Formulation and Physical Stability Test of Facial Gel Wash Dragon Fruit (*Hylocereus polyrhizus*) Peel Extract

N Yuniarsih¹*, I Lenterani¹ and Farhamzah¹
¹ Universitas Buana Perjuangan, Karawang, Indonesia

Email: nia.yuniarsih@ubpkarawang.ac.id

Abstract. Cosmetics are a necessity in everyday life. Cosmetics are divided into two types, namely cosmetics for care (skincare) and decorative cosmetics (make-up). The facial wash is a form of cosmetic care to clean the face which can be in the form of foam, cream, and gel. Gel is a preparation that has good distribution, the good release of active substances, and is easily washed with water. This research is to formulate dragon fruit peel (*Hylocereus polyrhizus*) into a facial gel wash. Dragon fruit peel is a waste that is often ignored by the community. The dragon fruit peel was extracted and then made a facial gel wash formulation with three formulas, namely 8%, 9%, and 10% followed by physical stability testing. This study aims to formulate and determine the physical stability of the facial gel wash formulation of dragon fruit peel extract stored at three different temperatures, at room temperature, under the sun, and 40°C. The stability of the preparation was seen based on the results of organoleptic testing, pH, viscosity, and accelerated foaming before and after storage. The results of the physical stability test were statistically processed using the One Way ANOVA method. The results of this study showed that the three formulas, especially formula 1, were more stable at room temperature, under the sun, and 40°C.

1. Introduction

In the present era, cosmetics are an important need and cannot be removed and omitted. Cosmetic is a substance used to treat a parts of body from head to toe. There are two types of cosmetics, decorative cosmetics or makeup and cosmetics for skincare. There are various types of skincare, based on the shape and pattern, one of which is a facial wash.

Facial wash is one type of cosmetics used on the face to clean the face from sticking oil and dirt. Facial wash is usually made in various dosage forms, such as foam, cream, and gel. Gel or also known as jelly is a semisolid system consisting of a suspension of small inorganic particles or large organic molecules and is penetrated with a liquid [1].

The choice of gel dosage forms because it has several advantages, namely good distribution on the skin, good release of active substances, and easy washing with water [2]. The gelling agent is an important compound in gel making. One example is a carbomer. Carbomer is a good gelling agent used as a thickener, has a high viscosity, and produces a clear gel color [3].

In its development, cosmetics have been used from generation to generation by ancestors, using raw materials that exist in nature. However, currently a lot of cosmetics on the market are made from dangerous ingredients. Many consumers have returned to using cosmetics made from natural ingredients.
Dragon fruit peel is a waste that is rarely used. Usually, the skin is removed only the fruit is used. In this study, the dragon fruit peel was extracted to be used as an active ingredient in face wash preparations. The face wash preparations that have been made are then evaluated and tested for their physical stability. The physical stability test is a test conducted to determine the stability of long-term storage of preparations and shelf life of preparations or expired date. According to the Head of the Indonesian Food and Drug Regulatory Administration, stability testing can be carried out in the long term and be accelerated. Long-term stability testing was carried out for 36 months at 30°C, while accelerated stability testing was carried out for 3 months at 40°C. According to [4], the stability test carried out is physical and chemical testing. The stability test was carried out at three different conditions, namely room temperature, under sunlight, and a temperature of 40°C [5].

Based on the description above, the author has made a facial wash gel preparation from dragon fruit peel extract. Furthermore, the facial wash gel preparation from dragon fruit peel extract that has been finished is tested for physical stability in three different conditions, namely room temperature, under the sun, and a temperature of 40°C. This aims to determine whether the preparations made can last for a long time after accelerated physical stability testing.

2. Material and method
The extracted dragon fruit peel is made into a facial wash gel preparation. The facial wash gel preparation from dragon fruit peel extract was tested for stability under three different conditions, namely at room temperature, under the sun, and a temperature of 40°C. Stability testing was carried out for 90 days, observations that were seen from the stability test of the facial wash gel preparation of dragon fruit peel extract in the form of organoleptic observations (including color, smell, and shape), pH, foam power, and viscosity. Observations were made on days 0, 1, 7, 15, 30, 60, and 90. Furthermore, the results of the observations were statistically tested using the One Way ANOVA method followed by the Post Hoc Test.

**Table 1. The Formula for Facial Wash Gel Extract of Dragon Fruit Peel**

| Ingredients                     | Concentration | Function          |
|---------------------------------|---------------|-------------------|
| Dragon fruit peel extract       | 8% 9% 10%     | Active ingredient |
| Brown rice                      | 1.3% 1.3% 1.3%| Scrub             |
| EDTA-4Na                        | 0.1% 0.1% 0.1%| Chelating agent   |
| Glycerin                        | 2% 2% 2%      | Wetting agent     |
| SLS                             | 2.5% 2.5% 2.5%| Foaming Agent     |
| Propylene Glycol                | 1% 1% 1%      | Preservative solvent |
| Methylparaben                   | 0.2% 0.2% 0.2%| Preservative      |

**Preparation of Facial Wash Gel for Dragon Fruit Peel Extract**
The procedure for making the formula begins with the addition of EDTA-4Na and glycerin to the distilled water then stirring until it dissolves. Next step is adding the methyl paraben which has been dissolved in propylene glycol. The temperature was increased to 40C, Sodium Lauryl Sulfate (SLS) was added gradually until it was homogeneous. Then adding the dragon fruit peel extract, brown rice, citric acid, coloring, and fragrance, stirring until evenly distributed. The final step is the addition of the
Carbomer gradually, after blend well; TEA is added gradually while stirring until the preparation is completely homogeneous.

3. Results and discussion

**Phytochemical Screening of Dragon Fruit Peel Extract**

After the phytochemical screening was carried out, the dragon fruit extract was positive for alkaloid, flavonoid, phenolic, steroid, and saponin secondary metabolite compounds.

**Table 2. Phytochemical Screening of Dragon Fruit Peel Extract**

| Testing   | Reaction                                                                 | Literature                  | Result (±/−) |
|-----------|---------------------------------------------------------------------------|-----------------------------|--------------|
| Alkaloids | 1 ml of sample + 2 ml HCl 2N (heated 5 minutes, filtered), filtrate + dragendorff | Orange solution             | +            |
| Flavonoids| 1 ml of sample + 0.1 gram of Mg powder + 5 drops of 2N HCl                 | Yellow, orange or red color solution | +            |
| Phenolic  | 2 ml of sample + 1 ml of methanol + 2 drops of 1% solution                 | Yellowish green color solution | +            |
| Steroids  | 2 ml of sample + 3 drops of concentrated HCl + 1 drop of concentrated     | Yellowish green color solution | +            |
| Saponin   | 2 ml of sample + 5 ml of distilled water + 10 drops of KOH (shake for 5 minutes, let stand for 10 minutes) | A constant foam formed within 10 minutes | +            |
| Tannins   | 2 ml of sample (heated for 5 minutes) + 3 ml of 1% solution               | Blackish blue solution      | −            |

**Annotation:**

(+) result: the sample contains the test compound
(-) result: the sample does not contain the test compound

**Organoleptic Observations**

Before storage for three months, the preparation is purple-brown has a characteristic aromatic odor, and takes the form of a gel. After being stored for three months, the preparations stored at room temperature did not change in a significant odor, shape or color. Preparations stored in the sun did not change in odor and shape, while the color after 15 days changes from purple-brown to brown and after 30 days changes to green. Furthermore, the preparations stored at 40°C did not change in smell and shape, while the color changed from purple-brown to brown after 15 days.

Color changing that occurs in facial wash gel preparations from dragon fruit peel extract that are stored in the sun and at temperature of 40°C occur because the secondary metabolites of anthocyanins, namely flavonoids in dragon fruit peel extract have been damaged due to exposure to direct sunlight which causes the occurrence of oxidation reactions repeatedly for 90 days. Storage at high temperatures will cause the extract to become unstable. Storage at high 40°C for a long time causes the purple color disappeared and turn into brown.

**pH Testing**

The pH of the dragon facial wash gel extract was stored for three months at room temperature for formulas F1, F2, and F3. Then tested statistically and the results showed no significant difference. Meanwhile, the pH of the facial wash gel preparation for dragon fruit peel extract was the most stable
in the sun and at a temperature of 40°C, namely the F3 formula because there was no significant difference after statistical tests. However, the average pH test data shows a decrease in the pH value from day to day but is still as required, namely 4.5 - 6.5. The pH of the facial wash gel for dragon fruit peel extract is stable because it still meets the requirements

The decrease in pH value that occurs is due to storage time and temperature. The longer the storage time will cause physical changes of the preparation and the high temperature will accelerate the physical changes that occur [5].

| Dragon Facial Wash Gel Formulation | Temperature       | 0    | 1    | 7    | 15   | 30   | 60   | 90   |
|-----------------------------------|-------------------|------|------|------|------|------|------|------|
| F1                                | Room temperature  | 5.99 | 5.96 | 5.95 | 5.95 | 5.92 | 5.89 | 5.87 |
| F1                                | Under the sun     | 5.98 | 5.96 | 5.95 | 5.93 | 5.92 | 5.92 | 5.90 |
| F1                                | Temperature 40°C  | 6.03 | 5.99 | 5.98 | 5.98 | 5.96 | 5.95 | 5.92 |
| F1                                | Room temperature  | 5.99 | 5.95 | 5.92 | 5.87 | 5.86 | 5.84 | 5.83 |
| F2                                | Under the sun     | 5.98 | 5.97 | 5.96 | 5.95 | 5.92 | 5.86 | 5.84 |
| F2                                | Temperature 40°C  | 6.03 | 5.98 | 5.96 | 5.93 | 5.92 | 5.91 | 5.90 |
| F2                                | Room temperature  | 5.99 | 5.97 | 5.96 | 5.95 | 5.93 | 5.89 | 5.88 |
| F3                                | Under the sun     | 5.98 | 5.95 | 5.94 | 5.92 | 5.92 | 5.89 | 5.87 |
| F3                                | Temperature 40°C  | 6.03 | 5.97 | 5.95 | 5.92 | 5.91 | 5.89 | 5.87 |

Foaming Power Testing
After storage for 90 days, the results of observations that were analyzed statistically showed less significant differences in F1 stored in 3 different conditions. The observations also show that F1 is more stable than F2 and F3.

The foaming rate is more related to the aesthetic value that is preferred by consumers who think that a good soap produces more foam (Purnama, 2006). The results of the high evaluation of the facial foam wash gel extract of dragon fruit peel for 5 consecutive minutes obtained a range of 1.00 - 5.00 with an average of 91.76%, the increase and decrease in the value of foam power was due to the shaking method when testing the foam power using manual method, not using tools that have standard speed and time that can be adjusted according to your needs, for example, such as a magnetic stirrer.

| Dragon Facial Wash Gel Formulation | Observation Day |
|-----------------------------------|-----------------|
| F1                                |                 |
| Room temperature                  | 91.99, 92.83, 93.41, 93.54, 93.61, 92.47, 92.33 |
| Under the sun                     | 91.99, 90.91, 96.49, 91.72, 91.13, 93.18, 94.37 |
| Temperature 40°C                  | 91.99, 87.19, 91.37, 92.58, 92.80, 90.91, 91.78 |
| Room temperature                  | 93.64, 91.75, 91.75, 90.71, 96.37, 92.89, 94.93 |
| F2                                |                 |
| Room temperature                  | 93.64, 81.49, 87.13, 92.65, 91.64, 91.20, 95.55 |
| Temperature 40°C                  | 93.64, 91.68, 94.50, 92.56, 92.41, 92.17, 92.05 |
| Room temperature                  | 85.59, 90.29, 91.10, 91.30, 92.95, 96.10, 93.58 |
Viscosity Testing
There was an increase in the viscosity of the facial wash gel preparation of dragon fruit peel extract which was stored in 3 different conditions. Data processing that has been done shows that there are more significant differences in F2 and F3. In this test F1 is more stable when compared to F2 and F3.

The increase in viscosity of dragon facial wash gel preparations which are stored at room temperature, under the sun, and at a temperature of 40°C occurs due to the evaporation process caused by the storage container not being tightly closed so that the water content in the preparation is reduced which makes the preparation thicker. Storage in the sun and a temperature of 40°C further accelerates the evaporation process of water contained in the preparation which results in F1, F2, and F3 stored in the sun and at a temperature of 40°C which is thicker when compared to F1.

| Table 5. Results of Viscosity Test for Facial Wash Gel Extract of Dragon Fruit Peel |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Facial Wash Gel Formulation | Temperature | 0 (Cp) | 1 (Cp) | 7 (Cp) | 15 (Cp) | 30 (Cp) | 60 (Cp) | 90 (Cp) |
| Room temperature | Room temperature | 2.279 | 2.386 | 2.478 | 2.615 | 2.712 | 2.726 | 2.721 |
| F1 | Under the sun | 2.309 | 2.287 | 2.480 | 2.484 | 2.393 | 2.348 | 2.299 |
| | Temperature 40°C | 2.311 | 2.383 | 2.525 | 2.603 | 2.722 | 2.791 | 2.774 |
| | Room temperature | 2.110 | 2.081 | 2.278 | 2.382 | 2.421 | 2.407 | 2.422 |
| F2 | Under the sun | 2.186 | 2.081 | 2.233 | 2.263 | 2.256 | 2.309 | 2.392 |
| | Temperature 40°C | 2.080 | 2.092 | 2.162 | 2.343 | 2.285 | 2.464 | 2.488 |
| | Room temperature | 2.229 | 2.492 | 2.686 | 2.721 | 2.794 | 2.820 | 2.804 |
| | Under the sun | 2.397 | 2.390 | 2.664 | 2.705 | 2.285 | 2.684 | 2.656 |
| | Temperature 40°C | 2.238 | 2.062 | 2.489 | 2.642 | 2.549 | 2.599 | 2.670 |

4. Conclusion
After testing, the conclusion of this study is that dragon fruit (*Hylocereus polyrhizus*) peel extract can be made into facial wash preparations with three different extract concentrations, namely 8%, 9%, and 10%. The results of the physical stability test of the facial wash gel preparation of dragon fruit peel extract were stable at room temperature, under the sun, and at temperature of 40°C. However, the best dragon facial wash gel preparation is F1 with an extract concentration of 8%.

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