

FORMULATION AND STABILITY TEST OF PEEL-OFF GEL MASKS FROM EXTRACTS BIDARA LEAF (*Ziziphus spina-christi* L.)

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ABSTRACT

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Background: Bidara leaf (*Ziziphus spina-christi* L.) contains flavonoids, saponins, and tannins that have antioxidant, antibacterial, and anti-inflammatory activity so that it has the potential to be used as an active ingredient in cosmetics, especially peel-off gel masks. This preparation is practical to use and is able to form a layer of elastic film that is easy to peel off. **The purpose :** P this research aims to formulate and test the stability of peel-off gel masks from bidara leaf extract. **The research method :** P was carried out experimentally in the laboratory. The extract is obtained by the maceration method using 96% ethanol, then formulated in three concentrations: F1 (1%), F2 (3%), and F3 (5%). Stability tests include organoleptic, homogeneity, pH, dispersability, dry time, and viscosity. **Results:** The entire formula is organoleptically stable and homogeneous. The pH values of F1 (4.00), F2 (4.00), and F3 (4.05) are below the standard pH of the skin (4.5–6.5). The dispersion test showed that F1 (4.3 cm) did not meet the standard (5–7 cm), while F2 (5.3 cm) and F3 (5.35 cm) were up to standard. The dry time of the three formulas is 30 minutes, still as standard (15–30 minutes). Viscosity tests showed F1 (1495 cps), F2 (1632 cps), and F3 (894 cps), which did not meet the standard (2000–4000 cps). **Conclusion:** F2 formula with an extract concentration of 3% is the most optimal formula because it meets most of the stability parameters, although the pH and viscosity values still need to be improved.

Background: Bidara leaves (*Ziziphus spina-christi* L.) contain flavonoids, saponins, and tannins, which exhibit antioxidant, antibacterial, and anti-inflammatory activities, making them potential active ingredients in cosmetics, particularly peel-off gel masks. This dosage form is practical to use and can form an elastic film layer that is easily removed. **Objective:** This study aimed to formulate and evaluate the stability of peel-off gel masks containing bidara leaf extract. **Method:** The research was conducted experimentally in the laboratory. The extract was obtained by maceration using 96% ethanol and formulated into three concentrations: F1 (1%), F2 (3%), and F3 (5%). Stability tests included organoleptic properties, homogeneity, pH, spreadability, drying time, and viscosity. **Results:** All formulas were stable in terms of organoleptic and homogeneity. The pH values of F1 (4.00), F2 (4.00), and F3 (4.05) were below the skin pH standard (4.5–6.5). Spreadability tests showed that F1 (4.3 cm) did not meet the standard (5–7 cm), while F2 (5.3 cm) and F3 (5.35 cm) were within the acceptable range. The drying time of all formulas was 30 minutes, which is still within the standard (15–30 minutes). Viscosity results showed F1 (1495 cps), F2 (1632 cps), and F3 (894 cps), all of which did not meet the standard (2000–4000 cps). **Conclusion:** The F2 formula with 3% extract was the most optimal because it fulfilled most stability parameters, although pH and viscosity still need improvement.

INTRODUCTION

Taking care of the skin regularly is important so that the skin remains healthy and in good condition. How to care for your skin varies, depending on the type of skin you have. For this reason, we first need to know our skin type based on its condition and characteristics. In general, skin types are divided into four: dry, oily, normal, and combination. Dry skin usually feels stiff, rough, or even peeling. Oily skin looks shiny, feels slippery, and the pores tend to be large. Meanwhile, normal skin is in the middle, balanced between dry and oily, looks clean, and is not easily irritated. In contrast to combination skin which tends to be dry in some areas but oily in others. (Andrini, 2023)

Indonesia is rich in natural resources, including various beneficial plants that are commonly used as basic ingredients for beauty products. One of the plants that has great potential is the bidara leaf (*Ziziphus spina-christi* L.). This leaf contains active substances such as flavonoids, saponins, and tannins that have antioxidant, anti-inflammatory, and antibacterial properties. Therefore, bidara leaves (*Ziziphus spina-christi* L) are very suitable as the main ingredient in skin care products, especially for face masks. (Sakka & Muin, 2023)

Masks are one of the popular and frequently used beauty care products. Its function is to remove dead skin cells, especially after the massage process. Its use is done by applying it evenly on the face, but not on the eyebrows, eyes and lips area. (Yuniarsih et al., 2021)

Masks are beauty products that function to keep the skin healthy and moist and are actions taken in facial skin care. Face masks on the market are available in various types, namely powder masks, cream masks, *peel-off gel* masks, paper masks, and homemade masks. In general, the process of wearing masks is very complicated and irrelevant to the lifestyle with a busy society, therefore to meet these needs, it is necessary to innovate masks that are easy to use. (Surbakti et al., 2023)

Gel peel off masks are a skincare cosmetic preparation that is in the form of a gel and after applying the skin for a certain amount of time until dry, this preparation will form a layer of elastic transparent film, so it can be peeled off. (Wahyuni et al., 2022)

RESEARCH METHODS

Research Design

This type of research is an experimental research by making a formulation of a *gel peel off mask* preparation from bidara leaf extract (*Ziziphus spina-christi* L.) to test its physical quality which includes organoleptic tests, homogeneity, pH measurements, dispersion measurements, adhesion, drying time and viscosity tests.

Time and Place of Research

The research process was carried out in July 2025 and samples were taken in Bandar Batauga Village, South Buton Regency. The research was carried out at the Laboratory of the Faculty of Pharmacy Halu Oleo and the Pharmacy Laboratory of Baubau Polytechnic.

Tools and Materials

Tool

The tools used in this study are blenders, bunsen, stirring rods, chemical cups, porcelain cups, measuring cups, scissors, tripods, gauze, watch glass, glass objects, oven (*memert*), pH meter (*happycollection28*), dropper pipettes, mask containers, *rotary evaporator* (*scilogex*), horn spoons, *stopwatch*, analytical scales (*radwag*), glass jars.

Material

The materials used are bidara leaves, 96% ethanol, polyvinyl alcohol (PVA), Hydroxy Propyl Methyl Cellulose (HPMC), propylene glycol, metal parabens and aquades.

Research Procedure

Sample Preparation

The sample used was bidara leaves (*Ziziphus spina-christi* L.) which is taken approximately 3 kg. Bidara leaf sampling was obtained in the Batauga Area, South Buton Regency, Southeast Sulawesi. Bidara leaf sampling was carried out at 08.00-10.00 WITA.

Bidara Leaf Extract (*Ziziphus spina-christi* L)

Bidara leaves (*Ziziphus spina-christi* L) are weighed as much as 511 grams then put into a maceration container, then dissolved with 96% ethanol as much as 3000 mL, then stirred for 3x24 hours

in a glass jar at room temperature, to ensure optimal extraction. Then it is filtered, then separated between pulp and filtrate. The pulp is extracted again with the same amount of new ethanol. The ethanol filtrate is obtained then collected and evaporated using a *rotary evaporator* and then put into the oven until the weight of the thick ethanol extract of bidara leaves is obtained, which is 37.5 grams. (Nabella et al., 2025)

PeelOff Gel Mask Formulation From Bidara Leaf Extract (*Ziziphus spina-christi* L.São Paulo S (Suzanni et al., 2024)

Table 1 Peel-Off Gel Mask Formulation

Material	Function	Concentration (%)		
		Formula 1	Formula 2	Formula 3
Bidara leaf extract	Active ingredients	1%	3%	5%
PVA	Basic gel	10%	10%	10%
HPMC	Basic gel	1%	1%	1%
Propylene glycol	Hufixan	10%	10%	10%
Methyl Paraben	Preservatives	0,2%	0,2%	0,2%
Aquadest	Solvent	Ad 100 ml	Ad 100 ml	Ad 100 ml

Source: Primary data, 2025

Prepare the tools and materials to be used. Weighted according to the formula stated in Table 3.1. Next, put (PVA) into a 100 mL measuring cup, then add aquadest and stir until homogeneous, add HMPC little by little, then add more methyl parabens and propylene glycol to the lumping until homogeneous and the rest of aquadest into a beaker with a hot plate temperature of 80 C, after all the ingredients are mixed with homogeneity add bidara leaf extract.

Evaluation preparation mask gel peeloff

Organoleptic Tests

Organoleptic tests were carried out on 3 formulations, each of which was given shape, aroma, and color. (Pratiwi & Wahdaningsih, 2018)

Homogeneity test

The homogeneity test is carried out by applying the preparation to the glass of the object, then leveling it using the glass of other objects and then observing whether or not there are particles that have not been mixed homogeneously. The sign that the preparation is said to be homogeneous is that if applied to glass or transparent material, the preparation does not show the presence of coarse grains (Sakdiyah et al., 2022) .

pH Test

pH testing is carried out by inserting a peel-off gel mask into a container, then measuring the pH with a pH meter. The pH of the preparation must be adjusted to the pH of the skin, which is in the range of 4.5-6.5 (Saputra et al., 2019) .

Dispersion test

The dispersion test was carried out by taking as many as 1 gram of gel preparation placed on a glass measuring 20 x 20 cm. It is then covered with mica and weighted on it until the weight reaches 125 grams and is measured in diameter after 1 minute. The requirement of this dispersion test is 5-7 cm (Saputra et al., 2019) .

Adhesion test

The adhesion test is carried out by placing 0.25 grams of gel on the glass of the object, then covered with another object glass on the top, attached to the adhesive test device. Note the time it takes to remove the two objects glasses. Good adhesion is more than 1 second. (Sunnah et al., 2018)

Time test

The dry time test was carried out by taking as much as 1 gram of each preparation formula to the back of the hand with a size of 7 cm and then looking at it with a stopwatch the time required by the preparation to dry, that is, the time until the preparation formed a film layer. The drying time requirement of peel-off gel mask preparations is 15-30 minutes. (Saputra et al., 2019)

Storage test

Physical Stability Check Test The physical stability check of the mask against refrigeration is carried out by: the mask is stored in a suitable container then stored in the refrigerator at a temperature of 00C-40C and left for 24 hours, then removed. After that it is observed whether there is separation or not. (Pramiastuti et al., 2019)

Viscosity test

The viscosity of the gel peel off mask was measured using a Brookfield type Viscometer type NDJ-8S. The peel off mask sample to be tested is placed on the beaker glass, then the tool is turned on. The spindle used No.4 then the spindle is placed right in the middle of the preparation using a reading on a 30 rpm sponge. The preparation of gel masks is excellent when it has a viscosity of 2000-50000 cps. (Samsul et al., 2022)

RESULTS & DISCUSSION

The manufacture of this peeloff gel mask is carried out by collecting raw materials from bidara leaf samples (*Ziziphus spina-cristi*L) as much as 3 kg. Sampling was carried out at 08.00-10.00 am because at that time the intensity of sunlight was not too high so the evaporation rate of water was relatively low and to ensure that the content of secondary metabolites such as flavonoids, alkaloids and tannins was at optimal and stable levels. Then the sample is washed with running water so that the sticking dirt disappears, a sprinkling is done on the sample to facilitate the drying process, then dried in the sun covered with a black cloth, then the dried simplicia is then blended until it becomes a simplicia powder obtained with a weight of 511 grams, then extraction.

In this study, the extraction process was carried out using the maceration method. The maceration method was chosen because the maceration method can avoid the damage of compounds. (Asworo & Widwastuti, 2023)

The maceration method is a simple filtering method. The process is carried out by soaking simplicia powder in a 96% ethanol solvent of 3000 mL for 3x24 hours with occasional stirring. The solvent will penetrate the cell wall and dissolve the active compounds contained in the material. After maceration, the filtrate results are filtered. Then it is evaporated using a rotary evaporator so that a thick extract can be obtained and then put into the oven with the aim of removing the remaining solvent to the maximum. So that the weight of the thick extract of papaya leaves is 37.5 grams. The yield value of bidara leaf extract (*Ziziphu spina-cristi* L.) obtained was 7.33% which was calculated based on the comparison between the weight of the thick extract and the weight of the initial dry simplicia. The yield is calculated to determine the efficiency of the extraction process as well as as the basis for determining the amount of extract. The higher the yield value indicates that the extracts produced are larger. The requirement for a good yield value is not less than 10%. This extract can be used for the formulation of peeloff gel mask preparations (Nahor et al., 2020) and subsequent testing.

Bidara leaf extract (*Ziziphus spina-cristi* L) was formulated to be made into a peel-off gel mask preparation with a concentration of (F1) of 1%, concentration (F2) of a concentration of 3%, and a stability test was carried out including organoleptic stability, homogenites, ph, adhesion, dispersibility, drying time, storage, and viscosity.

The organoleptic examination aims to observe the shape, color and smell of the resulting bidara leaf extract peel-off gel mask preparation, following Table of organoleptis tests.

Table 2 Organoleptic Test Results

Formula	Smell	Shape	Color
1	Typical bidara leaves	Semi-compact	Brownish-green
2	Typical bidara leaves	Semi-compact	Dark Brown
3	Typical Bidara Leaf	Semi-compact	Blackish brown

Source: Primary data, 2025

In Table 4.2 formulation 1 brownish-green, distinctive smell of bidara leaves (*Ziziphus spina-cristi* L), semi-dense form, soft without coarse particles and easy to use. Formulation of 2 shades of olive green, distinctive smell of bidara leaves (*Ziziphus spina-cristi* L), semi-dense form, soft without coarse particles and easy to use. Formulation of 3 shades of keki green, distinctive smell of bidara leaves, (*Ziziphus spina-cristi* L) semi-dense form, soft without coarse particles and easy to use. In the organoleptic test, Formulation 1 (F1) showed a brownish-green color, Formulation 2 (F2) showed an olive green color, while Formulation 3 (F3) showed a keki green color. The color difference in the three formulas is caused by the difference in the concentration of bidara leaf extract used, the higher the concentration of the extract, the color of the preparation tends to be more intense. The aroma produced by all formulas is identified as the distinctive aroma of bidara leaves without exhibiting a pungent or rancid odor, so it is organoleptically acceptable. The preparation form of the three formulas shows a stable semi-solid consistency, although there is a slight difference in the level of viscosity. Formula 1 (1%) has a lighter semi-solid form making it easy to apply, Formula 2 (3%) shows a semi-solid texture with a medium consistency, while Formula 3 (5%) shows a semi-solid with a more concentrated consistency. This difference shows that the higher the concentration of bidara leaf extract, the thicker the form of the preparation produced.

The results of the pH test of the formulation on bidara leaf extract (*Ziziphus spina-cristi* L) can be seen in the table below.

Table 3 pH Test Results

Formula	Ph	Information
1	4,00	Not eligible
2	4,00	Not eligible
3	4,05	Not eligible

Source: Primary data, 2025

In Table 4.3 formulations 1,2, and 3 of *the bidara leaf peel-off gel mask* (*Ziziphus spina-cristi* L) do not meet the good skin pH requirement of 4.5-6.5.pH test is carried out to see the acidity level of the bidara leaf extract *peel-off gel mask* during storage, as this is important to ensure that the preparation is safe and comfortable to use on the skin. The test results showed that Formulation 1 (F1) and Formulation 2 (F2) had a pH of 4.00, while Formulation 3 (F3) was 4.05, so all formulas were acidic and slightly lower than the ideal pH of the skin (4.5–6.5). Relatively stable pH values during storage indicate that the preparation is able to maintain acidity levels despite varying levels of extract. Even though they are acidic, all three formulas are still acceptable, but it is recommended to adjust the formulation so that the pH is close to the ideal range of the skin so that the gel mask is more comfortable to use.

The results of the homogeneity of the formulation in bidara leaf extract (*Ziziphus spina-cristi* L) can be seen in the table below.

Table 4 Homogeneity Test Results

Formula	Homogeneity	Information
1	Homogeneous	Qualify
2	Homogeneous	Qualify
3	Homogeneous	Qualify

Source: Primary data, 2025

In Table 4.4 in formulations 1,2 and 3 gelpeel-off masks show homogeneous qualifying. Homogeneity tests were performed to assess the uniformity of texture and distribution of ingredients in the peel-off gel mask of bidara leaf extract. The observation results showed that Formulation 1 (F1), Formulation 2 (F2), and Formulation 3 (F3) had a homogeneous, soft, and coarse particle-free texture. The difference in extract concentration does not affect homogeneity, so all three formulations remain stable and comfortable to use on the skin. Thus, all formulations *show good homogeneity, signifying that the quality of the preparation is maintained during storage.*

The results of the dispersion of the formulation on bidara leaf extract (*Ziziphus spina-cristi* L) can be seen in the table below.

Table 5 Dispersion Test Results

Formula	Dispersion (cm)	Information
1	4,3	Not eligible
2	5,3	Qualify
3	5,35	Qualify

Source: Primary data, 2025

In Table 4.5 of the dispersion test carried out, the results were obtained that the dispersion power of formulation 1 was 4.3 cm not qualified, formulation 2 was 5.3 cm to meet the signal and formulation 3 was 5.35 qualified. A dispersion test was carried out to find out how easily the bidara leaf extract *peel-off* gel mask can be evenly distributed on the skin. The test results showed that Formulation 1 (F1) had a dispersion of 4.3 cm so it was not eligible, while Formulation 2 (F2) was 5.3 cm and Formulation 3 (F3) was 5.35 cm eligible. This difference is due to the consistency of each formula; F1 is thicker so it is difficult to flatten, while F2 and F3 have a more fitting texture so it is easy to apply. Thus, F2 and F3 have good dispersability and are comfortable to use as peel-off gel masks, while F1 needs to improve its consistency to increase dispersibility. All formulas remained stable during the test and these results demonstrate the importance of formula consistency to affect the comfort of use.

The results of the formulation's adhesion to bidara leaf extract (*Ziziphus spina-cristi* L) can be seen in the Table below

Table 6 Adhesion Test Results

Formula	Adhesive	Information
1	1,16	Qualify
2	3,72	Qualify
3	1,45	Qualify

Source: Primary data, 2025

In Table 4.6 The adhesion test shows that formulation 1 has an adhesion of 1.16 seconds, formulation 2 has an adhesion of 3.72 and formulation 3 has an adhesion of 1.45. Adhesion test was carried out to determine the ability of the *peel-off* gel mask of bidara leaf extract (*Ziziphus spina-cristi* L.) to adhere to the skin before peeling. The test results showed that Formulation 1 (F1) had an adhesion of 1.16 seconds, Formulation 2 (F2) 3.72 seconds, and Formulation 3 (F3) 1.45 seconds. This difference in adhesion is influenced by the viscosity and concentration of the extract of each formulation; F2 has the highest adhesion because it has a snug texture so the gel can stick longer before peeling, while F1 and F3 come off faster because they have a lighter texture. From the adhesion test, F2 has the best adhesion, while F1 and F3 come off faster. This shows that adjusting the concentration of the extract and the texture of the gel is important to get a gel mask that adheres optimally but remains comfortable to use.

The drying power of the formulation on bidara leaf extract (*Ziziphus spina-cristi* L) can be seen in the table below

Table 7 Drying Test Results

Formula	Drying time	Information
1	30 minutes	Qualify
2	30 minutes	Qualify
3	30 minutes	Qualify

Source: Primary data, 2025

In Table 4.7 From the drying test, the results were obtained that formulation 1, formulation 2, and formulation 3 took 30 minutes to dry. These results show that all three formulas still meet the dry-time test standard, which is 30 minutes. A drying time test was carried out to find out how long the *peel-off* gel mask of bidara leaf extract (*Ziziphus spina-cristi* L.) takes to dry after being applied to the skin. Based on Table 4.7, Formulation 1 (F1), Formulation 2 (F2), and Formulation 3 (F3) all take 30 minutes to dry. These results show that all three formulations meet the set dry-time testing standards, making them convenient to use and easy to peel after drying. All formulations have a drying time of 30 minutes, according to the standard, so that the *peel-off* gel mask can be applied comfortably and effectively.

The results of the formulation stability test on bidara leaf extract (*Ziziphus spina-cristi* L) can be seen in the Table below

Table 8 Storage Test Results

Formula	Storage test	Information
1.	Formulation 1 refrigerator with temperature 00C-40C and left for 24 hours.	Qualify
2.	Formulation 2 in the refrigerator with a temperature of 00C-40C and left for 24 hours.	Qualify
3.	Formulation 3 in the refrigerator with a temperature of 00C-	Qualify

Source: Primary data, 2025

Storage tests were carried out to determine the physical and chemical stability of *the bidara leaf extract* peel-off gel mask (*Ziziphus spina-cristi* L.) when stored in cold conditions. Masks of each formulation are stored in a suitable container, then placed in a refrigerator at 0–4°C for 24 hours, then re-observed. The results of the observations showed that Formulation 1 (F1), Formulation 2 (F2), and Formulation 3 (F3) retained physical characteristics such as color, texture, homogeneity, and aroma without significant changes. All formulations show good stability to cooling for 24 hours. This indicates that gel masks remain safe and comfortable to use after being stored in cold conditions for a short period of time.

The results of the formulation viscosity test on bidara leaf extract (*Ziziphusspina-cristi* L) can be seen in the table below

Table 9 Viscosity Test Results

Formula	Viscosity (cps)	Information
1	1495	Not eligible
2	1632	Not eligible
3	894	Not eligible

Source: Primary data, 2025

Viscosity test was carried out to determine the level of viscosity or to the dilution of the peel-off gel mask of bidara leaf extract (*Ziziphus spina-cristi* L.). The test results showed that Formulation 1 (1%) had a viscosity of 1495 cps, Formulation 2 (3%) 1632 cps, and Formulation 3 (5%) 894 cps. All formulations are below the peel-off gel mask viscosity standard of 2000–4000 cps. This shows that the resulting masks are thinner than standard, so they have a lighter texture and are easier to apply, even though they have not reached the ideal viscosity limit. All formulations have a lower viscosity than standard, making gel masks thinner and easier to use. Formulation adjustments are required to ensure that the viscosity reaches the ideal level as per the standard.

Based on research, bidara leaves (*Ziziphus spina-cristi* L.) from Batauga, South Buton Regency, Southeast Sulawesi can be formulated into peel-off gel masks with concentrations of F1 (1%), F2 (3%), and F3 (5%). The test results showed that all formulas had a pH more acidic than normal skin (4.5–6.5), F1 did not meet the dispersibility standard, and the viscosity of all three formulas was still substandard. The more acidic pH constraint is caused by bidara leaf extract containing flavonoids and acidic tannins, and the formula has not been equipped with a pH regulating substance (buffer) so that the acidity of the preparation is not neutralized. The dispersion of F1 is low because the gel is too thick because the proportion of gelling agents (PVA and HPMC) is more dominant than the extract, so the texture of the mask is less flexible. While the viscosity of the three formulas is still substandard because the amount of gelling ingredients is relatively low, the extracts dissolved in aquadest cause dilution, and the stirring process and temperature during mixing also affect the viscosity of the preparation. Taking into account these factors, the concentration of the extract, the viscosity of the gel, and the composition of the ingredients that make up the preparation, it is necessary to adjust the formulation so that the pH, dispersibility, and viscosity of the gel mask are in accordance with the standard, so that it is comfortable and effective to use.

CONCLUSION

Based on the results of the research carried out, it can be concluded that the extract of bidara leaves (*Ziziphus spina-cristi* L). It can be formulated as a gel *peel off mask preparation* with concentrations of 1%, 3% and 5%. The results of the f1, f2 and f3 peel-off gel mask stability test based on the tests carried out by organoleptic tests, homogeneity, dispersability, and adhesion meet the requirements. However, in the pH test the entire formula does not meet the normal skin pH requirements (4.5–6.5) because the preparation tends to be more acidic, while the viscosity test is also not qualified which is likely influenced by the composition of the gel base and the concentration of the extract resulting in a less than optimal viscosity

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