

## Conference Paper

# Formulation of Tablets of Rosella Petal (*Hibiscus sabdariffa*) Extract With Gum Arabic as a Binder

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**Abstract.**

Rosella petals (*Hibiscus sabdariffa*) have antioxidant activity from anthocyanins, which are part of the flavonoids that produce the red color of the petals. Rosella petal extract can be made into chewable tablets for consumption. The purpose of this study was to produce chewable tablets of rosella petal extract using gum arabic as a binder. This was experimental quantitative research. Chewable tablets of rosella petal extract were made in 3 formulas with various concentrations of gum arabic: F1 (10%), F2 (15%) and F3 (20%). The chewable tablets were prepared by the wet granulation method. Variations in the gum arabic concentration as a binder can influence the physical properties of the tablets produced, including hardness, friability and taste response. If the concentration of gum arabic is larger, it will make the tablet harder and lessen the friability of the tablet.

**Keywords:** chewable, rosella, petals, gum arabic

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## 1. Introduction

Rosella is one of the type of plants used as traditional medicine. The part of Rosella that is often used is the flower petal. Rosella petal has many advantages, one of them is the content of phenolic compounds in rosella petal extract which shows antioxidant activity [1]. The petals of the rosella plant are widely used in food processing, this part contains anthocyanins which give color to the rosella petals. In addition, anthocyanins are also used as antioxidants that can neutralize free radicals [2].

Anthocyanins are used as antioxidants which are considered can cure degenerative diseases, which can prevent atherosclerosis, blood vessel blockage disease, through the oxidation of bad fats in the body such as low density lipoproteins. Previous research has proven that rosella extract has antioxidant activity using DPPH (2,2-diphenyl-1-picrylhydrazyl) which shows results of 102-69 ppm or can be said to have a

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strong category of antioxidants [3]. Rosella petal anthocyanins, especially *delphinidin-3-sambubioside* and *cyanidin-3-sambubioside* are the main active compounds used to anti-hypertensive, antioxidant, and hypocholesterolemic effects, in the extract the amount of the main active compounds is relatively high [4].

The potential utilization of rosella extract is still limited and not optimal. One of the preparations that can be used as an innovation is a chewable tablet. Chewable tablets are made by compression, generally using mannitol, sorbitol, sucrose and dextrose as binders and fillers, containing coloring and flavoring agents to improve appearance and taste [5]. The extract formulated into chewable tablets will be more easily released as active ingredients in body tissues and absorbed by the body. The purpose of chewable tablets is to provide a form of medication that can be given easily to children or the elderly who have difficulty swallowing drugs, and can cover unpleasant tastes [6].

The binder in the chewable tablet formulation has a very important role that making all the components of the material mixed so that a compact tablet is produced, which works by increasing the cohesive properties of the powder through binding in the formation of granules which in compression form a cohesive mass or compression as a tablet [7]. Gum arabic has good flow properties, is pharmacologically inert, has good compressibility and compactness, the material is easy to obtain (availability of raw materials), and the price is relatively cheaper than other binders. The concentration of gum arabic as a binding agent in tablets ranges from 10-25% in the form of a solution [8].

Based on the description above, it is necessary to develop a pharmaceutical preparation from rosella petals extract to facilitate its use, namely in the form of chewable tablets. This study will examine the effect of variations in binder on the physical properties of the rosella petals extract (*Hibiscus sabdariffa* L.) chewable tablet.

## 2. Methods

The design formula (F) consists of 3 formulas with 1 independent variable, namely variations in the concentration of binder (gum arabic). F1 is a formula with 10% gum arabic concentration, F2 is a formula with 15% gum arabic concentration, and F3 is a formula with 20% gum arabic concentration. The design of the formula can be seen in Table 1.

Granules were made using the wet granulation method. The dried extracts of rosella petals, mannitol, lactose, and aspartame were mixed until homogeneous using a mixer. Mucilago gum arabic added to the powder mixture slowly, homogenized until a good

TABLE 1: Chewable tablet formula design.

Composition	Formula (mg)					
	F1		F2		F3	
	mg	%	mg	%	mg	%
Rosella petals Extract	440	29.33	440	29.33	440	29.33
Mannitol	752.5	50.17	742.5	49.5	732.5	48.83
Lactose	250	16.67	250	16.67	250	16.67
PGA (0.2 ml/tab)	150	10	225	15	300	20
Talk	27	1.8	27	1.8	27	1.8
Mg Stearate	3	0.2	3	0.2	3	0.2
Aspartame	7.5	0.5	7.5	0.5	7.5	0.5

granule mass is formed. The granule mass was passed through a 16 mesh sieve, dried in an oven at 50°C for  $\pm$  2 hours to dry. The dried granules were then sieved through an 18 mesh sieve and added with magnesium stearate and talc.

The tablet compression was carried out using a single punch tablet TDP model with a punch size of 13 mm (flat-faced punch). The tablet mass mixture was weighed and put into the punch manually as much as 500 mg. Then the tablets formed were characterized/evaluated their physical properties.

The data from the evaluation of the physical properties of the granules were the compression test, the flow time test, the angle of repose test, the moisture content test and the data from the physical properties evaluation of the rosella petals extract chewable tablets, namely the friability test and the hardness test of the tablets obtained were then analyzed using the IBM SPSS software. statistics 21. The data obtained were tested for normality and homogeneity using the Shapiro Wilk and Levene's test methods. If the data is normally distributed and homogeneous, then proceed with one-way analysis of variance (One Way ANOVA). The results of the One Way ANOVA test if there are significant differences, then proceed with the Post Hoc test. Statistical testing was carried out from 95% confidence level. In the results of the taste response test, the data will be calculated the percentage value of each formula in the form of a bar graph.

### 3. Results and discussion

#### 3.1. Evaluation of the physical properties of granules

### 3.1.1. Granule determination

The results of statistical tests using the Shapiro-Wilk test and Levene's Test can be seen that the granule settling index is normally distributed and homogeneous. Then proceed with the One Way Anova statistical test with a 95% confidence level showing that there are significant differences in all formulas, because the probability value obtained is  $< 0.05$ . Furthermore, a follow-up test with *Post Hoc* found that the formulas that had a significant difference were F1 with F3 and F2 with F3. This is because F3 has the highest determination index value among other formulas. The results of the determination index test can be seen in Figure 1.

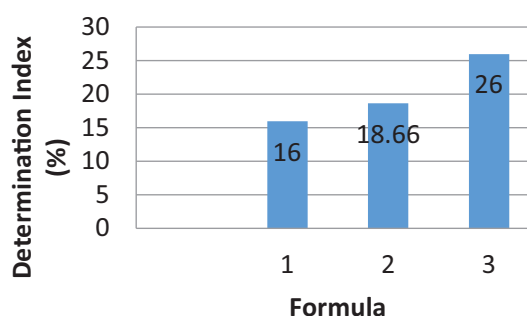


Figure 1: Granule Determination Index Result Chart.

### 3.1.2. Granule flow time

The results of statistical tests using the Shapiro-Wilk test and Levene's Test can be seen that the flow time of the granules is normally distributed and homogeneous. Then proceed with the One Way Anova statistical test with a 95% confidence level showing that there are significant differences in all formulas, because the probability value obtained is  $< 0.05$ . Furthermore, a follow-up test with *Post Hoc*, it was found that all formulas had significant differences from each other. Thus, it can be concluded that the addition of the concentration of gum arabic binder has an effect on the results of the granule flow time test. The results of the granule flow time test can be seen in Figure 2.

### 3.1.3. Angle of Repose

The results of statistical tests using the Shapiro-Wilk test and Levene's Test can be seen that the results of the angle of repose of the granules are normally distributed

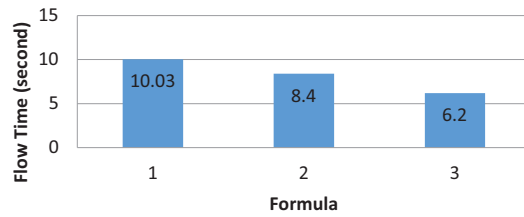


Figure 2: Granule flow time yield chart.

and homogeneous. Then proceed with the One Way Anova statistical test with a 95% confidence level showing that there are significant differences in all formulas, because the probability value obtained is  $<0.05$ . Furthermore, a follow-up test with Post Hoc was carried out, it was found that all formulas had significant differences from each other. Thus it can be concluded that the addition of gum arabic binder concentration has a significant effect on the results of the granule angle of repose test. The results of the granule dam angle test can be seen in Figure 3.

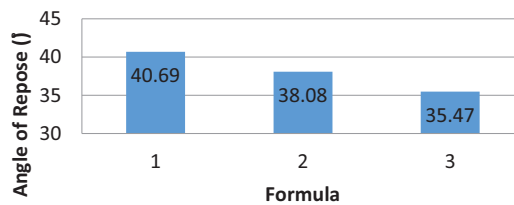
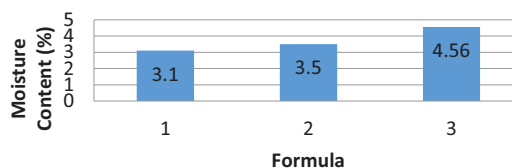


Figure 3: Granules angle of repose diagram.

### 3.1.4. Moisture content of granules

The results of statistical tests using the Shapiro-Wilk test and Levene's Test can be seen that the results of the data on the moisture content of the granules are normally distributed and homogeneous. Then proceed with the One Way Anova statistical test with a 95% confidence level showing that there are significant differences in all formulas, because the probability value obtained is  $<0.05$ . Furthermore, a follow-up test with Post Hoc found that the formulas that had a significant difference were F1 with F3 and F2 with F3. This indicates that the addition of a binder concentration of 10% and 15% with a concentration of 20% binder has a significant effect on the results of the moisture content test. The results of testing the moisture content of the granules can be seen in Figure 4.

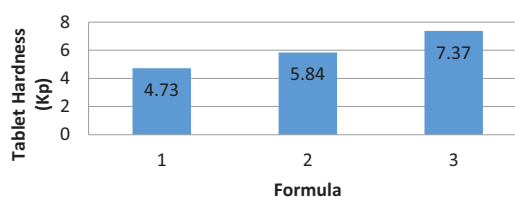


**Figure 4:** Granule moisture content yield chart.

## 3.2. Evaluation of tablet physical properties

### 3.2.1. Tablet hardness

The results of statistical tests using the Shapiro-Wilk test and Levene's Test can be seen that the results of the hardness data of the chewable tablets of rosella petals extract were normally distributed and homogeneous. Then proceed with the One Way Anova statistical test with a 95% confidence level showing that there are significant differences in all formulas, because the probability value obtained is  $<0.05$ . Furthermore, a follow-up test with Post Hoc was carried out, it was found that all formulas had significant differences from each other. Thus, it can be concluded that the addition of gum arabic binder has a significant effect on the hardness test results of rosella petals extract chewable tablets. The results of the hardness test of the rosella petals extract chewable tablets can be seen in Figure 5.



**Figure 5:** Tablet hardness result chart.

### 3.2.2. Fragility of tablets

The results of statistical tests using the Shapiro-Wilk test and Levene's Test can be seen that the results of the friability of the chewable tablets of rosella petals extract were normally distributed and homogeneous. Then proceed with the One Way Anova statistical test with a 95% confidence level showing that there are significant differences in all formulas, because the probability value obtained is  $<0.05$ . Furthermore, a follow-up test with Post Hoc found that the formulas that had a significant difference were F1 with F2 and F1 with F3. This is because the F3 fragility value is very low compared to other

formulas. The values of hardness and brittleness are inversely related, because the hardness value of F3 is the largest, the brittleness value will be smaller which results in F3 having a significantly different brittleness value from the other formulas. Thus, it can be concluded that the addition of gum arabic binding agent concentration significantly affected the results of the brittleness test of rosella petals extract chewable tablets. The results of testing the brittleness of the rosella petals extract chewable tablets can be seen in Figure 6.

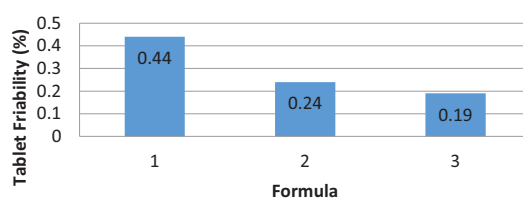


Figure 6: Tablet friability result chart.

### 3.2.3. Tablet flavor feedback

In this taste response test, the taste, color, and texture of the tablet were grouped into 5 categories, namely very like, like, ordinary, dislike, and dislike. After the respondent tried the rosella petals extract chewable tablet and filled out a questionnaire on the taste, color, and texture of the tablet, then the respondent was asked to choose which formula was acceptable to the respondent. The results of the examination of the formulas that are acceptable to the respondents can be seen in Figure 7.

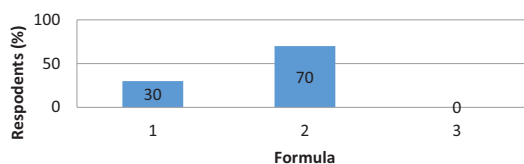


Figure 7: Diagram of the Formula Accepted by Respondents.

The higher the concentration of gum arabic binder, the less filler material, namely mannitol. It is not only as a filler but also has a sweet taste so that it can cover the sour taste of rosella petals powder extract along with aspartame. In addition, formula 1 has the lowest concentration of gum arabic binder so that the granulation process is not perfect yet, causing the resulting hardness to be too small and the texture of chewable tablets when consumed is easy to break and make it uncomfortable. Thus, in formula 2 with a concentration of 15% gum arabic binder and a sufficient amount of mannitol as

filler, it can help covering the sour taste of rosella petals extract and also has a better texture than formula 1.

## acknowledgments

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