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Research Article

Formulation And Evaluation Sunflower Seed Oil With Sappan Wood Extract (*Caesalpinia Sappan*) Lip Balm

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ABSTRACT

Lip balm preparations can be used to prevent and treat chapped lips due to UV exposure and synthetic ingredients. Natural ingredients such as sappan wood extract and sunflower seed oil can be used to reduce the use of synthetic ingredients. The brazilin compound in sappan wood has anti-free radical, antibacterial, and anti-inflammatory abilities. While chlorogenic type polyphenol compounds in sunflower seeds have potential as antioxidants. The purpose of this study was to make a lip balm preparation of a combination of sunflower seed oil with sappan wood extract. This research is an experimental research by extracting sappan wood using the socletation method and 70% ethanol solvent. Lip balm preparations were made from a combination of sunflower seed oil: secang wood extract in the ratio of 5%:1,25% (F1), 10%:2.5% (F2) and 15%:3,75% (F3). Evaluation of the preparation includes organoleptic test, homogeneity, pH, spreadability, adhesiveness, melting point, and moisture capacity. While the results of the stability test were analyzed using the paired t-test parametric test with SPSS 24.0 and a significance level of 95%. The results showed that the characteristics of the lip balm preparation of a combination of sunflower seeds and sappan wood extract showed results in organoleptic testing, namely having a yellowish beige and

yellow color. The aroma is typical of beeswax with an oily semi-solid texture. The lip balm preparation shows that all preparations are homogeneous, with pH test results of 4.90-6.12; leachability of the lip balm.

1. Introduction

The majority of Indonesian often complain about problems with their lips which are often called chapped lips which are caused by cracking of the surface layer of keratin due to dehydration, poor protection from health care, cosmetics and sunlight (Mumtazah et al. 2020). Peeling on the lips occurs because human lip skin contains few melanin cells. Apart from that, the corneum layer which functions to protect the skin usually has 15-16 layers, whereas the lips only have 3 to 4 very thin corneum layers and there are no hair follicles and sweat glands to protect it from the external environment. Exfoliating lip keratin cells will cause discomfort and pain, so to prevent this, cosmetic preparations are needed to form a new layer on the surface of the skin and keep the lips moist for a long time, one of which is lip balm (Ambari et al. 2020).

Lip balm is a preparation that functions as a moisturizer which is applied to the lips by forming a layer of oil on the surface of the lips and has the function of helping maintain lip moisture, protecting from UV rays and warding off free radicals (Rasyadi 2021). Many lip balm preparations on the market use synthetic ingredients which have a damaging effect on the skin and are carcinogenic or cause cancer(Azis 2022). One of the compounds in lip balm that causes carcinogens is crystalline phenol, petroleum, dyes and paraffin (Azis and Harselina 2023). Therefore, this research is an innovation in lip balm preparation to avoid the side effects of using synthetic ingredients by utilizing natural ingredients such as sappan wood and sunflower seeds.

Sunflower (*Helianthus annus* L.) is a nutritious plant and has benefits as a raw material for the food industry in the form of *kwaci* and as a producer of vegetable oil which can be used to make products. Sunflower seeds contain unsaturated oils, inorganic compounds, vitamin E, and high phenolic substances. Chlorogenic polyphenol compounds in sunflower seeds have the potential to act as antioxidants that can inhibit oxidation (Aisyah Meisya Putri 2020). Apart from sunflower seeds, old plants such as *Ceasalpania sappan* are used in traditional medicine because they contain chemical compounds such as brazilin with the effect of protecting the body against free radicals, antibacterial and anti-inflammatory (Febryan, Aryani, and Hidayat 2020). Based on that description, in this research materials will be used in the form of sappan wood extract and sunflower seed oil to make lip balm preparations with the aim of knowing the characteristics of lip balm preparations using a combination of sunflower seed oil with sappan wood extract.

2. Materials and Methods

Design and Type of Research

This type of research is laboratory experimental. This research began with making secang wood extract by soxhletation using 200 ml of 70% ethanol solvent. Lip balm preparations are made with 3 formulations as in the table below.

Table 1. Lip balm formulation is a combination of sunflower seed oil and sappan wood extract

Materials	Function	Formulation (%)			
		0	I	II	III
Sappan wood extract	Active ingredients	-	1,25	2,5	3,75
Sunflower seed oil	Active ingredients	-	5	10	15
Beeswax	Hardenner	17,5	17,5	17,5	17,5
Methyl Paraben	Preservative	0,1	0,1	0,1	0,1
Lanolin	Emulsifier	12,5	12,5	12,5	12,5
Propylene glycol	Solvent	5	5	5	5
Oleum Cacao	Basis	Add 100	Add 100	Add 100	Add 100

Material and Tools

The tools used in this research were digital scales Fujitsu FS-AR210 brand, beaker, Erlenmeyer, stirring rod, spatula, measuring cup, dropper pipette, porcelain cup, socket set, pH meter, stirrer, water bath, tissue, glass object, and memmert N33 oven. The materials used in this research were sappan wood extract, sunflower seed oil, beeswax, methyl paraben, lanolin, propylene glycol, and cacao oleum. Sunflower seed oil in this study was obtained from Herbal Lansida, Yogyakarta, Central Java which was accompanied by a letter of analysis of product.

Methods

Extraction

The preparation of secang wood extract in this research was carried out using the soxhletation method by weighing 20 grams of secang wood simplicia powder using an analytical balance. The extraction process was repeated 5 times until all secang wood samples were completely extracted. Then wrap it in filter paper and tie it using mattress rope, and put it in a lead. Then put 200 ml of 70% alcohol solvent into a round-bottomed flask, place the flask in heating mentle. Then, plug the condenser and water hose into the socket, which has been filled with a filter paper bag, and turn on the water tap for the condenser. The heating mantle is turned on at 70ºC and heated until the ethanol in the flask evaporates into the condenser and drips into the round bottom flask. This is done until the liquid fills the tube and returns to the flask after passing through the siphon and until the solvent is no longer colored (clear). Turn off the heating mantle with the water tap still flowing, and remove the socket and flask once it has cooled. The process of thickening the extract uses a rotary evaporator by entering the liquid in the round bottom flask into the rotary evaporator at a temperature of 65ºC and at a speed of 40 until the solvent is completely evaporated. After that, the extract is put into a porcelain cup that has been weighed first to be evaporated again in a water bath at 50ºC until a thick extract is obtained.

Phytochemical Screening

Flavonoid Test

Identification of flavonoid compounds in secang wood extract was carried out by taking 5 ml of the sample, adding 0.05 grams of Mg powder and 1 ml of concentrated HCl, then shaking vigorously. Positive results are indicated by the formation of red, yellow or orange (Ambari et al. 2020).

Alkaloid Test

Identification of alkaloid compounds in secang wood extract was carried out by placing a 1 ml sample in a test tube, then adding a few drops of Mayer, Wagner, Dragendorf reagent solution. The precipitate formed in the test sample indicates that the sample contains alkaloids. Adding Mayer's reagent produces a white precipitate, adding Wagner's reagent produces a brown precipitate, and Dragendorf's reagent produces a red precipitate (Reiza, Rijai, and Mahmudah 2019).

Tannin Test

Identification of tannin compounds in secang wood extract is done by placing 1 ml of the sample into a test tube, then 2-3 drops of $FeCl_3$. A sample can be said to contain tannin compounds if the color changes from blackish green to black (Manongko, Sangi, and Momuat 2020).

Saponin Test

Identification of tannin compounds in secang wood extract is done by placing 1 ml of the sample into a test tube, then 2-3 drops of $FeCl_3$. A sample can be said to contain tannin compounds if the color changes from blackish green to black (Marliana Dewi Soerya, Suryanti Venty 2015).

Terpenoid test

Identification of terpenoid compounds in secang wood extract was carried out by taking a small amount of the extract and drying it on a drip plate, adding 3 drops of acetic anhydride and 1 drop of concentrated sulfuric acid. The presence of terpenoid compounds shows the appearance of a red color (Ambari et al. 2020).

Making lip balm preparations

Making lip balm preparation begins by dissolving 2.5 grams of secang wood extract in 1 gram of propylene glycol on a hot plate at 45 ° C while stirring using a spatula as a mixture 1. Then melted 5 grams of beeswax and oleum cacao in a porcelain dish on a water bath at 65°C until melted and stirred using a spatula. After melting, lanolin is added, and sunflower seed oil is then stirred using a magnetic stirrer until homogeneous as a mixture of 2. Mixture 1 and mixture 2 are then mixed slowly on a hotplate at 50°C and added methyl paraben, then stirred using a spatula. Once homogeneous, it is put in a pot jar and waited for it to solidify (Agustiana and Herliningsih 2019).

Organoleptic Test

Organoleptical tests are carried out using the five senses, namely by knowing the smell, color, and texture of lip balm preparations that have been made (Ambari et al. 2020).

Homogeneity Test

The homogeneity test aims to determine whether the preparation is mixed homogeneously between the active ingredient and additional ingredients. This test is carried out by applying a preparation that has been made as much as 0.5 grams on the preparate glass then observed the presence of coarse grains or not. Preparations that do not appear to have coarse grains can be said to show a homogeneous arrangement (Nurmi 2019).

pH Test

The pH test is carried out to determine the acidity level in lip balm preparations measured using a pH meter. Before use, the pH meter is calibrated first using a solution of pH 5, pH 7, and pH 9. pH measurement in the preparation is carried out by weighing the preparation as much as 1 gr of preparation and then dissolved with 100 ml of hot aquadest. Then the pH meter is inserted into the sample that has been diluted to observe the value listed on the pH meter as a determinant of the pH value of the preparation. Good lip balm and meets the quality requirements of SNI 16-4399-1996 in Uce Lestari's research, which has a pH in accordance with the physiological pH of the skin, which is 4.5-8 (Lestari 2021).

Adhesion test

A preparation of 1 gr is then placed on the object glass and covered with other object glass. Then a load weighing 1000 gr is added for 5 minutes, then the load is lifted and calculated when the two glass objects separate each other. The stickiness requirement is not less than 4 seconds (Husnia 2017).

Melting Point Test

A preparation of 1 gram is put into a porcelain dish, then set the oven temperature to 50º C for 15 minutes, at a temperature increase of 1º C every 15 minutes, and observed what temperature the preparation melts The melting point test standard in accordance with the quality requirements of SNI 16-4769-1998 in Yusraini's research is 50°C – 70°C (Bhernama, Nasution, and Nst 2022).

Spreadability Test

The lip balm preparation is weighed as much as 0.5 grams and placed in the middle of the lower petri dish. Then a weighed petri dish of its partner is placed on it and a load weighing 200 grams is added. Then wait for 1 minute and measure the diameter of the spread formed using a caliper. The standard test for the spreadibility of lip balm is 5-7 cm (Salsabila, Dewi, and Atikah 2022).

Moisture Test

This test was conducted using 16 panelists, dividing the group into 4 groups. The first group, using the formula F0, the second group using the formula F1, the third group using the formula F2, and the fourth group using the formula F3. The moisture test of lip balm preparations was carried out by applying lip balm to the lips of panelists for 20 minutes then observing the results was carried out using a skin analyzer (Firdausi Imani, Cahaya;Shoviantari 2022).

Stability test

Physical stability tests on lip balm preparations are carried out using the cycling test method to determine the stability of the preparation with the influence of temperature variations during storage time. The preparation is stored in the refrigerator with a temperature of 4 ° C for 24 hours followed by being stored

in the oven with a temperature of 40 ° C for 24 hours. The test was carried out as many as 3 cycles and observed physical changes from the preparation at the beginning and end of the test which included organoleptic tests, pH tests, homogeneity tests, dispersion tests, and adhesion tests (wicaksono 2019).

Data Analysis

The results of organoleptic tests and homogeneity tests were analyzed using qualitative descriptive methods. Meanwhile, the results of the pH test, adhesion test, melting point test, spreadability test, humidity test were analyzed by comparing the standard quality requirements for preparations according to SNI and analyzed using SPSS version 24.00 by carrying out a normality test with a significance value of P>0.05 showing that the data was distributed. normal. The stability test results were analyzed by conducting a paired t-test with a significance value of P>0.05.

3. Results and Discussions

Sappan Wood Extract

In the extraction process using the soxhletation method, the solvent used is 200 ml of 70% ethanol. Ethanol is the only solvent that is safe or non-toxic if consumed because it has low toxicity compared to other solvents. The reason for choosing 70% ethanol as a solvent is because it is polar, with a higher polarity than 96% ethanol, and ethanol has a hydroxyl group (OH) which can form hydrogen bonds with the hydroxyl group (OH) of flavonoid compounds so that it can increase the solubility of flavonoid compounds in ethanol.

The presence of a temperature factor or heating of the solvent at the extraction stage can accelerate the transfer of metabolites into the solvent more quickly. In addition, the repeated solvent soxhletation process with a high extraction temperature means the molecules move faster, and solvent circulation increases the mass transfer rate of the compound, so that the substance comes into contact with the solvent more often and produces more extract. The secang wood extract obtained after the soxhletation process was 113 ml and showed a yield of 32.5 ml after concentration on a rotary evaporator. The results of the secang wood extract can be categorized as large quantities because the long heating time causes the extract to release a lot of oil, and forms two phases, resulting in difficulties in thickening, and the extract obtained is liquid.

Phytochemical Screening

The results of phytochemical screening from sappan wood extract (Caesalpinia sappan) using a color test showed the following results:

Table 2. Phytochemical screening test results for secang wood extract

Chemical Compund	Reactor	Result	Information
Flavonoid	0.05 grams of magnesium and 1 ml of concentrated HCl	The formation of red, yellow, or orange colors	(+)

Alkaloid	Mayer's reagent	A white precipitate is formed	(-)
	Wagner's reagent	A brown precipitate is formed	(+)
	Dragendorf's reagent	A red precipitate is formed	(+)
Tannin	$FeCl_3$	The formation of a blackish green or black color	(+)
Saponin	Aquades	Foam forms and does not disappear within 30 seconds	(+)
Terpenoid	Acetic anhydride, and concentrated sulfuric acid	The formation of red color	(+)

Test the physical properties of lip balm

Organoleptic test

The organoleptic test results for lip balm preparations are as follows:

Table 3. Organoleptic test results for lip balm preparations combining sunflower seed oil with sappan wood extract

Formula	Result (A)			Result (B)		
	Texture	**Color**	**Aroma**	**Texture**	**Color**	**Aroma**
Formula 0	Semi-solid	White	Special beeswax	Semi-solid	White	Special beeswax
Formula 1	Semi-solid slightly oily	Faded yellowish cream	Special beeswax	Semi-solid slightly soft	Faded yellowish cream	Special beeswax
Formula 2	Semi-solid slightly oily	Deep yellowish cream	Special beeswax	Semi-solid slightly soft	Deep yellowish cream	Special beeswax

Formula 3	Semi-solid oily	Yellow	Special beeswax	Semi-solid slightly soft	Yellow	Spesial *beeswax*

Information :
Result (A) : Before stability test
Result (B) : After stability test

Based on organoleptic test data on lip balm preparations, different colors were obtained between F0, F1, F2 and F3. The color produced by F0 is white due to the absence of the addition of secang wood extract, F1 with 1.25% secang wood extract produces a faded yellowish cream color, F2 with 2.5% secang wood extract produces a deep yellowish cream color, and preparation F3 with 3.75% sappan wood extract produces a yellow color.

The texture of F0 lip balm preparations, namely semi-solid, is produced due to the presence of additional ingredients such as beeswax which functions as a hardening agent and has solid physical properties like wax, while lanolin functions as an emollient and has semi-solid physical properties. Preparations F1 and F2 show semi-solid, slightly oily texture results, and F3 shows oily semi-solid results. The oily nature of F1, F2, and F3 is caused by the addition of sunflower seed oil with different concentrations. The higher the concentration of sunflower seed oil given, the more oily the preparation will be. Apart from that, secang wood extract which contains essential oils makes the oil concentration in the preparation higher (Rismayanti 2016). The odor shown by the four lip balm formulations shows the distinctive smell of beeswax (Prasetyo, Junus, and Rifa'i 2022). This happens because the administration of a low concentration extract to the lip balm preparation means that the odor produced from the extract is covered by the smell of beeswax which is used as an additional ingredient in the lip balm preparation.

The addition of cacao oleum as an additional ingredient which has a melting point of 31ºC to 34ºC and the addition of lanolin which is used as an additional ingredient in lip balm preparations which has a melting point of 38ºC to 40ºC makes the texture of the lip balm preparations softer after the stability test(Raymond C Rowe, Paul J Sheskey 2009). The color of the lip balm preparation showed the same results as before the stability test, namely white in F0, a faded yellow cream color in F1 preparation, a deep yellow cream color in F2 preparation, and yellow in F3 preparation. This stable result is because the brazilin compound in secang wood extract has a boiling point of 145ºC-149ºC(Nirmal et al. 2015). Apart from the color, the odor produced by the lip balm preparation after the stability test was carried out also showed the same results as before the stability test, namely the characteristic smell of beeswax.

Homogeneity test

The results of the lip balm homogeneity test are as follows:

Table 4. Homogeneity test results for lip balm preparations combining sunflower seed oil with sappan wood extract

Formula	Replication	Result A	Result B
Formula 0	4	Homogen	Homogen
Formula 1	4	Homogen	Homogen
Formula 2	4	Homogen	Homogen
Formula 3	4	Homogen	Homogen

Information:

Result (A) : Before stability test
Result (B) : After stability test

Based on the results of testing the homogeneity of lip balm preparations in this study, the results were homogeneous. This is indicated by the absence of coarse grains in the preparation when smeared on a glass preparation, which means that it is in accordance with the SNI 16-4399-1996 standard which states that a preparation must show a homogeneous composition. Homogeneity of a preparation refers to the same level of active ingredients in each application, therefore it can influence the effectiveness of therapy. If the preparation is homogeneous, then the levels of active substances in the preparation are assumed to be the same when used(Limanda, Siska Anastasia, and Desnita 2019).

This homogeneous result is also caused by the stirring process in making the preparation, the time used when stirring can expand the contact area by increasing the stirring speed so that it can increase the homogeneity of a mixture in the preparation. Apart from that, stirring is a process that shows induced movement in a material or mixture, and the stirring process can create circulation patterns that influence the homogenization process (Baskara, Suhendra, and Wrasiati 2020). This test was carried out to meet the ideal conditions for a lip balm so that it provides a soft feeling when applied to the skin.

pH Test

The results of the pH test on the lip balm preparation are as follows:

Table 5. pH Test Results of Lip Balm Preparations Combination of Sunflower Seed Oil with Sappan Wood Extract

Formula	Replication	Result pH (A)	Average	Result pH (B)	Average	Paired t-test result
Formula 0	1	6,86	6,88	6,12	5,78	0,006*
	2	6,88		5,94		
	3	6,97		5,55		
	4	6,83		5,53		
Formula 1	1	6,60	6,63	5,86	5,75	0,001*
	2	6,72		5,66		
	3	6,45		5,68		
	4	6,75		5,80		
Formula 2	1	7,62	7,51	5,41	5,38	0,000*
	2	7,41		5,39		
	3	7,77		5,38		
	4	7,24		5,34		
Formula 3	1	7,53	7,68	5,00	4,99	0,000*
	2	7,84		5,04		
	3	7,7		5,05		
	4	7,65		4,90		

Information:
Result (A) : Before stability test

Result (B) : After stability test
*= significant (unstable)

pH testing was carried out to determine the pH of lip balm preparations combining sunflower seed oil with secang wood extract, as the results of the pH test showed that the four preparations complied with SNI 16-4399-1996 standards, namely the physiological pH range of the skin, namely 4.5 – 8. This shows that the lip balm preparation is still safe to use, because if the lip balm preparation is too acidic it can cause irritation to the skin of the lips, whereas if the pH of the lip balm preparation is too alkaline it can make the skin of the lips dry(Khasanah et al. 2023). The pH before the stability test showed that the higher the concentration of secang wood extract and sunflower seed oil caused the pH to decrease further. This is because the brazilin compound in secang wood extract has a pH of 6 - 7 when dissolved in a polar solvent such as distilled water (Sri Ayu Wulandari, Endara Safitri, and Evi Eka Susanti 2020).

After carrying out the stability test, there was a decrease in the pH of each formula, and seen from the results of the paired t-test, the results obtained were F0, namely 0.006, F1, namely 0.001, F2, namely 0.000, and F3, namely 0.000, which means the results of all formulas had a significant value of <0, 05. This shows that there is a significant difference between the initial preparation before the stability test was carried out and after the stability test was carried out, which means that the influence of hot and cold temperatures during the stability test caused the pH of the brazilin compound to become acidic(Sri Ayu Wulandari et al. 2020).

Spreadability Test

Table 6. Spreadability Test Results on Lip Balm Preparations Combining Sunflower Seed Oil with Sappan Wood Extract

Formula	Replikation	Result (A)	Average	Result (B)	Average	Paired t-test result
Formula 0	1	2,1 cm	2,4 cm	3,0 cm	2,85 cm	0,073
	2	2,5 cm		3,0 cm		
	3	2,6 cm		2,8 cm		
	4	2,4 cm		2,6 cm		
Formula 1	1	2,4 cm	2,5 cm	2,8 cm	2,8 cm	0,063
	2	2,5 cm		2,5 cm		
	3	2,7 cm		3,0 cm		
	4	2,6 cm		2,9 cm		
Formula 2	1	2,4 cm	2,62 cm	2,8 cm	2,8 cm	0,102
	2	2,8 cm		2,9 cm		
	3	2,4 cm		2,5 cm		
	4	2,9 cm		3,0 cm		
Formula 3	1	2,5 cm	2,62 cm	2,7 cm	2,82 cm	0,161
	2	2,9 cm		2,9 cm		
	3	2,6 cm		2,7 cm		
	4	2,5 cm		3,0 cm		

Information:
Result (A) : Before stability test

Result (B) : After stability test

The results shown from the four preparations are not accordance with the standard spreadability of lip balm according to SNI 16-4399-1996, namely 5 – 7 cm. This is because the high concentration of beeswax used in the preparation causes the lip balm to form a slightly hardened preparation, so that the lip balm preparation cannot spread easily and the value resulting from the spreadability test is also lower (Ambari et al. 2020).

After carrying out the stability test, it was found that the spreadability value of each preparation had increased even though all the values still did not meet the SNI 16-4399-1996 standard. The paired t-test results of all formulas have a p value> 0.05, which means they are stable and there is no significant difference in the spreadability test. The increase in spreadability after the stability test was caused by the lip balm preparation becoming slightly softer with the additional ingredients of lanolin which has a low melting point, namely 38℃ – 40℃ (Kementerian Kesehatan RI 2013), and cacao oleum which has a melting point of 31℃ – 34℃ (Raymond C Rowe, Paul J Sheskey 2009), so that the lip balm preparation became slippery and easier to spread.

Adhesion Test

The results of the adhesion test on the lip balm preparation are as follows:

Table 7. Adhesion Test Results for Lip Balm Combination of Sunflower Seed Oil with Sappan Wood Extract

Formula	Replication	Result (A)	Average	Result (B)	Average	Paired t-test result
Formula 0	1	24s	31,25	9s	30,5	0,605
	2	26s		16s		
	3	24s		62s		
	4	51s		27s		
Formula 1	1	32s	36,25	45s	30,75	0,754
	2	42s		45s		
	3	8s		23s		
	4	63s		10s		
Formula 2	1	88s	84,75	24s	35,25	0,070
	2	51s		45s		
	3	100s		62s		
	4	100s		10s		
Formula 3	1	48s	67	12s	20,75	0,064
	2	97s		24s		

3	93s	22s
4	30s	25s

Information:
Result (A) : Before stability test
Result (B) : After stability test

Adhesion testing is carried out to determine the ability of the lip balm preparation to stick to the skin of the lips. The standard for a good adhesion test is no less than 4 seconds so that the preparation can stick longer to the skin of the lips. The results obtained from the adhesion test before the stability test were carried out experienced increases and decreases. The long time required for the adhesion test is because the active substance can be strongly bound to the base used in the preparation so that it can influence the adhesion test time to be longer(Ridhani and Nurul Hidayah 2022).

After carrying out the stability test, there was an increase and decrease due to the temperature during storage, and the results obtained from the paired t-test showed a P value> 0.05, which means that there was no significant difference between the preparation before and after the stability test. This is because the lip balm preparation experiences softening due to the additional ingredient lanolin in the lip balm preparation used which has a low melting point, namely 38℃ – 40℃ (Kementerian Kesehatan RI 2013). The difference in results does not affect the preparation of lip balm because the results still meet the standards.

Melting Point Test

The results of the melting point test for lip balm preparations in this study are as follows:

Table 8. Melting Point Test Results for Lip Balm Combination of Sunflower Seed Oil with Sappan Wood Extract

Formula	Replication	Result (A)	Average	Result (B)	Average
Formula 0	1	52,2℃	52,2℃	52,7℃	52,7℃
	2	52,2℃		52,7℃	
	3	52,2℃		52,7℃	
	4	52,2℃		52,7℃	
Formula 1	1	54,6℃	54,6℃	52,7℃	52,7℃
	2	54,6℃		52,7℃	
	3	54,6℃		52,7℃	
	4	54,6℃		52,7℃	
Formula 2	1	54,6℃	54,6℃	52,7℃	52,7℃
	2	54,6℃		52,7℃	
	3	54,6℃		52,7℃	
	4	54,6℃		52,7℃	
Formula 3	1	54,6℃	54,6℃	52,7℃	52,7℃

2	54,6℃	52,7℃
3	54,6℃	52,7℃
4	54,6℃	52,7℃

Information:
Result (A) : Before stability test
Result (B) : After stability test

The results obtained from the melting point test were differences between F0 and F1 with perfect melting results at a temperature of 52.2℃ and F2 and F3 with perfect melting results at a temperature of 54.6℃. This difference is caused by heating at a temperature of 50℃ causing the additional ingredient oleum cacao with a melting point of 31℃ – 34℃ (Raymond C Rowe, Paul J Sheskey 2009), and lanolin which has a melting point of 38℃ – 40℃ to melt quickly (Kementerian Kesehatan RI 2013).

The ideal melting temperature for lip balm formulations according to SNI 16-4769-1998 standards is 50℃ – 70℃. This is so that the lip balm preparation does not melt easily and change shape when stored indoors during the process of storing, using or distributing the product (Bahari 2022). After the stability test was carried out, the lip balm preparation experienced faster melting in F2 and F3 due to the influence of temperature in the stability test which was higher than the melting point of lanolin, making the preparation melt faster when the melting point test was carried out after the stability test.

Moisture Test

The results of the moisture test on the lip balm preparation are as follows:

Table 9. Moisture Test Results of Lip Balm Preparations Combination of Sunflower Seed Oil with Sappan Wood Extract Before Stability Test

Formula	Replication	Before treatment (%)	After treatment (%)	Difference before and after treatment
Formula 0	1	31	35	4
	2	32	34	2
	3	32	35	3
	4	31	33	2
Average		31,5	34,25	2,75
Formula 1	1	20	32	12
	2	24	32	8
	3	29	34	5
	4	27	36	9
Average		25	33,5	8,5
Formula 2	1	35	48	13
	2	35	40	5
	3	34	42	8
	4	27	39	12
Average		32,75	42,25	9,5
Formula 3	1	35	48	13

2	25	40	15
3	32	42	10
4	27	40	13
Average	29,75	42,5	12,75

Table 10. Moisture Test Results of Lip Balm Preparations Combination of Sunflower Seed Oil with Sappan Wood Extract after Stability Test

Formula	Replication	Before treatment (%)	After treatment (%)	Difference before and after treatment (%)	Paired t-test result
Formula 0	1	20	32	5	0,080
	2	20	34	4	
	3	15	32	5	
	4	20	36	2	
Average		18,75	33,5	4	
Formula 1	1	19	32	13	0.141
	2	27	36	9	
	3	27	35	8	
	4	30	39	9	
Average		25,75	35,5	9,75	
Formula 2	1	24	40	16	0,252
	2	35	40	5	
	3	30	39	9	
	4	33	45	12	
Average		30,5	41	10,5	
Formula 3	1	34	49	15	0,564
	2	28	40	12	
	3	25	50	25	
	4	32	42	10	
Average		29,75	45,25	15,5	

The moisture test is carried out by applying a lip balm preparation to the panelists' lips after checking the moisture levels of the panelists' lips before treatment with a skin analyzer. The results obtained from the humidity test before the stability test were carried out were F0 2.75%; F1 8.5%; F2 9.5%; and F3 12.75%. This happens because the higher the concentration of sunflower seed oil in each formula, the higher the moisture content.

After the stability test was carried out, it showed an increase compared to before the stability test was carried out. The paired t-test shows that the results of the four formulas have a significance value of >0.05, which means they are stable and there is no significant difference between the preparations before the stability test is carried out and after the stability test is carried out. This increase in moisture value occurs due

to the oil phase contained in the lip balm preparation, which forms an oil layer on the surface of the skin to prevent water evaporation and cause moisture on the skin (Dominica et al. 2023).

4. Conclusions

Based on the results and discussion, it can be concluded as follows:

1. The characteristics of the lip balm preparation, a combination of sunflower seeds and secang wood extract, has a yellowish cream and yellow color and has a distinctive beeswax aroma with an oily semi-solid texture. The lip balm preparations showed that all preparations were homogeneous, with pH test results of 4.90 – 6.12; adhesion power 10 – 62 seconds; spreadability test 2.5 – 3 cm; melting point 52.7℃; and moisture value 2% – 25%.
2. The lip balm preparation formula with the best preparation characteristics results is F3 with a concentration of 15% sunflower seed oil and 3.75% secang wood extract because it got good scores from all preparation characteristic tests.

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