



# Characteristics Of Mangosteen (*Garcinia Mangostana* L) Peel Extract Paper Soap With The Addition Of Glycerin And Hydroxypropyl Methyl Cellulose

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**Abstract.** Paper soap is a unique soap product innovation in the form of thin sheets resembling paper. Mangosteen peel contains xanthone compounds, which are considered to have antioxidant and anti-inflammatory properties. Mangosteen peel also contains flavonoids, tannins, and saponins. This research aims to determine the effect of mangosteen peel extract and the ratio of glycerin to Hydroxypropyl Methylcellulose (HPMC) on paper soap formulation and to obtain the best formulation in accordance with SNI No. 06-3532-1994. The method used in this research is maceration. The variations of mangosteen peel extract used are 2 ml, 4ml, 6 ml, 8 ml, and 10 ml, while the ratios of glycerin to HPMC are 10:1, 8:3, and 6:5. Several quality tests were conducted in this research to determine the desired paper soap characteristics, including organoleptic analysis, pH test, water content test, foam height test, free fatty acid test, and free alkali test. The results of the organoleptic analysis showed that paper soap became non-sticky, smooth, more durable, less prone to moisture, and flexible. The best paper soap formulation was obtained in F5 C, with a pH of 9, foam height of 10 cm, water content of 0.2%, free fatty acid content of 1.025%, and free alkali content of 0.02%.

**Keywords:** Paper Soap, Mangosteen Peel, Maceration, HPMC

## 1 Introduction

Paper soap is one of the innovative soap preparation products in the form of thin sheets resembling paper with a thickness of 10-500  $\mu\text{m}$  [1]. Paper soap comes from water-soluble polymer components and also soap which has the main function of cleaning germs on hands or areas of the human body [2]. Paper soap was developed during the COVID-19 pandemic to avoid continuous use of soap and minimize the risk of spreading viruses [3]. Using paper soap is more efficient and easy to carry anywhere without reducing the quality of the soap as a germ cleaner on areas of the human body.

The process for making paper soap is the same as making soap in general, namely through a saponification reaction where fatty acids are reacted with alkali. Apart from these main ingredients, other additives are also added to soap to meet the user's needs, for example by adding anti-oxidants and anti-bacterials. One natural antioxidant and

antibacterial ingredient that can be used is mangosteen rind extract. According to research conducted by Sari, et al, [4] shows that mangosteen rind extract is composed of polyphenolic compounds, namely folic acid, tannin, anthocyanin and xanthenes which have high antioxidant activity and can help protect the skin from damage caused by free radicals. [5].

The formulation of paper soap and soap is generally the same, but the difference is the dosage form and dosage size. Formulation techniques to produce paper soap preparations include the addition of plasticizers, the addition of plasticizers and film forming polymers (film forming agents) and the use of paper membranes by dipping or immersion techniques. In this research, the paper soap formulation was made by adding a plasticizer in the form of Glycerin and a film forming agent in the form of HPMC (Hydroxy Propyl Methyl Cellulose). Because paper soap can have elastic, soft, non-sticky properties, it helps maintain skin moisture and prevents the skin from becoming dry after using soap.

This research aims to determine the effect of mangosteen peel extract and the ratio of glycerin to Hydroxypropyl Methylcellulose (HPMC) on paper soap formulation and to obtain the best formulation in accordance with SNI No. 06-3532-1994

## **2. Experimental Procedure**

### **2.1. Material**

The raw material are Mangosteen Peel, Virgin Coconut Oil (VCO), Sodium Hydroxide (NaOH) 31%, Stearic Acid, Ethanol 96%, Sugar, Flavor, Hydroxy Propyl Methyl Cellulose (HPMC), Glycerol, Aquadest, Iron (III ) Chloride ( $\text{FeCl}_3$ ), Mg Powder, Hydrochloric Acid (HCl)

### **2.2. Equipment**

The Equipment used in this research are Beaker Glass, Erlenmeyer, Test Tube, Analytical Balance, Watch Glass, Measuring Pipette, Rubber Ball, Hotplate, Tube clamp, Stirrer, Oven, Funnel, Drop pipette, Soap mold, Measuring cup, pH meter, A set of distillation tools. Rotary vacuum evaporator

### **2.3. Procedure**

Making paper soap with the addition of mangosteen rind extract is divided into 3 parts :

#### **1. Making mangosteen peel extract and analyzing phytochemical tests**

The rind of the mangosteen fruit is cleaned and cut into small pieces then dried in the hot sun and ground into powder. Next, maceration extraction was carried out using 70% ethanol. Then the extract results will be screened through flavonoid, saponin and tannin tests

## 2. Making paper soap

The formulation for making paper soap using mangosteen peel extract (*Garcinia Mangostana L*) with the addition of glycerol and Hydroxy Propyl Methyl Cellulose (HPMC) can be seen in table 1.

**Table 1.** Formulation of Ingredients for Making Paper Soap (Percentage)

	mangosteen peel extract	Ratio Gliserin : HPMC	Stearat Acid	NaOH	VCO	Etanol	Sugar	Essential Oil	Aquadest
F1 A	2								
F2 A	4								
F3 A	6	10 : 1	5	20	28	20	24	1,5	20
F4 A	8								
F5 A	10								
F1 B	2								
F2 B	4								
F3 B	6	8 : 3	5	20	28	20	24	1,5	20
F4 B	8								
F5 B	10								
F3 C	2								
F3 C	4								
F3 C	6	6 : 5	5	20	28	20	24	1,5	20
F3 C	8								
F3 C	10								

## 3. Product Analysis

The Analysis in the form of organoleptic tests and tests on pH, foam height, water content, free fatty acids, free alkali which refer to the Indonesian National Standard (SNI) No. 06-3532-1994

## 3. Results And Discussion

### 3.1 Characteristic of Paper Soap

Visual organoleptic testing is a testing method that uses human senses as the main tool to determine product quality. Organoleptic tests include weight, thickness of soap, color, texture and the effect of storage time on soap texture. Paper soap is thin soap which has a thickness like paper, which is around 10- 500  $\mu\text{m}$  [1] (widyasanti dkk, 2018), while the paper soap produced from this research has a average thickness 0,01 mm with an average weight 0.3 gram The resulting paper soap can be seen in figure 1.



**Figure 1.** Paper Soap

Figure 1 shows that the more mangosteen rind extract added affects the color of the paper soap, the paper soap is darker. but, the addition of the extract does not affect the texture of the soap, on average the texture of the resulting soap has a smooth, non-sticky and flexible surface, this is due to the addition of glycerol and HPMC. The addition of glycerol as a plasticizer will weaken the stiffness of the preparation and make the preparation more flexible, while the addition of HPMC makes the texture of the preparation less sticky even if stored for 30 days in a closed place at room temperature.

**3.2 Quality of Paper Soap**

From the analysis result of phytochemical test and quality of product are shown in Table 2 and Table 3.

**Table 2.** Results of Identification of Mangosteen Peel Extract Phytochemical Compounds

Analysis	Result	Note
Flavonoid	The color of solution is yellowish red	+
Tanin	The solution is blackish green and there is sendimen	+
Saponin	Have foam	+

Table 3. Result of Quality of Paper Soap

Parameters
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Formulasi	pH	Water Content (%)	Foam height (cm)	Free Fatty Acid (%)	Free Alkali (%)
F1 A	8	0,3	7	1,025	0,04
F1 B	8	0,3	6	1,025	0,06
F1 C	8	0,2	7	1,025	0,04
F2 A	9	0,4	6	2,05	0,02
F2 B	9	0,3	6	1,025	0,04
F2 C	9	0,1	8	1,025	0,02
F3 A	9	0,3	7	2,05	0,06
F3 B	9	0,2	7	1,025	0,08
F3 C	9	0,1	8	1,025	0,02
F4 A	9	0,3	8	1,025	0,04
F4 B	9	0,3	9	1,025	0,02
F4 C	9	0,2	9	1,025	0,02
F5 A	9	0,4	9	2,05	0,06
F5 B	9	0,3	10	1,025	0,04
F5 C	9	0,2	10	1,025	0,02
SNI 06-3532-1994	8-11	Max 15	1,3-22	Max 2,5	Max 0,1

Table 3 shows that variations in extracts and ratios of glycerin and HPMC have pH values ranging between 8-9. This means that there is no specific effect of variations in the addition of mangosteen peel extract or variations in the ratio of HPMC and glycerin to the pH of the paper soap obtained. Therefore, the formulation F1 A- F5 C with a ratio of glycerin and HPMC (10:1, 8:3, 6:5), paper soap meets SNI No. 06-3532-1994 ranges between 8-11. This pH value is safe for the skin so that the paper soap produced can be used safely for washing hands and does not cause skin irritation

The more mangosteen peel extract added to the paper soap, the higher the foam value produced. This is because the more content in the extract, the saponin value in the paper soap formulation increases. So the height of the foam also increases. Meanwhile, with the glycerin:HPMC ratio, the higher the HPMC content in the paper soap formulation, the higher the foam produced. This is because the HPMC structure functions to thicken and strengthen the walls of the foam bubbles and slow down the flow of water, so that the foam formed is denser and more stable [6].

The addition of mangosteen peel extract does not really affect the water content of paper soap, this can be proven by the value of the water content which is inconsistent with the addition of mangosteen peel extract and tends to increase. Meanwhile, with the ratio of glycerin:HPMC (6:5), the water content obtained will be more stable and tend to be lower than the ratio (10:1 and 8:3). This means that along with the addition of HPMC to paper soap, the water content produced will be more stable and lower

the water content, because HPMC itself has hydrophilic polymer properties, meaning it can absorb and form solutions with water. When HPMC is in solid or powder form, it tends to absorb water from its environment. This hydrophilic property makes HPMC useful as a binder, filler and adhesive in soap making formulations

Mangosteen peel extract does not really affect the free fatty acids in paper soap. This can be proven by the value of inconsistent free fatty acid with the addition of mangosteen peel extract, whereas with the glycerin:HPMC ratio, the higher the HPMC content in the soap formulation, the less free fatty acids will be produced. This is due to the influence of HPMC which has hydrophilic polymer properties, so that hydrolysis does not occur which causes an increase in free fatty acids in paper soap because free fatty acids are formed due to the hydrolysis process of fat caused by water, heat and enzymes that occur in oil, thus producing glycerol. and free fatty acids.[7].

The addition of mangosteen peel extract does not really affect the free alkali value because the resulting value does not show any change in the influence of mangosteen peel extract, whereas with the glycerin:HPMC ratio, it also does not really affect the free alkali value because the resulting value does not show any change in the influence of the ratio ratio. glycerin:HPMC (10:1, 8:3, 6:5). This is because the free alkali value is influenced by the amount of alkali added, the type of fat or oil used, temperature and reaction time [8].

#### 4. Conclusion

The addition of mangosteen peel extract to paper soap has an effect on increasing the color and stability of the foam, while the ratio of glycerin and Hydroxy Propyl Methyl Cellulose (HPMC) to the resulting paper soap product becomes less sticky to each other, and the texture becomes smoother and thicker. durable and does not water easily even if stored in an airtight place and becomes flexible when stiff. The best formulation of paper soap obtained was F5 C with 10 ml extract and a ratio of glycerin to HPMC (6:5), with analysis results of pH 9, foam height 10 cm, water content 0.2%, free fatty acids 1.025% , as well as 0.02% free alkali.

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