LAMPIRAN

Lampiran 1. Perhitungan Rendemen

Rendemen Ekstrak Daun Pandan

Berat Sampel = 200 gram (x)

Berat cawan kosong = 72,87 gram (b)

Berat cawan+sampel = 149 gram (c)

Berat cawan+sisa = 73,66 gram

Berat ekstrak = b-c

= 149 gram – 72,87 gram

= 76,13 gram (y)

$$R = \frac{y}{x} \times 100\%$$

$$R = \frac{76,13}{200} \times 100\%$$

R = 38,065%

Lampiran 2. Perhitungan Bahan

1. Formula 1

- Ekstrak daun pandan = $\frac{5}{100}$ x 100 ml
  = 5 gram
- Ekstrak daun nangka = $\frac{5}{100}$ x 100 ml
  = 5 gram
- Carbomer = $\frac{0,1}{100}$ x 100 ml
  = 0,1 gram
- Natrium lauryl sulfate = $\frac{10}{100}$ x 100 ml
  = 10 gram
- Metil paraben = $\frac{0,2}{100}$ x 100 ml
  = 0,2 gram
- Propilenglikol = $\frac{6}{100}$ x 100 ml
  = 6 gram
- Menthol = $\frac{0,2}{100}$ x 100 ml
  = 0,2 gram
- Aquadest ad 100ml = 100 - 26,5
  = 73,5 ml

2. Formula 2

- Ekstrak daun pandan = $\frac{5}{100}$ x 100 ml
  = 5 gram
- Ekstrak daun nangka = $\frac{5}{100}$ x 100 ml
  = 5 gram
- Carbomer = $\frac{0,3}{100}$ x 100 ml
  = 0,3 gram
- Natrium lauryl sulfate = $\frac{10}{100}$ x 100 ml
  = 10 gram
- Metil paraben = $\frac{0,2}{100}$ x 100 ml
  = 0,2 gram
- Propilenglikol = $\frac{6}{100}$ x 100 ml
  = 6 gram
- Menthol = $\frac{0,2}{100}$ x 100 ml
  = 0,2 gram
- Aquadest ad 100ml = 100 – 26,7
  = 73,3 ml

3. Formula 3

- Ekstrak daun pandan = $\frac{5}{100}$ x 100 ml
  = 5 gram
- Ekstrak daun nangka = $\frac{5}{100}$ x 100 ml
  = 5 gram
- Carbomer = $\frac{0,5}{100}$ x 100 ml
  = 0,5 gram
- Natrium lauryl sulfate = $\frac{10}{100}$ x 100 ml
  = 10 gram
- Metil paraben = $\frac{0,2}{100}$ x 100 ml
  = 0,2 gram
- Propilenglikol = $\frac{6}{100}$ x 100 ml
  = 6 gram
- Menthol = $\frac{0,2}{100}$ x 100 ml
  = 0,2 gram
- Aquadest ad 100ml = 100 – 26,9
  = 73,1 ml

Lampiran 3. Perhitungan uji bobot jenis

Formula 1

a. **Replikasi I =** $\frac{48{,}90 - 22{,}41}{25 \text{ ml}} = 1{,}0596$

b. **Replikasi II =** $\frac{48{,}91 - 22{,}41}{25 \text{ ml}} = 1{,}06$

c. **Replikasi III =** $\frac{48{,}93 - 22{,}41}{25 \text{ ml}} = 1{,}0608$

Rata-rata = 1,060

Formula 2

a. **Replikasi I =** $\frac{47{,}60 - 22{,}41}{25 \text{ ml}} = 1{,}0076$

b. **Replikasi II =** $\frac{47{,}63 - 22{,}41}{25 \text{ ml}} = 1{,}0088$

c. **Replikasi III =** $\frac{47{,}66 - 22{,}41}{25 \text{ ml}} = 1{,}01$

Rata-rata = 1,0088

Formula 3

a. **Replikasi I =** $\frac{48{,}82 - 22{,}41}{25 \text{ ml}} = 1{,}0564$

b. **Replikasi II =** $\frac{48{,}84 - 22{,}41}{25 \text{ ml}} = 1{,}0572$

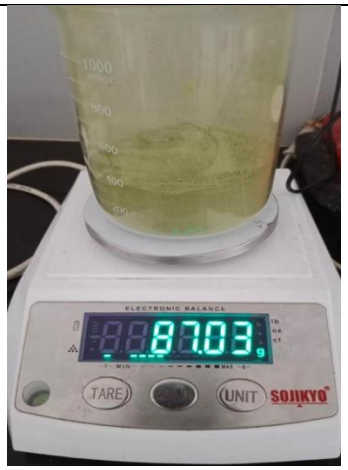
c. **Replikasi III =** $\frac{48{,}88 - 22{,}41}{25 \text{ ml}} = 1{,}0588$

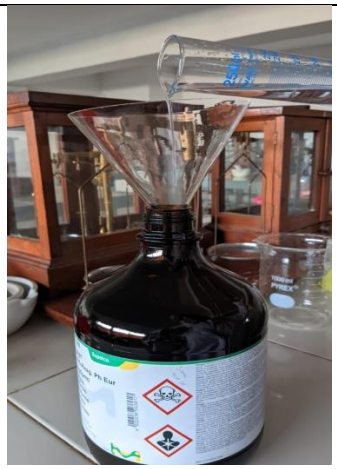
Rata-rata = 1,057

Lampiran 4. Gambar pengumpulan bahan

No	Gambar	Keterangan
1		Penirisan daun pandan setelah dicuci
2		Pengeringan daun pandan
3		Penimbangan berat kering daun pandan

Lampiran 5. Gambar pembuatan ekstrak

No	Gambar	Keterangan
1		Penghalusan simplisia
2		Pengayakan simplisia
3		Penimbangan serbuk simplisia

No	Gambar	Keterangan
4		Proses maserasi simplisia
5		Proses penguapan dan pengentalan ekstrak
6		Hasil ekstrak daun pandan

Lampiran 6. Gambar pembuatan sediaan

No	Gambar	Keterangan
1		Penimbangan ekstrak
2		Penimbangan bahan

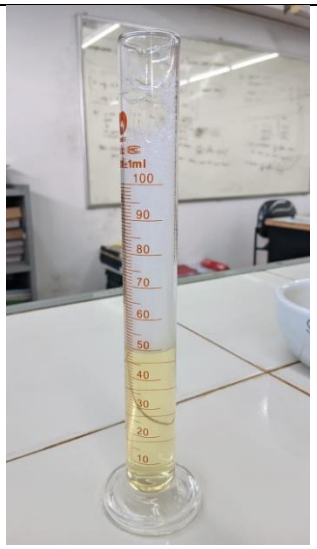
No	Gambar	Keterangan
3		Pencampuran bahan
4		Hasil sediaan shampoo

Lampiran 7. Gambar uji sifat fisik

No	Gambar	Keterangan
1		Uji organoleptik
2		Uji homogenitas

No	Gambar	Keterangan
3		Uji pH

4			Uji bobot jenis

No	Gambar	Keterangan
5		Uji tinggi busa
6		Uji viskositas

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Formulation and Physical Stability Test of Shampoo Preparation Combination of Ethanol Extract of Jackfruit Leaves (*Artocarpus heterophyllus*) and Pandan Leaves (*Pandanus Amaryllifolius*) with Varying Carbomer Concentrations

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ABSTRACT

Hair plays an important role for humans because hair can influence a person's appearance. Pandan leaves (Pandanus Amaryllifolius) contain compounds in the form of alkaloids, flavonoids, saponins, polyphenols, tannins and dyes. In pandan leaves, the compounds that can provide antimicrobial activity are flavonoids and polyphenols (phenols). This research aims to formulate and test the physical stability of a shampoo combining ethanol extract of jackfruit leaves (Artocarpus heterophyllus) and pandan leaves (Pandanus Amaryllifolius) with varying carbomer concentrations. This research method is laboratory experimental. The carbomer concentration used is 0.1%, 0.3%, 0.5%. The research results showed that the shampoo preparation with the best carbomer concentration was formula 3 with a carbomer concentration of 0.5%. Viewed from an organoleptic perspective, namely with a blackish brown color, the typical smell of pandan accompanied by menthol, pH 6, the shampoo preparation obtained is homogeneous and produces the best foam, namely 13.5 cm in formula 3. Keywords: Shampoo, anti-dandruff, pandan leaves, jackfruit leaf extract.

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1. INTRODUCTION

The hair that adorns a person's head is an aesthetic necessity, so many people spend a lot of time caring for and repairing their hair. It is not surprising that shampoo controls 12% of the cosmetics market because of its huge use. Shampoo is also a staple ingredient in hair care cosmetics.[1] This means that a good shampoo composition is very important. Shampoo itself is a cosmetic preparation in the form of liquid, gel, emulsion or aerosol which contains surfactants so that it has washing, moisturizing and foaming properties. Shampoo is useful for removing dirt, fat and hair oil and making hair shiny and

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easy to care for. Human hair amounts to approximately 100,000 strands. Hair loss cycles are normal, but for some people, hair loss is still a worry. Hair loss can be caused by several factors such as age, hormonal disorders, pregnancy, use of drugs, constant sun exposure and lifestyle.[2]

Therefore, hair must be cared for both in terms of health and cleanliness. There are problems that arise if hair is not cared for properly, for example hair problems can interfere with the beauty and appearance of hair, one of which is dandruff. Dandruff is a scalp condition characterized by the presence of white or gray flakes or scales on the scalp. This dandruff can be caused by excessive removal of the stratum corneum of the scalp without inflammation.[3] Other factors that cause dandruff include air and water pollution, lifestyle changes, poor hygiene, sweating and mental stress, poor diet, hormonal differences and infections can also cause dandruff.[4]

Many people have used various types of treatment to overcome the dandruff problem they face. As medicine develops in Indonesia, the development is now leading to a herbal treatment system, because it has been proven to be safer and does not cause side effects like chemical drugs.[5] One of the herbal plants that is efficacious for treating dandruff is pandan (*Pandanus amaryllifolius*). According to Budiman (2012), the chemical contents in pandan leaves that can provide antimicrobial activity are flavonoids and polyphenols (phenols) because these compounds will inhibit the growth of fungi that cause dandruff.[6]

Shampoo is a preparation that contains surfactants in the appropriate form, which can be liquid, solid or powder, which under certain conditions can help remove oil on the surface of the head, dirt on the skin, hair and also the scalp. There are two types of anti-dandruff shampoo on the market, namely shampoo with synthetic active ingredients and shampoo with natural ingredients. Synthetic active ingredients in shampoo have many side effects that are a problem for consumers, including rashes or irritation, follicular rash, urticaria, hair loss, discolorationand brittle hair.[7]

The aim of this research was to determine the formulation and test the physical stability of a shampoo preparation combining the ethanol extract of jackfruit leaves (*Artocarpus heterophyllus*) and pandan leaves(*Pandanus amaryllifolius*) with varying carbomer concentrations.

2. EXPERIMENTAL

2.1. Tools and materials

The tools used in this research were mortar and stamper, porcelain cup, watch glass, measuring cup, measuring flask, glass beaker, Erlenmeyer, stirring rod, horn spoon, dropper pipette, reaction tube rack, evaporator, pycnometer, glass object, pH paper. and so forth.

The ingredients used in this research were jackfruit and pandan leaf extracts, Carbomer, Sodium LaurylSulfate, Methyl Paraben, Propylene glycol, Menthol and Aquadest.

2.2. Research procedure

1. Making pandan leaf simplicia using the maceration method

The fresh pandan leaves obtained were wet sorted to separate foreign materials from the plant. Next, the pandan leaves are washed under running water until clean, then cut into small pieces. The pandan leaves that have been cut are then dried in the oven for 2 days, then the simplicia are blended until fine pandan leaf simplicia powder is obtained.[8]

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2. Making Extracts

Put 200 grams of dry simplicia of pandan leaves into a maceration container and add enough 70% ethanol solvent and leave for 10 minutes for the simplicia wetting process to take place with the aim of absorbing the solvent into the simplicia. The maceration container is closed and stored in a place protected from sunlight and stirred occasionally. Then the extract is filtered and then separated between the filtrate and the dregs using a flannel cloth. The pulp is re-extracted and done repeatedly to produce a filtrate. Then it is collected and evaporated until a thick extract is obtained.

3. Identify chemical compound groups in pandan leaves
   a. The flavonoid test was carried out by adding pandan leaf extract into a test tube, adding Mg powder and hydrochloric acid solution, shaking and letting it separate. Flavonoids are positive if a red, yellow or orange color appears on the amyl alcohol layer.
   b. The Tannin test was carried out by putting pandan leaf extract into a test tube and adding 2 drops of $FeCl_3$ solution reagent. Dark blue or blackish green color indicates the presence of tannin.
   c. The alkaloid test is carried out by putting pandan leaf extract into a test tube and adding 2 drops of Mayer reagent and producing a white or yellow precipitate. Meanwhile, 2 drops of bauchardate reagentwere added to produce a blackish brown precipitate.
   d. Terpenoid and steroid tests use Lieberman Burchard reagent and produce green to blue indicating the presence of steroids.
4. Identify the groups of chemical compounds in jackfruit leaves
   a. The flavonoid test was put into a test tube and Mg powder and 4 drops of 2% HCL were added. Produces filtrate color to orange red and yellow.
   b. The alkaloid test in the Mayer reagent produces a white or yellow precipitate, while the Bauchardat reagent produces a brown to black precipitate.
   c. The Tannin test is carried out by adding 2 drops of 1% FeCl3 and produces a dark blue or blackish green color.
5. Formulation of jackfruit leaf and pandan leaf shampoo

In this research there were three formulations, namely 5%, 5%, 5%. The design formulation can be seen inTable 1.

Table 1. Design formulation

Materials	F1	F2	F3
Jackfruit leaf extract	5 %	5%	5%
Pandan leaf extract	5%	5%	5%
Carbomer	0,1%	0,3	0,5
Sodium Lauryl Sulfate	10%	10%	10%
methyl paraben	0,2%	0,2	0,2
Propylene glycol	6%	6%	6%
Menthol	0,2%	0,2%	0,2%
Aquadest	Ad 100ml	Ad 100 ml	Ad 100 ml

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6. Making shampoo preparations
   This is done by sprinkling carbomer over hot water until it expands. After it expands, methyl paraben and sodium lauri sulfate are added which have been dissolved in water and stirred until homogeneous (Part 1). The crushed menthol is then added with propylene glycol (Part 2). Part 1 is added to part 2 little by little and stirred until homogeneous, then thick pandan leaf extract and jackfruit leaf extract are added, then the remaining distilled water is added to the mixture and stirred until homogeneous.
7. Evaluation of Inventory
   a. Organoleptic Test
      The physical appearance of the shampoo must be attractive, homogeneous, not broken and able to form foam. This analysis examines the shape, smell and color of the shampoo preparation.
   b. Ph Test
      Measurement of the pH of shampoo preparations is carried out by dipping pH paper into the solution until it shows color and observing the color that occurs. The pH value of shampoo must meet the requirements set out in SNI No. 06-2692-1992, namely around 5.0-9.0.
   c. Homogeneity Test
      The aim is to be able to see the pandan leaf and jackfruit leaf extracts well so that they do not leave any grains of the ingredients used.
   d. Measurement of foam height
      The foam height measurement test was carried out to determine the shampoo's ability to produce foamin water. The shampoo preparation was tested to measure the foam height in turns for each formulation, put 0.1 ml into a measuring cup and mixed with distilled water, then covered and shakenfor 5 minutes, measuring the height of the foam formed.
   e. Viscosity Test
      The aim is to determine the viscosity of the shampoo preparation.
   f. Specific Gravity
      The aim is to determine the specific gravity of the shampoo preparation.
   g. Test for irritation
      The aim is to determine the irritation of the shampoo on the skin before use by applying shampooformula 1, formula 2 and formula 3 alternately on the back of the palm.

3. RESULTS AND DISCUSSION

3.1. Analysis of Characterization Results

Based on the results of organoleptic observations that have been carried out, it shows that there are differences in color form in each formula. If we look at the organoleptic test requirements, namely thatthe preparation must be attractive, homogeneous, not broken and able to form foam, so in this study each preparation formula for jackfruit leaf extract shampoo combined with pandan leaves meets the organoleptic test requirements.

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Table 2. Observation Results of Organoleptic Tests of Shampoo Preparations

Observation	F1	F2	F3
form	Liquid	liquid	liquid
color	Clear dark brown	Blackish brown	Clear dark brown
smell	Typical pandan accompanied menthol	Typical pandan accompanied menthol	Typical pandan accompanied menthol

The pH of the shampoo must be adjusted to the pH of the hair and scalp, which is around (5- 6). Shampoo pH that is too acidic will damage hydrogen bonds and salt bridges in the hair structure. Preferably a pH of more than 8.5 will damage disulfide bonds, and a pH of more than 12 will damage hydrogen bonds and salt bridges. If these three bonds are lost, the hair will become rough and damaged.[9] The results of measuring the pH of shampoo preparations based on table 3, show that the pH in formula 1, formula 2 and formula 3 is 6.

Table 3. Observation results of pH test of shampoo preparations

Formula	Replication 1	Replication 2	Replication 3
1	6	6	6
2	6	6	6
3	6	6	6

Based on the table above, it is known that the pH test is 6 for both formula 1, formula 2 and 3.
he next test, namely homogeneity testing, aims to determine the mixability of all the ingredients formaking the shampoo. The results of the homogeneity test can be seen in table 3 below:

Table 4. Homogeneity test results

Formula	Result	Explanation
F1	Homogeneous	Qualify
F2	Inhomogeneus	Not eligible
F3	Homogeneus	Qualify

Homogeneity is one of the requirements for shampoo preparations. A homogeneous shampoo willshow that there are no coarse particles in the preparation. Formula 1 and Formula 2 meet the requirements because there are no particles, but Formula 3 contains clumps of particles so it does not meet the requirements.

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The foam height test was carried out to determine the ability of the surfactant to form foam. The foam from the shampoo is important because the shampoo foam keeps the shampoo on the hair when washing hair, makes it easier for the hair to be washed, and prevents each strand of hair from sticking together so it doesn't get tangled.[10] The results of testing the height of the shampoo foam can be seenin table 5.

Table 5. Foam Height Test Results

Replication	Formula 1	Formula 2	Formula 3
1	7	10	11
2	6,4	11	13.5
3	9,5	11,7	11,3

The foam height measurement results reflect the ability of a detergent to produce foam. Measuring foam height is one way to control the quality of a detergent product so that the product has the appropriate ability to produce foam. There are no requirements for minimum or maximum foam height for a shampoo preparation, because foam height does not indicate cleaning ability. This is more related to the aesthetic value and preferences of consumers who like the appearance of excess foam. Based on the observation results, the foam height in table 5 is the best in the second 3 replication formulation, namely 13.5 cm. Foam formation is influenced by the surfactant used, water hardness, room temperature at the time of measurement, holding time and thickener (Carbomer) in the shampoo formula which also functions as a foam stabilizer.[11]

Table 6. One Way ANOVA Analysis of Foam Height Replication

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	30,229	2	15,114	8,561	,017
Within Groups	10,593	6	1,766		
Total	40,822	8			

The results of the One Way ANOVA analysis in table 6 show that the foam height test has an average of 15.114 which is greater than the average foam height test level of 1.766. Because sig. > 0.05 then the analysis decision is that H0 is accepted. Apart from that, it is also determined based on the value of the F test, where the Fcount value of 8.561 is greater than the Ftable, namely 0.17. Then the value of H1 is accepted. However, it was found in table 8 that the significance was 0.017 <0.05, which means that there was an influence of differences in Carbomer concentration and formula on the foam height of jackfruit leaf extract (*Atrocarpus heterophyllus*) and pandan leaf extract (*Pandanus amarillyfolius*) shampoo preparations.

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Table 7. Viscosity Test Results

Formula	Replication I	Replication II	Replication III	Average
I	7,92	8,37	8,14	8,14
II	7,55	7,13	5,68	6,78
III	5,11	5,12	5,28	5,17

Viscosity measurements aim to determine the relationship between the increase in each replication. In table 7 it is known that the viscosity in formula I is 8.14, in formula II 6.78 and in formula III 5.17.

Table 8. Specific gravity measurement results

Formula	Replication I	Replication II	Replication III	Average
I	47,64	47,63	47,62	47,63
II	47,51	47,52	47,54	47,52
III	47,86	47,88	47,90	47,88

The results of the specific gravity examination which can be seen in table 8 show that in formula 3 the average is 47.88.

Replication

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,000	2	,000	14,498	,000
Within Groups	,000	15	,000		
Total	,000	17			

The results of the One Way ANOVA analysis in the table above, showed a significance of 0.000 < 0.05, which means that there is an influence of differences in Carbomer concentration and formula on the specific gravity of jackfruit leaf extract (*Atrocarpus heterophyllus*) and pandan leaf extract (*Pandanus amarillyfolius*) shampoo preparations.

4. CONCLUSION

Evaluation of shampoo preparations with a combination of ethanol extract of jackfruit leaves (*Artocarpus heterophyllus*) and pandan leaves (*Pandanus amaryllifolius*) with varying carbomer concentrations had good evaluation results and fulfilled the requirements of the shampoo preparation evaluation test with the average pH obtained being 6, meeting the standards of SNI 5 -9, a shampoo preparation that is homogeneous and can produce good foam.

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