

## Lip Balm Formulation Contains Pear Peel Ethanol Extract (*Pyrus bretschneideri*)

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### A B S T R A C T

*Pear peel (Pyrus bretschneideri) contains vitamin C, flavonoids and anthocyanins that have the potential to protect the lips from dryness and chapping due to sun exposure. This study aims to formulate a lip balm from pear peel ethanol extract (Pyrus bretschneideri) and determine the optimal formulation and physical stability test. The research was carried out using laboratory experimental methods, the extraction method used was the maceration method using 96% ethanol solvent using variations of lip balm formulations: F0 (without extract), F1 (3 g), F2 (6 g), and F3 (9 g). The results showed that pear peel extract (Pyrus bretschneideri) could be formulated as a lip balm and the optimal formula of the lip balm preparation was formula 1. Organoleptic tests show F1 to F3 has a semi-solid shape, color varies from yellowish to brownish-yellow, odor varies from waxy to waxy and a slight pear aroma. The homogeneity test indicates that F0 and F1 are homogeneous, while F2 and F3 are not homogeneous due to the deposition of active ingredients. The pH test results ranged from F0, which is pH 6.18, to F3, which is pH 6.26. The applicator power test had good results and did not show any striking color intensity. The melting point of lip balm is 52.8°C (F0) to 56.2°C (F3). The vitamin C level test increased from 0.193 mgEQ/g (F0) to 4.684 mgEQ/g (F3). The antioxidant activity in this study was found in F3 with a value of 123.00 µg/mL, including a value with moderate antioxidant activity.*

### INTRODUCTION

Cosmetics come from the Greek "cosmetice tekhnē," which means decorative art. According to the FDA (Food and Drug Administration), cosmetics are products that are applied to the human body with the aim of beautifying, cleansing, and changing appearance. In the modern era, especially for women, cosmetics are almost an important necessity because a beautiful and attractive appearance is the desire of many women (Febrianti et al., 2024).

The lips are one of the parts of the face that greatly affect aesthetic perception. Because the layer of dead skin cells on the lips is very thin, the lips look more transparent. The skin of the lips does not have hair follicles, sweat glands, sebaceous glands, or glands that produce oil and sweat, which usually serve as a skin barrier. The absence of these elements makes the lips more susceptible to dryness and chapping, especially in dry weather (Dance & Yanita, 2024).

In addition to being less aesthetically attractive, chapped lips can also cause pain and discomfort. In addition to being caused by hot and cold weather, exposure to UV rays from the sun can also damage the stratum corneum which functions to protect the lips. Damage to keratinocytes causes the lips to become chapped, dry, and dull. In addition to looking dull, this condition can also trigger pain, discomfort in the eyes, and declining lip skin health. To improve this condition, formulation is needed *Lip balm* effective in caring for lips (Yuliasri et al., 2023). Exposure to UV rays from the sun and dehydration can have an impact on the health of the skin of the lips. The use of cosmetic treatments such as lip balm (*Lip balm*) can help treat and prevent dry lips (Pratiwi & Rahmiati, 2023).

Lip balm (*Lip balm*) is a cosmetic product that contains main ingredients such as waxes, oils from natural extracts, and synthetic fats, which function to increase moisture and prevent dryness on the skin of the lips (Pratiwi & Rahmiati, 2023). Lip balm (*Lip balm*) is commonly used to protect the lips, especially in cold air conditions with low humidity, as well as to prevent water evaporation in hot weather. This product is a cosmetic made with a basic ingredient similar to lipstick (Ratih et al, 2014).

In a study conducted by Arthania in 2021, pears (*Pyrus bretschneideri*) is one of the fruits that is often consumed by the general public. This fruit contains a lot of water both in the pulp and the skin. In addition, pears also have benefits for the skin because they contain vitamin C and copper. Pear peel also contains flavonoid compounds that have antioxidant properties. In a study conducted by (Lee et al., 2015), it is stated that pear peel contains antioxidant compounds that can inhibit free radicals.

These antioxidants play a role in improving skin elasticity and moisture. As a neutralizing agent, antioxidants work by connecting unpaired electrons into pairs (Mustiqawati et al., 2022).

## METHOD

This research was conducted in July-August 2024. The research was conducted in the city of Kendari, Southeast Sulawesi, precisely at Halu Oleo University. Pharmaceutical Laboratory by meeting the predetermined requirements.

The equipment used in this study includes aluminum foil, stirring rods, beaker cups, porcelain cups, measuring cups, hot plates, watch glasses, filter cloths, parchment paper, universal pH, droppers, rotary evaporators, horn spoons, UV-Vis spectrophotometers, melting point measuring devices, digital scales, glass jars, and containers *Lip balm*.

The ingredients used in this study include pears, carnauba wax, 96% ethanol, glycerin, methyl parabens, olive oil, tween 80, and vaseline album.

The first step is to prepare all the necessary tools and materials for the research process. Perform wet sorting of the pears that have been collected, then wash them using running water. Separate the peel from the pulp. The drying process of the skin is carried out in the sun until it is completely dry. Once dry, blend the ingredients using a blender. Take a sample of 150 grams of dried pear peel and put it in an extraction container. Add 1 liter of 96% ethanol, then stir for 15 minutes. Allow the mixture to settle for 3 x 24 hours. After the maceration process is completed, the result is evaporated using a Rotary Evaporator at a temperature of 50-60°C. Next, calculate the percentage of yield of the pear peel extract obtained.

### Formulation of Lip Balm Preparation Pear Peel (*Pyrus brethschneideri*)

Table 1. Lip balm formulation Pear Peel (*Pyrus brethschneideri*)

It	Material	Weight of the material being weighed				Function
		F0	F1	F2	F3	
1.	Pear peel ethanol extract	No Extract	3g	6g	9g	Active substances
2.	Carnaubawax	3.6g	3.6g	3.6g	3.6g	Base
3.	Methyl paraben	0.01g	0.01g	0.01g	0.01g	Preservatives
4.	Tween 80	3.15g	3.15g	3.15g	3.15g	Emulgator
5.	Glycerine	3.15g	3.15g	3.15g	3.15g	Humectants
6.	Olive oil	3mL	3mL	3mL	3mL	Emollient
7.	Vaselin album	6g	6g	6g	6g	Emollient

Source : Secondary Data, (2023)

Insert the base ingredients *Lip balm*, namely carnauba wax, olive oil, tween 80, glycerin, and album vaseline into a beaker glass, then heat using a hotplate at 70°C until all ingredients are well mixed. Once the base is homogeneous, add the methyl paraben and mix until evenly distributed. Next, lower the temperature to 40°C and add the pear peel extract, then stir quickly until a homogeneous mixture. After that, pour the mixture into a container *Lip balm* and let it harden before evaluation.

### Lip Balm Lip Balm Evaluation Pear Peel Extract (*Pyrus brethschneideri*)

#### Organoleptic Test

According to (BPOM RI, 2019), organoleptic tests include observation of changes in color, shape, and aroma. *Lip balm* must meet certain specifications, namely having a pleasant smell, homogeneous color, and a stable shape and in accordance with the preparation standards.

#### Homogeneity Test

Apply a certain amount of preparation to the watch glass and observe it visually. The applied preparation should show a homogeneous arrangement, without the absence of coarse grains or uneven particles.

#### pH Test

To make *Lip balm* At a concentration of 1%, weigh 1 gram of the preparation and place it in a beaker glass. Dissolve the preparation with 100 mL of aquades over a water bath. After the solution is homogeneous, measure its pH using a pH meter that has been calibrated with a standard solution.

Based on SNI 16-4799-1998, the pH of the preparation should be in the skin pH range, which is 4.5 – 8.

#### Apply Power Test

The applicator power test is carried out by applying the preparation *Lip balm* on the skin of the back of the hand. Observe the number of preparations that stick and the color that is caused. Perform this treatment 3 times to ensure consistent results.

#### Melting Point Test

Enter the preparation *Lip balm* into a capillary pipe with a depth of 10 mm. Place the capillary pipe into the melting point tool in the appropriate position. Current Temperature *Lip balm* Starting to melt is the melting point *Lip balm*. By (SNI, 1996), melting point *Lip balm* must be in the range of 50-70°C.

#### Vitamin C Test

Weigh 50 mg of ascorbic acid and place it in a 500 mL measuring flask. Dissolve with the aquaades until it reaches the boundary mark.

To make a solution with a concentration of 10 ppm, take 5 mL of the parent solution and put it in a 50 mL measuring flask, then add the aqueous until it reaches the cut-off mark. After that, measure the maximum wavelength in the range of 200–400 nm.

Put the parent solution into a 50 mL measuring flask with volumes of 2, 3, 4, and 5 mL (which will provide concentrations of 4, 6, 8, and 10 ppm) and add the aquaade until it reaches the limit mark on each flask. Measure the wavelength of each of these solutions.

Next, weigh 5 grams *Lip balm* and dissolve in an aquaade until it reaches the limit mark in a 100 mL measuring flask. Take 2 mL of this solution and dilute it into a 50 mL flask to the cut-off mark. Finally, measure the wavelength of the solution using a UV-Vis spectrophotometer.

#### Antioxidant Activity Test

A total of 2.5 mg of DPPH reagent was weighed and dissolved in methanol. This solution is then transferred into a 25 mL measuring flask and diluted with an aqueous until it reaches the cut-off mark.

*Lip balm* weighing 0.01 grams is dissolved in methanol until completely dissolved. This solution is then diluted with an aquaade in a 10 mL measuring flask to the limit mark.

Dilution is carried out to obtain solutions with concentrations of 20, 30, 40, and 50 ppm. For a concentration of 20 ppm, take 0.2 mL of the parent solution and dilute it with aquaade in a 10 mL measuring flask to the cut-off mark. The same process is applied for concentrations of 30, 40, and 50 ppm.

A total of 1 mL of solution with a concentration of 20 ppm was mixed with 7 mL of methanol, then 2 mL of DPPH solution was added and incubated in the dark at 30°C. The same procedure is applied for solutions with concentrations of 30, 40, and 50 ppm. Furthermore, absorption was measured using UV-Vis spectrophotometry at a maximum wavelength of 517 nm.

Calculated % of inhibition with the formula:

$$\% \text{ inhibition} = \frac{\text{absorbansi kontrol} - \text{absorbansi sampel}}{\text{absorbansi kontrol}} \times 100\%$$

The absorbance value is obtained from the output results of the UV-Vis spectrophotometer. Next, a graph of the relationship between % inhibition and concentration (ppm) was created using Microsoft Excel, which resulted in a linear regression. The IC50 value is calculated using the formula  $y=ax+b$ .

The standards for antioxidant activity are as follows: IC50 < 50 µg/mL indicates very strong antioxidant activity; IC50 between 50-100 µg/mL indicates strong antioxidant activity; IC50 between 100-150 µg/mL indicates moderate antioxidant activity; and IC50 between 150-200 µg/mL indicates weak antioxidant activity.

## RESULTS & DISCUSSION

This study aims to evaluate whether the formulation of *Lip balm* which contains pear peel extract (*Pyrus bretschneideri*) effective as a lip balm. Pear peel was chosen because it contains vitamin C which is beneficial for keeping lips moisturized.

The use of pear peel (*Pyrus bretschneideri*) based on its benefits for the skin, which include vitamin C and copper content. In addition, pear peel contains flavonoid compounds that have antioxidant properties, able to inhibit free radicals (Arthania et al., 2021).

*Lip balm* It is used to protect the lips, especially in cold air conditions with low humidity, as well as to prevent water evaporation during hot weather. This product is a cosmetic made with a basic ingredient similar to lipstick (Ratih et al, 2014).

Extraction is a technique to separate components from a mixture using solvents, based on the difference in solubility between the substances present. The main purpose of extraction is to extract chemical compounds from plants. This process relies on the principle of mass transfer of the components of the substance to the solvent, starting with the transfer through the interface layer and then diffusion into the solvent.

Pear peel extraction (*Pyrus bretschneideri*) was carried out using a sample weighing 150 g. The extract obtained from the pear peel was 25.43 g, resulting in a percentage of yield of 16.95%.

#### Organoleptic Test of Lip Moisturizing Preparations

Table 2. Organoleptic Testing Lip Moisturizing Preparations contain Pear peel extract (*Pyrus brethschneideri*)

Organoleptis	F0 (No Extract)	F1 (3%)	F2 (6%)	F3 (9%)
Shape	Semi Solid	Semi Solid	Semi Solid	Semi Solid
Color	Yellowish	Yellowish is slightly brown	Yellowish is slightly brown	Yellowish is slightly brown
Smell	Typical candles	Typical wax and a hint of Pear scent	Typical wax and a hint of Pear scent	Typical wax and a hint of Pear scent

Source : Primary Data, (2024)

In the testing of lip balm formulations (*Lip balm*) that uses pear peel extract (*Pyrus bretschneideri*), organoleptic tests were carried out including color, aroma, and shape. The test results showed that the color *Lip balm* in the formulation of F0 to F3 varies, ranging from yellowish to brownish-yellow, according to the addition of the extract concentration. This is in line with the findings (Rasyadi et al., 2022), which indicates a discoloration associated with an increase in the concentration of the extract. The higher the concentration of the extract, the more intense the color produced.

#### Homogeneity Test of Lip Moisturizing Preparations

Table 3. Results of the Homogeneity Test of Lip Moisturizing Preparations containing Pear peel extract (*Pyrus brethschneideri*)

Formulation	Homogeneity Test Results
F0 (No Extract)	Homogeneous
F1 (3%)	Homogeneous
F2 (6%)	Non-Homogeneous
F3 (9%)	Non-Homogeneous

Source : Primary Data, (2024)

The observation of the homogeneity of the preparation aims to evaluate the equal distribution of the active substance content in the *Lip balm*. The results show that the formulations F0 and F1 are homogeneous, without the presence of coarse grains, while F2 and F3 are not homogeneous because the active ingredients settle at the bottom of the preparation, this can happen when the mixing and cooling process is not done properly so that the active ingredients are dispersed unevenly, so that the heavier parts settle at the bottom. According to (SNI, 1996), the preparation is considered homogeneous if there are no lumps or coarse particles, as well as evenly mixed colors.

#### pH Test of Lip Moisturizing Preparations

Table 4. The pH test results of the Lip Moisturizing Preparation contain Pear peel extract (*Pyrus brethschneideri*)

Formulation	pH Test Results
F0 (No Extract)	6,18
F1 (3%)	6,20
F2 (6%)	6,23

Source : Primary Data, (2024)

A pH test is performed to evaluate the pH of a lip balm preparation (*Lip balm*) which contains pear peel extract (*Pyrus bretschneideri*). The test results showed that the pH in the formulation of F0 was 6.18, F1 was 6.20, F2 was 6.23, and F3 was 6.26. Although the pH has increased slightly, these values are still within the appropriate range for a good lip preparation, which is 4.5–8, and meet the set standards (Ridhani & Nurul Hidayah, 2022).

#### Lip Moisturizing Preparation Applicability Test

Table 5. Results of the Smear Power Test of Lip Moisturizing Preparations Containing Pear peel extract (*Pyrus brethschneideri*)

Formulation	Application Power Test Results
F0 (No Extract)	Good and does not show color intensity
F1 (3%)	Good and does not show color intensity
F2 (6%)	Good and does not show color intensity
F3 (9%)	Good and does not show color intensity

Source : Primary Data, (2024)

The application power test aims to assess the intensity of the color and ensure *Lip balm* has good application quality when used on the lips. The test results show that all formulations *Lip balm* with pear peel ethanol extract (*Pyrus bretschneideri*) has good application power and does not show any noticeable color intensity. According to (Supartiningsih et al., 2017), testing the power of the smear is important because it helps determine the quality of the *Lip balm*. Formulation *Lip balm* It is considered good if it can provide even application results without coarse particles.

#### Melting Point Test of Lip Moisturizing Preparations

Table 6. Results of the Melting Point Test of Lip Moisturizing Preparations Pear peel extract (*Pyrus brethschneideri*)

Formulation	Melting Point Test Results
F0 (No Extract)	52.8 °C
F1 (3%)	54.1 °C
F2 (6%)	55 °C
F3 (9%)	56.2 °C

Source : Primary Data, (2024)

The melting point test aims to assess stability and strength *Lip balm*. The test results showed that the melting point for the formulation of F0 was 52.8°C, F1 was 54.1°C, F2 was 55°C, and F3 was 56.2°C. All of these results are within the corresponding range (SNI, 1996), which is between 50°C and 70°C.

#### Test Vitamin C Lip Moisturizing Preparations

Table 7. Vitamin C Test Results of Lip Moisturizing Preparations contain Pear peel extract (*Pyrus brethschneideri*)

Formulation	mgEQ/g results
F0 (No Extract)	0,193
F1 (3%)	0,619
F2 (6%)	2,926
F3 (9%)	4,684

Source : Primary Data, (2024)

Vitamin C test on formulation *Lip balm* with pear peel ethanol extract (*Pyrus bretschneideri*) aims to determine the vitamin C content in the product. This test involves comparing the content of vitamin C at various concentrations *Lip balm* which contains pear peel extract. The solvent used is aquaades, as ascorbic acid is water-soluble, thus helping to reduce contamination of impurity.

Determination of vitamin C levels begins with identifying the maximum wavelength to measure absorbance with optimal analytical sensitivity. In this study, the maximum wavelength found was 264.5 nm.

Furthermore, standard measurements of ascorbic acid were carried out with concentration variations of 4, 6, 8, and 10 ppm to determine the linearity range of the standard solution of vitamin C. The measurement results showed that the absorbance value increased with the increase in vitamin C concentration.

The results of the vitamin C level test in this study showed that the F0 formulation had a vitamin C level of 0.193 mgEQ/g, F1 of 0.619 mgEQ/g, F2 of 2.926 mgEQ/g, and F3 of 4.684 mgEQ/g. This suggests that vitamin C levels increase with the addition of pear peel extract

concentrations. In other words, the higher the concentration of pear peel, the higher the vitamin C content in the preparation. Based on these results, the best formulation is F3 (Fauzi et al., 2017).

#### Antioxidant Activity Test of Lip Moisturizing Preparations

Table 8. Results of Antioxidant Activity Test of Lip Moisturizing Preparations Containing Pear peel extract (*Pyrus brethschneideri*)

Formulation	IC50 Result ( $\mu\text{g/mL}$ )
F0 (No Extract)	191,30
F1 (3%)	182,21
F2 (6%)	160,66
F3 (9%)	123,00

Source : Primary Data, (2024)

The antioxidant activity test aims to assess the potential antioxidant activity in the preparation *Lip balm*. According to Wijaya (2017), a smaller IC50 value indicates stronger antioxidant activity in the sample. Examples of plants that contain antioxidants are flavonoid compounds contained in binahong leaves (Nurwanti et al., 2024).

According to (Wardaniati & Yanti, 2020), the antioxidant activity test involves creating a regression curve that correlates the concentration of the sample with the percentage of inhibition. The sample concentrations used were 20, 30, 40, and 50 ppm, while the percentage of inhibition was calculated based on the difference between the absorbance values of the control and the sample.

The results of the antioxidant activity test with an IC50 value showed that F0 had a value of 191.30  $\mu\text{g/mL}$ , F1 182.21  $\mu\text{g/mL}$ , F2 160.66  $\mu\text{g/mL}$ , and F3 123.00  $\mu\text{g/mL}$ . These results show that F0, F1, and F2 have weak antioxidant activity, while F3 shows moderate antioxidant activity.

Based on the results of the research that has been carried out, the optimal formula is found in formula 1 because it meets all testing standards. But in the vitamin C level test, formula 1 showed that the level of vitamin C was not too high. In addition, in the antioxidant activity test, F1 is classified as having weak antioxidant activity. Although F1 meets general quality standards, an increase in vitamin C levels and antioxidant activity may be necessary to achieve better performance.

## CONCLUSION

Based on the results of the study, it can be concluded that pear peel extract (*Pyrus brethschneideri*) was successfully formulated into a preparation *Lip balm*, with the optimal formula for F1, F2, and F3. Tests show that *Lip balm* has a color variation from yellow to brownish yellow, with the formulations F2 and F3 experiencing inhomogeneity due to the deposition of the active ingredients, while F0 and F1 remain homogeneous. Ph *Lip balm* is in the range of 6.18 to 6.26, which is suitable for the skin. Melting point *Lip balm* ranges from 52.8°C to 56.2°C, indicating good physical stability. Vitamin C levels increased with the increase in the extract concentration, reaching 4.684 mgEQ/g at F3, which also showed moderate antioxidant activity with an IC50 value of 123.00  $\mu\text{g/mL}$ .

The limitations of this study lie in safety testing and allergy potential. This study is still not in-depth enough in exploring the skin reactions that may occur due to the use of certain chemicals in lip balms (*Lip balm*).

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