granules from the literature.Discussion

The discussion was prepared based on the results of the study.

RESULT AND DISCUSSION

RESULT

Testing of organoleptic formula for effervescent granules of rambutan peel, from the three granule formulas made was obtained by the form of coarse granules with a distinctive odor of rambutan, faded brick red color and salty sweet taste.

The moisture content of the formula of dried extract effluent from rambutan peel for formula A was 0.64%, for formula B it was 0.24% and Formula C was 0.38%.

For flow speed test, the average flow velocity for formula A is 9.82 seconds, for formula B for 8.22 seconds and for formula C for 8.64 seconds. Whereas in testing the angle of repose of the granule for formula A obtained 29.98º, for formula B obtained 28.76º and for formula C obtained 29.62º.

Test for True density of granules for formula A is 0.8898 g / ml, for formula B which is 0.1183 g / ml and for formula C which is 1.5325 g / ml

The average dispersion time of granules for formula A for 128 seconds, formula B for 107 seconds and formula C for 112 seconds.

The results of the pH measurements of the granules after being dissolved in water for formula A were 6.91, for formula B that is 7.01 and for formula C which is 6.85.

DISCUSSION

Rambutan (*Nephelium lappaceum* L.) is a tropical fruit that is very popular in Indonesia because of its sweet and distinctive taste. All this time, the fruit is only sweet and delicious, the skin itself has not been fully utilized because it tastes bitter and tends to be bitter. Although several studies have been carried out on rambutan peels, including Thitilertdecha, et al. (2010), phenolic components of rambutan peels include geraniin, corilagin, both of which are flavonoids, and elagic acid from the tannin group. Rambutan peel extract has an IC50 of 20, 39 μg / dl which means that with 20, 39 μg / dl can suppress 50% of DPPH free radicals (Wulandari and Lestari, 2012).

This study aims to utilize the rambutan (*Nephelium lappaceum* L.) peel as a health drink in the form of effervescent granules. Rambutan fruit peel which has been separated from the flesh of the fruit and its fine hair is washed clean and then made in the form of dried juice by adding 60% glucose to the juice of rambutan's peel. The purpose of adding glucose is so that the rambutan's peel liquid extract is easier to dry, in addition to overcoming the taste of the juice that is very tight. This mixture is then dried to obtain dried extract of rambutan fruit peel.

After obtaining dried extract of rambutan's peel, effervescent granules are made. In this research 3 effervescent granule formulas were made with variations in the amount of polyethylene glycol as a granule binder. The use of polyethylene glycol as a dry binder is preferred because of its crystal-shaped structure and its ability as a good dry binder especially when using dry granulation

methods. Polyethylene glycol 6000 in a concentration of 3% can be used as a lubricant or as a binder. When using polyethylene glycol 400 or 6000 in the formula, the quality of the granule is very good. In the pharmaceutical industry polyethylene glycol is used to dissolve water-insoluble drugs. The use of polyethylene glycol can also increase the spread of drugs in the body (Rowe, 2009). As an effervescent mix, citric acid, tartaric acid and sodium bicarbonate are used with the weight ratio adjusted according to the calculation of the acid-base reaction. Mannitol is added to the formula as a filler to meet the weight of the granule, the advantage is that it has a sweet taste that does not produce a sandy texture when the preparation has been dissolved.

For mixing effervescent granules, the dry method is used. The ingredients in the formula are not given liquids in the process of making granules to minimize the occurrence of acid-base reactions between the components of the effervescence. After being mixed with acids and bases the granule components are dislugged and sifted using mesh number 18. This is done so that the resulting granules have uniform size and uniform particle shape.

Effervescent granule quality tests were carried out through several physical quality tests, namely organoleptic test, moisture content test, flow velocity test and angle of repose, density test, dispersion time test and average pH test.

Organoleptic tests were carried out by observing the shape, color, taste and odor of the granule formula produced. Of the three formulas made by the three, they show the shape of particles, smell, taste and color are almost the same. Then proceed with the water content test to observe what water content is contained in the granule. The test results showed the water content for formulas A, B and C respectively were 0.64%, 0.24% and 0.38%. From these results it can be seen that the three formulas made meet the moisture content test requirements. The moisture content of efferent granules with herbal ingredients is a maximum of 0.4-0.7% (Lestari & Natalia, 2007).

Flow velocity test is done to see if the formulated granules can flow well. Test results for formulas A, B and C respectively were 9.82 seconds, 8.22 seconds and 8.64 seconds. Good granule flow if the time needed to drain 100 grams gram 10 seconds (Anshory et al. 2008). Angle of repose test aimed to determine the ability of the granule to flow freely. The test results for formulas A, B and C are 29.98º, 29.98º and 29.98º respectively. If the angle of repose formed $\leq 30^{o}$ states that the preparation can flow freely, and if the angle formed $\geq 40^{o}$ states that the preparation has an unfavorable flow rate. From the value of the angle of repose it can indicate the acceptability of the flow properties possessed by a material (Ansel, 2012).

The True density test done to determine the quality of the granule by comparing the mass with the volume of the granule. The test results for formulas A, B and C are 0.8898 g / ml, 1.1183 g / ml and 1.5325 g / ml, respectively. Testing of dispersion time was carried out to determine the ability of the dissolution rate of granules in water. Test results for formulas A, B and C respectively were 128 seconds, 107 seconds and 112 seconds. These results all show that the time needed to dissolve the three granule formulas did not exceed 2 minutes. The time to dissolve efferent granules ranges from 1-2 minutes. If the granule is well dispersed in water with a time of $\leq$ 5 minutes, then the preparation meets the requirements at the time of dissolution. (Anshory, et al., 2007). The solution produced from the granule formula was then tested for pH to see the pH suitability of the neutral pH solution. Test results for formulas A, B and C respectively were pH 6.91, pH 7.01 and pH 6.85.

All of the tests carried out on the rambutan effervescent granules all showed that the three granule formulas met the physical quality requirements of granules, and the formula with the best physical quality among the three was formula B. This is evident from the pH value closest to neutral pH, time the fastest dispersion, the most fast flow rate and the least water content. In the manufacture of PEG effervescent granules, it is preferred that the

effervescent granule formula is avoided by using wetting agents such as water or alcohol. Aside from being an anhydrous binder, PEG 6000 can improve the flow of granules and increase the dissolution of granules in the body.

Binder is a substance that is added to increase the cohesiveness or quality of bonds between the powder components in the formula. Polyethylene glycol can be used up to a concentration of 3% as a dry binder in granules. The choice of binder must be adjusted to the active substance and in the right amount in order to obtain the desired binding quality but does not affect the quality of the granule disintegration and dissolution of the active substance. From the research that has been done, it is obtained that PEG 6000 levels as the most optimal binder for the formula of granule effervescent sari dried rambutan fruit peel is at a concentration of 1.5%.

CONCLUSION

Based on the results of the research that has been done, it can be concluded:

1. Dried extract of rambutan (*Nephelium lappaceum* L.) peel can be formulated as health drinks in the form of effervescent granules.
2. The three granule formulas that have been made, granules with good physical quality are formula B using 6000 polyethylene glycol as much as 1.5%.

ACKNOWLEDGEMENT

The authors are thankful to Pharmacy Department of Health Polytechnic Makassar for providing necessary facilities to carry out this research from beginning to the end.

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