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Lip Balm Formulation and Physical Properties Evaluation Of Yellow Pumpkin Fruit (*Cucurbita Moschata* Duchesne) Ethanol Extract with Cera Alba Variation Concentration

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ABSTRACT

Lip balm is a cosmetic product generally used to care for, moisturize, decorate, and protect lips from environmental influences. This study aims to determine the effect of variations in concentration of cera alba as base on the lip balm physical properties of yellow pumpkin fruit (Cucurbita moschata Duchesne)ethanol extract. The experimental design used was a pre-experimental one-shot case study. This study employed three formulas with varying concentrations of Cera alba, namely 10% (F1), 15% (F2), and 20% (F3). The physical properties of the lip balm under investigation included homogeneity, pH, adhesion, and hardness. The results showed that the variation concentration of cera alba had affect on adhesion and hardness, while not affect the homogeneity of physical properties and pH.

Keywords : Yellow pumpkin, cera alba, lip balm

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1. Introduction

Lip balm is a cosmetic product generally used to care for the lips, functions as a moisturizer, provides decoration, and protects the lips from environmental influences and evaporation on the epithelial cells of the lip mucosa (Limanda et al., 2019). Some balms might require antioxidant ingredients to protect the lips from free radicals and anti-UV protection to prevent pigmentation due to sunlight (Nazliniwaty et al., 2019).

Pumpkin (*Cucurbita moschata* Duchesne) is a plant that is rich in beta-carotene which functions as an antioxidant to fight premature aging and rejuvenate the skin (Coleman, 2009). Research by Cahyanti (2013) revealed that ethanol extract of pumpkin fruit has antioxidant activity with a reduction level of 88.24%.

Cera alba is a waxy material produced from the honeycomb of the *Apis mallifera* bee. Cera alba is a good binder of oil and wax to produce a homogeneous preparation mass. Cera alba is also used in lip balm because it is able to maintain the consistency of the preparation and ensure the stability of the desired color (Anjari, 2015). This study aims to determine the effect of variations concentration of cera alba as the lip balm base on the lip balm physical properties of yellow pumpkin fruit (Cucurbita moschata Duchesne) ethanol extract. Testing of the physical properties of lip balm includes homogeneity test, pH test, adhesion test, and hardness test.

2. Method

This research is an experimental study involving three sample treatment groups. The concentration of cera alba in sample 1 (F1) was 10%, in sample 2 (F2) was 15%, and in sample 3 (F3) was 20%. Observations were carried out only at the post-test stage by comparing the results of observations of the sample group after being given treatment. Homogeneity test data were analyzed theoretically by comparing physical properties with literature. Meanwhile, pH, adhesive strength, and hardness were analyzed statistically using SPSS with the One Way Anova test with a confidence level of 95%.

2.1. Yellow Pumpkin Fruit Extraction

Five hundreds grams of pumpkin fruit powder was macerated with 2.5 L of 70% ethanol for 3x24 hours and then filtered. The maserate was concentrated using a rotary evaporator at a temperature of 65ºC. The concentrated extract was evaporated in the oven at 50ºC to produce a thick extract.

2.2. Phytochemical Screening of Extract

The flavonoid test was carried out by putting 1 mL of pumpkin fruit ethanol extract into a test tube, adding 2 mL of ethanol then adding 0.5g magnesium powder and 3 drops of concentrated HCl. Positive results are indicated by the formation of a yellow to red color (Ambari et al., 2020). The terpenoid test was carried out by placing a small amount of pumpkin fruit ethanol extract in a test tube and then adding 3 drops of acetic anhydride and 1 drop of concentrated sulfuric acid. Positive results are indicated by the formation of a red color (Ambari et al., 2020).

2.3. Lip Balm Formulation

Lip balm made by weighing all the ingredients used according to the calculations for making a 5 grams preparation. The formula shown in table 1. Cera alba, lanolin, cacao oleum, and glycerin are put into a porcelain cup and then melted on a hot plate. The ethanol extract of pumpkin fruit and nipagin was crushed using a pre-warmed mortar and stamper. After the mixture has melted, pour the mixture into the grinding mortar until homogeneous. Then put it in a lip balm container, then leave it at room temperature until it solidifies.

Table 1. Lip Balm Formula

Ingredients	F1 (%)	F2 (%)	F3 (%)
pumpkin fruit ethanol extract	8	8	8
Cera alba	10	15	20
Lanolin	10	10	10
Glyserin	10	10	10
Nipagin	0.1	0.1	0.1
Oleum cacao	61.9	56.9	51.9

2.4. Homogeneity Test

Homogeneity testing is carried out by applying 0.1 grams of lip balm to the surface of a glass object, then visually observing to see whether the preparation is mixed evenly and wheter there are no coarse grains (Eryani, 2022).

2.5. pH Test

The pH measurement using a Universal pH indicator. Universal pH Indicator paper is dipped into the lip balm preparation for a few seconds, then the color on the pH Indicator paper is compared with the comparison color on the packaging (Ambari et al., 2020).

2.6. Adhesion Test

The adhesion test was carried out by placing 0.5 gramsof the preparation between 2 glass objects, then pressing it with a 1 kg load for 5 minutes. After that, the load is lifted from the object glass, then the object glass was installed on the test equipment. The test tool was given a load of 80 grams and then the time of release of the lip balm from the glass object was recorded (Miranti, 2009)

2.7. Hardness Test

Hardness testing the of lip balm is carried out by placing the lip balm horizontally, at a distance of approximately half an inch from the edge of the lip balm, hanging a weight that acts as a weight weighing 10 grams every 30-second interval (Vishwakarma et al., 2011).

2.8. Data analysis

Data from homogeneity testing were processed using a theoretical approach. The results of the research data on the physical properties of pH, adhesion, and hardness were tested using the SPSS program. The data was tested for normality first using the Kolmogorov-Smirnov method then followed by the One Way Anova test with a confidence level of 95%.

3. Result

The results of phytochemical testing of the pumpkin fruit ethanol extract of showed that the ethanol extract of pumpkin fruit was positive for containing flavonoids and terpenoids. The flavonoid test showed positive results with the

formation of a red color, and the terpenoid test was also positive with the formation of a deep red color.

Organoleptic of lip balm showed that all formulas have semisolid in shape, brownish yellow in color and has a distictive smell of yellow pumpkin extract. The resulting lip balm can be seen in Figure 1 below.

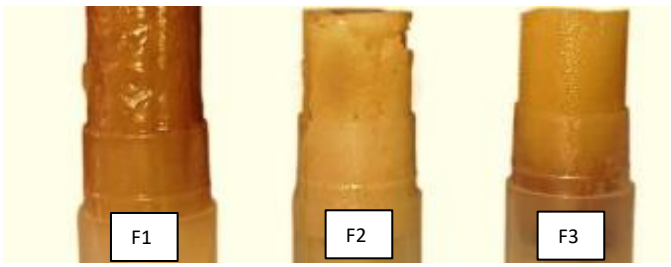

Figure 1. Yellow pumkin fruit lip balm

Results from the homogeneity test can be seen in table 2. The aim of testing the physical properties of homogeneity is to see that the preparation is evenly mixed without any coarse grains. From Table 2, it is known that all lip balm formulations are physically homogeneous.

Table 2. Homogeneity result

Formula	Replication 1	Replication 2	Replication 3	Results
F1	Homogen	Homogen	Homogen	Homogen
F2	Homogen	Homogen	Homogen	Homogen
F3	Homogen	Homogen	Homogen	Homogen

Table 3 showed that pH of F1, F2, and F3 were 5.3; 6; dan 6. The pH requirement of lip balm is 4,5-6,5. The results of the pH normality test data showed a significance value of 0.210 ($p>0.05$) indicating that the data was normal. The significance value of one way ANOVA test is 0.079 ($p>0.05$). This shows that there is no significant difference in pH in the three formulas. Results from pH testing can be seen in Table 3 below.

Table 3. pH result

Formula	Replication 1	Replication 2	Replication 3	Results
F1	6	5	5	5.3±0.57
F2	6	6	6	6 ±0
F3	6	6	6	6±0

Results from the adhesion test can be seen in Table 4. Based on the data in Table 4, it can be seen that the adhesive force of F1 is 19.17 seconds, F2 is 23.43 seconds, and F3 is 30.06 seconds. The adhesion test requirement of lip balm is more than 4 seconds. The three formulas meet the adhesion test requirements (more than 4 seconds). The normality test results have a significance value of 0.220 ($p>0.05$) which can be interpreted as normal data. The significance value of one way ANOVA test is 0.001 ($p<0.05$), which means there was a significant difference in the adhesive power of the three lip balm formulas with ethanol extract from pumpkin fruit.

Table 4. Adhesion test result

Formula	Replication 1 (second)	Replication 2 (second)	Replication 3 (second)	Results (second)
F1	18.46	19.37	19.68	19.17±0.63
F2	23.08	23.22	23.43	23.43±0.17
F3	29.85	29.98	30.37	30.06±0.27

Results from the hardness test can be seen in Table 5. Based on the data in Table 5, it can be seen that the hardess of F1 is 10 kg, F2 is 60 kg, and F3 is 93.3 kg. The hardness requirement of lip balm is 400 – 1200 grams. The normality test results have a significance value of 0.204 ($p>0.05$), which means that the data is normal. The significance value of one way ANOVA test is 0.001 ($p<0.05$), which means there is a significant difference in the hardness of the three lip balm formulas.

Table 5. Hardness test result

Formula	Replication 1 (g)	Replication 2 (g)	Replication 3 (g)	Results (g)
F1	10	10	10	10±0
F2	60	60	60	60±0
F3	100	100	80	93,3±11,5

4. Discussion

Yellow pumpkin (*Cucurbita moschata* Duchesne) is one of the ingredients foods rich in calories, carbohydrates, protein, fat, minerals, beta-carotene, thiamine, niacin, fiber, and vitamin C. Beta-carotene content in pumpkin acts as a source of antioxidants that have the ability to fight signs of premature aging and increases the production of glycosaminoglycans as well procollagen. These two compounds have an important role in improving the condition skin by maintaining moisture and stimulating tissue formation, which overall helps the process of rejuvenating skin cells (Coleman, 2009).

The potential of pumpkin extract as an antioxidant and skin moisturizer can be used in the form of lip balm preparations. Utami et al. (2021) research concluded that 8% of pumpkin fruit ethanol extract shows the best stability in lip balm formulations. However, research of the cera alba concentration as a base in the formulation of ethanol extract lip balm Yellow pumpkin has not been studied. Choosing the right lip balm base can determine the quality of lip balm hardness so that they can be accepted and used properly, because the basis is the main constituent of lip balm preparations (Suena et al., 2022). Cera alba concentrations that used in this research were 10% (F1), 15% (F2), and 20% (F3). The physical properties of the lip balm under investigation included homogeneity, pH, adhesion, and hardness.

The homogeneity test was carried out by applying 0.1 g of the lip balm preparation on a transparent glass plate to ensure that all components were evenly distributed. The test results show that F1, F2, and F3 are physically homogeneous without any coarse grains. It can be interpreted cera alba variation concentration didn’t affect the lip balm homogeinity. This is due to cera alba to have properties as a good binder of oil and wax so it can produces a homogeneous dosage mass (Anjari, 2015).

pH test is carried out to determine the level of acidity of the preparation which affects its safety at the moment used by consumers. pH criteria of lip balm is 4.5 – 6.5 which is the pH of the lip. The result of the pH test at Table 3 showed that all formulas meet the requirements. Based on the One Way Anova statistical test it can be concluded that cera alba variation concentration didn't affect the pH of lip balm. Cera alba consists of fat compounds that do not have groups of acid or base function. This fat compound does not have any properties changing the pH of the preparation.

An adhesion test is carried out to determine the ability of lip balm sticks to the lip's epidermis layer. The longer the lip balm lasts on the lips, the better the lip balm's adhesion because the user doesn't need to apply lip balm repeatedly on the lips. The requirement of the adhesion test is not less than 4 seconds. Based on Table 4 all the formulas meet the requirements. Increasing the concentration of cera alba causes increased adhesive power of lip balm. Based on the One Way Anova statistical test it can be concluded that cera alba variation concentration affects the adhesion of lip balm. This is because cera alba has properties that can increase the viscosity and binding capacity of preparations lip balm. The higher the concentration of cera alba, the higher the viscosity preparation, which causes the preparation to be thicker and easier to adhere to the skin (Anjari, 2015).

The lip balm hardness test was carried out to determine the lip balm's resistance to breaking. The hardness test requirement for lip balm preparation is 40-120 grams (Mardianti, 2011). Based on Table 5, F2 and F3 meet the requirement of hardness. F1 didn't meet the hardness requirement because a lack of cera alba concentration to provide adequate hardness. On the other hand, increasing the concentration of cera alba in F2 and F3 produces lip balm that is denser and resistant to pressure. According to Sheskey et al. (2017) one of the functions of cera alba in topical preparations is as a stiffening agent or hardening agent, so that cera alba affects hardness preparation. Based on the One Way Anova statistical test it can be concluded that cera alba variation concentration affects the hardness of lip balm.

5. Conclusion

Based on the research results, it can be concluded that the variation concentration of cera alba affects the physical properties of adhesion and hardness of lip balm, but does not affect the physical properties of homogeneity and pH of lip balm. The cera alba concentration that meets the requirements for the physical properties of lip balm is 15% and 20%.

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