Formulation and Physical Evaluation of Green Tea Leaf Extract (*Camellia Sinensis* L.) As a Gel Peel Off Mask

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Abstract

Green tea contains flavonoids which are the result of metabolism of both plants which are widely distributed in plants. Catechins as the active substance in green tea leaves function as an antibacterial for Staphylococcus aureus which can inhibit the growth of acne. Gel peel off mask is a skin care preparation in the form of a gel and will dry after being applied to the skin. Peel off gel masks can be useful for repairing and treating facial skin from problems with wrinkles, aging, acne and can also be used to shrink pores. The purpose of this study was to determine the best formulation and concentration of green tea leaf extract peel-off gel masks. The research method used is an experimental method, by making a tea leaf extract formulation as a peel off gel mask. The results showed that the green tea leaf extract gel peel-off mask preparation was brown in color, had a distinctive smell, homogeneous and stable, did not irritate the volunteers' skin, and fulfilled the evaluation tests of other preparations. The preference test based on the preference parameter for texture is significant at 0.078 (sig=0.000<0.078), for color is significant at 0.05 (sig=0.000<0.05) and aroma is significant at 0.05 (sig=0.002<0.05). Green tea leaf extract with a concentration of 0.08%, 0.16% and 0.32% can be used as a gel peel off mask formulation. Future researchers are expected to be able to compare the effectiveness of peel off gel mask preparations with a variety of other types of tea and with different concentrations.

Keyword: Green Tea, Mask, Peel Off

INTRODUCTION

The skin is one of the outer organs that limits the environment in the body with the outside environment. The function of the skin is to protect tissues against chemical and physical damage, especially mechanical damage and against the entry of microorganisms. Skin can naturally experience premature aging and this can be caused by sources of free radicals originating from the environment such as air pollution, sunlight, mechanical friction, hot or cold temperatures and excessive oxidation reactions which can cause oxidative reactions such as cell damage or death (Nawangsari, 2018).

One problem that is often found on the skin is acne. Acne vulgaris (acne) is a chronic inflammatory process of the polysebaceous glands which is characterized by the presence of comedones, papules, pustules and nodules. Apart from hormonal factors, hygiene to food factors that trigger the growth of acne on the face, other factors that cause acne are the presence

and activity of the Staphylococcus aureus bacteria, where these bacteria cause pustules and nodules to appear (Aqmarina et al., 2016). For all circles, both men and women need cosmetics to increase self-confidence (Amanah et al., 2021). Acne is divided into four levels, namely mild, moderate and severe. This level is determined based on the number of pimples on the face, chest and back as well as the size of the zits or acne inflammatory conditions (Ginting, 2018).

Many people use chemicals to stop pimples from occurring, but not all facial skin is resistant to chemicals and some use natural ingredients to cure acne. Making cosmetics from natural ingredients is better than synthetic ingredients. Synthetic materials can cause side effects and can even damage the natural shape of the skin. One plant that has potential as a natural treatment for acne is green tea leaves (*Camellia sinensis* L.). Green tea (*Camellia sinensis* L.) are young shoots and leaves of the tea plant which are processed without going through a special fermentation process. The parts of tea leaves that contain antibacterial properties are phenolic or polyphenolic substances (catechins, tannins, flavonoids) and non-phenolic substances (alkaloids and fluorine) which can inhibit and kill bacteria.

Green tea contains flavonoids which are the result of plant secondary metabolism which are widely distributed in plants. Catechins as active substances in green tea leaves function as antibacterial *Staphylococcus aureus* which can inhibit the growth of acne. The antibacterial activity of green tea leaves is at a concentration of 7% (Andaryekti et al., 2015). New information was revealed regarding the antibacterial activity of 96% ethanol extract of green tea pulp (Trisina et al., 2022). These antioxidant activities need to be applied to pharmaceutical dosage forms to improve aesthetics and ease of use, one of which is in the dosage form of peel-off gel masks (Sholikhah, 2020).

One of the preparations for maintaining cleanliness and facial skin care is a face mask. A mask is a treatment aimed at tightening skin tone and caring for the skin with the ingredients contained in cosmetics, for facial skin care which has the benefit of providing moisture, stimulating dead skin cells, removing dirt and horn cells that are adheres to the skin, normalizes the skin from acne disorders, dark spots and removes excess fat on the skin, reduces wrinkles and hyperpigmentation and improves blood circulation. The type of mask that is practical to use is a gel mask which after drying can be immediately peeled off or commonly known as a gel *peel off* mask (Husna, 2019).

peel off mask is a skin care preparation in the form of a gel and will dry after being applied to the skin for a certain time, this preparation will form a transparent elastic film layer so that it can be peeled off. Peel off gel masks have many advantages over other types of masks,

namely being able to relax, remove dead skin cells and with regular use can reduce wrinkles, besides that the active substances contained in *peel off* gel masks can also be in contact longer with facial skin (Sarmila et al., 2021). The use of peel off facial masks is beneficial for repairing and treating facial skin from problems with wrinkles, aging, acne and can also be used to shrink pores (Ginting, 2018). Peel off gel mask formulations require humectants as a base that maintains moisture and prevents water loss (Rejeki et al., 2021). Based on the description above, the author is interested in conducting research on "Formulation and Physical Evaluation of Green Tea Leaf Extract (*Camellia sinensis* L.) as a Peel Off Gel Mask.

METHODS

The research method used is an experimental method, by making green tea leaf extract formulations (*Camellia sinensis* L.) sebagai masker gel *peel off*. Research on the formulation of green tea leaf extract (*Camellia sinensis* L.) as a peel off gel mask carried out in the Pharmacognosy Laboratory and the Pharmaceutical Laboratory Poltekkes Kemenkes Medan Pharmacy Department from April - May 2022. The sampling technique in this study was purposive sampling. The sample tested in this study was green tea leaves (*Camellia sinensis* L.) Juma brand from Sidamanik, Medan, North Sumatra Province. Data analysis in this study by testing ANOVA.

1. Tools and Materials

The tools used in this study were: stirring rod, beaker glass, blender, bottle, porcelain cup, funnel, watch glass, measuring cup, filter cloth, rubber and plastic stick, lumping, pH meter, pipette, knife, rotary evaporator, napkin , spatula, stamper, spatula, cutting board, analytical balance.

The materials used in this study were: distilled water, green tea leaf extract (*Camellia sinensis* L.) Juma brand, etanol 70%, hidroksi propil metil selulosa (HPMC), metil paraben, polivinil alkohol (PVA), propil paraben, propilenglikol.

2. Preparation Procedure

a. Preparation of 70% Ethanol Extract of Green Tea Leaves

Simplisia of tea leaves (*Camellia sinensis* L.) extracted by maceration method using solvent ethanol 70%. is as follows: Put 10 parts of simplicia or a mixture of simplicia with a suitable fine degree into a vessel, pour it with 75 parts of the extract, cover it, leave it for 5 days protected from light while stirring frequently, then sprinkle it and squeeze it. Wash the dregs with sufficient solvent in a closed vessel, until 100 parts are obtained. Leave in a cool place, protected from light for 2 days. Elap pour or strain. The maserate was then

evaporated using a rotary evaporator at a temperature of 40 – 50℃ until a thick extract was obtained (Saragi, 2019).

b. Formula Sediaan Masker Gel *Peel Off*

Peel off gel masks were made by expanding PVA in container A with a quantity of boiling aquadestilata, HMPC was developed in container B with remaining room temperature aquadstillata, in container C methyl and propyl paraben were mixed into container A and stirred until homogeneous. Do a physical evaluation of the preparation then pack it in a tube.

Table 1. Peel off gel mask formulation

Material	Concentration (%)			
	F0	**F1**	**F2**	**F3**
Green tea leaf extract	0	0,08	0,16	0,32
Polivinil alcohol (PVA)	8	8	8	8
Hidroksi Propil Metil Selulosa (HPMC)	3	3	3	3
Propilenglikol	12	12	12	12
Propil paraben	0,1	0,1	0,1	0,1
Metil paraben	0,2	0,2	0,2	0,2
Ethanol 70%	15	15	15	15
Aquades up to	100	100	100	100

(Nurwaini & Sari, 2019).

c. Peel Off Gel Mask Making Procedure

Dissolve HPMC with water that has been heated at 70 – 80℃, then homogenized (mixture 1). Expand the PVA in boiling water until it swells completely and then stir (mixture 2). Combine the methyl paraben and propyl paraben diluted with propyleneglycol (mixture 3). HPMC, PVA and propylene glycol which contain methyl paraben and propyl paraben are homogenized so that they form a peel-off gel mask. The peel off gel mask is homogenized with green tea extract which has been dissolved in 70% ethanol with the addition of water up to 100 parts, then a green tea leaf extract peel off gel mask is obtained (*Camellia sinensis* L.)

3. Evaluation of the physical quality of preparations

a. Organoleptic Test

The organoleptic test was carried out by observing changes in the shape, smell and color of the preparations which were carried out visually after making the base. The preparation is usually clear with a semi-solid consistency (Ningrum, 2018).

b. Homogeneity Test

The homogeneity test is seen based on the absence of lumps or coarse grains. The homogeneity test is carried out by applying 0.1 gram of the preparation on the object glass,

then covering it with another glass object, then observing whether there are parts that are not mixed properly (Merwanta et al., 2019).

c. pH test

A total of 1 gram of the preparation was dissolved in 10 ml of CO2-free water up to 10 ml. The pH meter electrode is immersed in the solution being tested, the pH meter needle is allowed to move until it shows a fixed position. The pH indicated by the pH meter needle is recorded (Wijayanti et al., 2015).

d. Irritation Test

An irritation test was carried out on the green tea leaf extract peel off gel mask preparation with the aim of knowing whether the peel off gel mask made could cause irritation to the skin or not. Irritation is divided into two categories, namely primary irritation which will occur shortly after sticking or touching the skin and secondary irritation which occurs a few hours after touching or sticking to the skin.

The technique used in this irritation test was an open patch test on the inner forearm or behind the earlobe against 15 volunteers. An open patch test was carried out by applying the prepared preparation to the attachment site with a certain area (2.5 x 2.5 cm), leaving it open and observing what happened. This test is carried out for ± 15 minutes and see if there is an irritation reaction that arises (Amanah, 2021). A positive irritation reaction is indicated by the presence of redness, itching or swelling on the skin of the forearm or behind the earlobe that is being treated (Nababan & Veronika, 2019).

e. Dry Time Test

Drying time was measured at room temperature by applying 0.5 gram of the mask preparation to the marked area behind the ear and then measuring the time needed for the preparation to dry using a stopwatch. Measurements were made three times with different volunteers (Ginting, 2018).

f. Likeability test

The hedonic test was carried out to determine the level of preference of the panelists for the prepared peel off gel mask. The preference test was carried out visually on 15 panelists. Over 18 years old, do not have sensitive skin or allergies, each panelist was asked to apply a peel off gel mask with various concentrations that had been made on the wrist area. After trying the peel off gel mask, it took about 15 minutes and after trying it, it was expected that the panelists would clean their hands using a wet tissue (Nara, 2019).

RESULTS

Results of Making Peel Off Gel Mask Preparations

The green tea leaves used to make the gel peel off mask preparations are at concentrations of 0%, 0.08%, 0.16% and 0.32% respectively. The gel peel off mask preparation obtained was in the form of a clear viscous liquid for the F0 formula, while the F1, F2 and F3 formulas were clear brown in color.

Results of the Evaluation of Preparations

a. Organoleptic Test Results

The results of organoleptic observations that were observed visually with the five senses on the shape, smell and color of the green tea leaf extract peel-off gel mask preparation can be seen in table 2.

Table 2. Organoleptic Test Results for Gel Peel Off Mask Preparations

Formula	Form	Smell	Warna
F0	Gel	Typical smell	Transparent
F1	Gel	Typical smell	Light brown
F2	Gel	Typical smell	Brown
F3	Gel	Typical smell	Dark brown

Information:
F0 : Peel off gel mask without Juma green tea extract
F1 : Peel off gel mask with Juma green tea extract 0.08%
F2 : Peel off gel mask with Juma green tea extract 0.16%
F3 : Peel off gel mask with Juma green tea extract 0.32%

b. Homogeneity Test Results

The results of the homogeneity examination of the formulated peel off gel mask preparations showed that all preparations did not show any coarse grains when the preparations were smeared on transparent glass. This shows that the preparations made have a homogeneous composition. The results of homogeneity can be seen in figure 1.

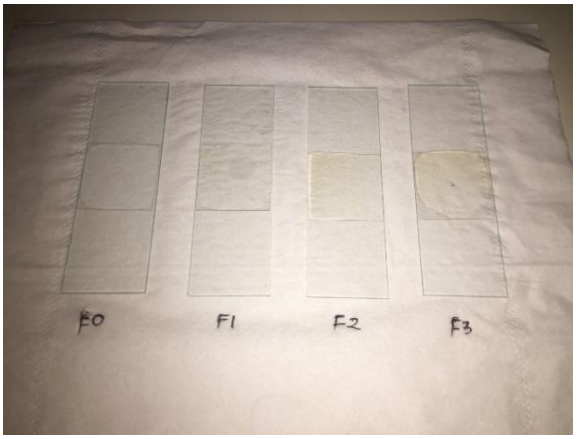

Figure 1. Preparations Homogeneity Test Results

c. Results of Measurement of Preparation pH

The pH test of the preparation was carried out using a pH meter. The results of the pH test for the peel off gel mask preparation can be seen in table 3.

Table 3. Preparations pH Test Results

Formula	pH value
F0	5,92
F1	5,94
F2	5,90
F3	5,88

Information:
F0 : Peel off gel mask without Juma green tea extract
F1 : Peel off gel mask with Juma green tea extract 0.08%
F2 : Peel off gel mask with Juma green tea extract 0.16%
F3 : Peel off gel mask with Juma green tea extract 0.32%

Judging from the pH results, it was stated that the peel off gel mask preparations were still within the normal pH range of the skin, namely 4.5 – 6.5. If the pH is too acidic it can cause irritation and if the pH value is too alkaline then the skin will be dry (Ningrum, 2018).

d. Drying Time Test Results of Preparations

Testing the drying time of the preparation was carried out by observing the time required for the preparation to dry, namely the time from when the peel-off gel mask was applied to the skin until a dry layer was formed. Measurements were repeated 3 times with different volunteers. Based on the results of measuring the drying time of the mask, the results were obtained in the range of 26-28 minutes. From the data obtained, the peel off gel mask still meets a good drying time, which is between 15 – 30 minutes. The results of the drying preparation time test are shown in Table 4.

Table 4. Drying Time Test Results

	Time of Preparations Drying (Minute)			
	F0	F1	F2	F3
Formula	26	26	26,5	26,8
	26	27,5	26,7	27
	27,2	28,2	27	28
Average	**26,4**	**27,2**	**26,7**	**27,3**

Information:
F0 : Peel off gel mask without Juma green tea extract
F1 : Peel off gel mask with Juma green tea extract 0.08%
F2 : Peel off gel mask with Juma green tea extract 0.16%
F3 : Peel off gel mask with Juma green tea extract 0.32%

e. Results of the Irritation Test on Volunteers

Based on the results of the irritation test conducted on 15 volunteers by attaching a peel-off gel mask preparation to the skin behind the ear, it showed that all volunteers gave negative results for the parameters of the irritation reaction. Parameters observed were the presence of red skin, itching or swelling. From the results of the irritation test, it can be concluded that the

prepared peel off gel mask is safe to use. The results of the skin irritation test for volunteers can be seen in Table 5.

Table 5. Skin Irritation Test Results for Volunteers

Statement	Volunteers														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
redness	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Itchy rash	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Swollen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Information:
(-) : No reaction
(+) : There was a reaction

f. Preference Test Results (*Hedonik Test*)

The preference test was carried out by giving explanations to all volunteers and then giving questionnaires containing instructions and scores for the assessment of color, aroma and texture in the preparation of green tea leaf extract peel-off gel masks.

Table 6. Data on the value of the preference test for peel off gel mask preparations

Formula	Type Testing	Likeability Level			Total	Mark Satisfaction End
		Really like	Like	Don't Like		
F0	Color	3	11	1	32	Like
	Aroma	4	7	4	30	
	Texture	10	2	3	37	
	T : n				**6,6**	
F1	Color	12	3	0	42	Really like
	Aroma	6	5	4	32	
	Texture	12	2	1	41	
	T : n				**7,6**	
F2	Color	14	1	0	44	Really like
	Aroma	7	6	2	35	
	Texture	7	8	0	37	
	T : n				**7,7**	
F3	Color	14	1	0	44	Really like
	Aroma	8	5	2	36	
	Texture	11	2	2	39	
	T : n				**7,9**	

Information:
Really Like : Really Like is a three (3)
Like : Like is worth two (2)
Don't Like : Dislike is worth one (1)
T : Total
n : Lots of Panelists (15)

Based on the preference test table, it can be said that the panelists liked the preparation on average. However, manual calculations have been carried out by adding up the results obtained and then dividing by the number of panelists and getting the average results that are most

preferred, namely formula F3 with the highest score of 7.9, F2 is rated 7.7, F1 is rated 7.6 and F0 is rated 6,6. With a predefined scale range 0 – 3 (dislike), 4 – 6 (like), 7 – 10 (like very much).

Color

The results of the research on color tested on 15 panelists regarding peel off gel mask products given green tea extract are shown in the following figure.

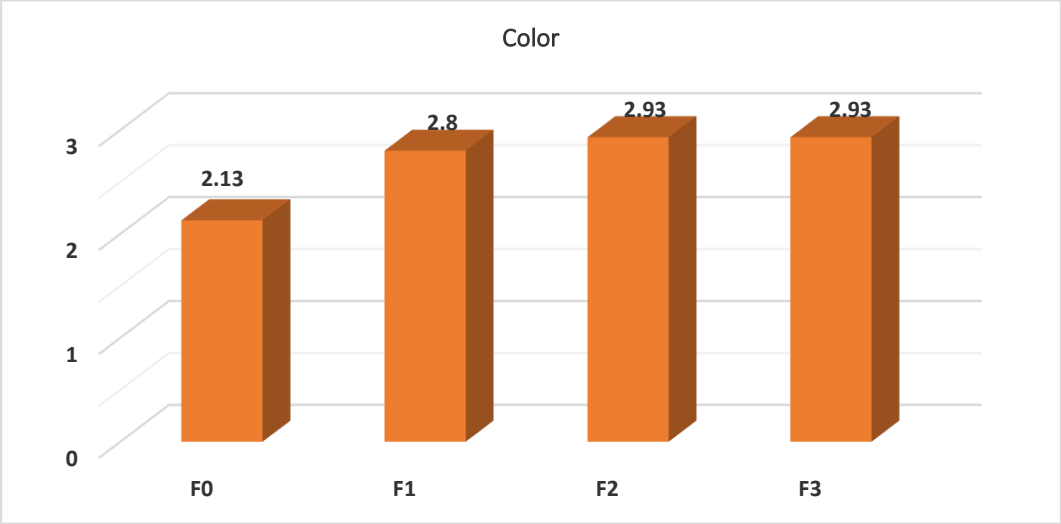

Figure 2. Color Parameter Preference Test Results

Based on the results of the ANOVA test, it shows that the F-count value is 5.276, which means that H0 is rejected and Ha is accepted. As for the probability or significant value at 0.05 (sig = 0.000 <0.05). It can be concluded that there is a difference in the color of the preparations. The color of the preparation has an influence on the results of the preference test for the mask preparation made. The color aspect preference test results for the highest peel-off gel masks were on F2 and F3 with the addition of 0.16 gr and 0.32 gr of tea leaf extract, resulting in a brown color.

Aroma

A preference test for the aroma of peel off gel masks was carried out by asking the panelists to smell the aroma of each mask formulation. The results are shown in the image below.

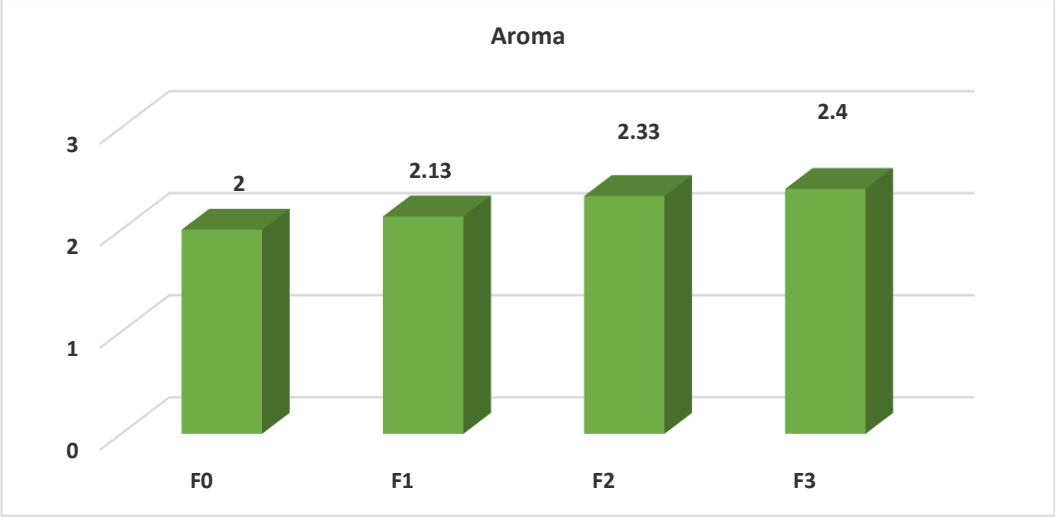

Figure 3. Aroma Parameter Preference Test Results

Based on the results obtained in the ANOVA test, it shows that the F-count is 23.250, which means that H0 is rejected and Ha is accepted. As for the probability or significant value at 0.05 (sig = 0.000 <0.05). It can be concluded that there are differences in the results on the aroma aspect of each formulation. Based on the results of the F3 aroma aspect test, the highest value was 2.4, with a tea leaf extract formulation of 0.32 gr. The smell of the mask produced has a distinctive smell. The smell does not come from brand juma tea leaves, but comes from PVA dissolved in distilled water at 100°C.

Texture

The preference test is based on the preference parameter for the texture of the peel off gel mask preparation by analyzing opinions on the texture of the preparation with various concentrations.

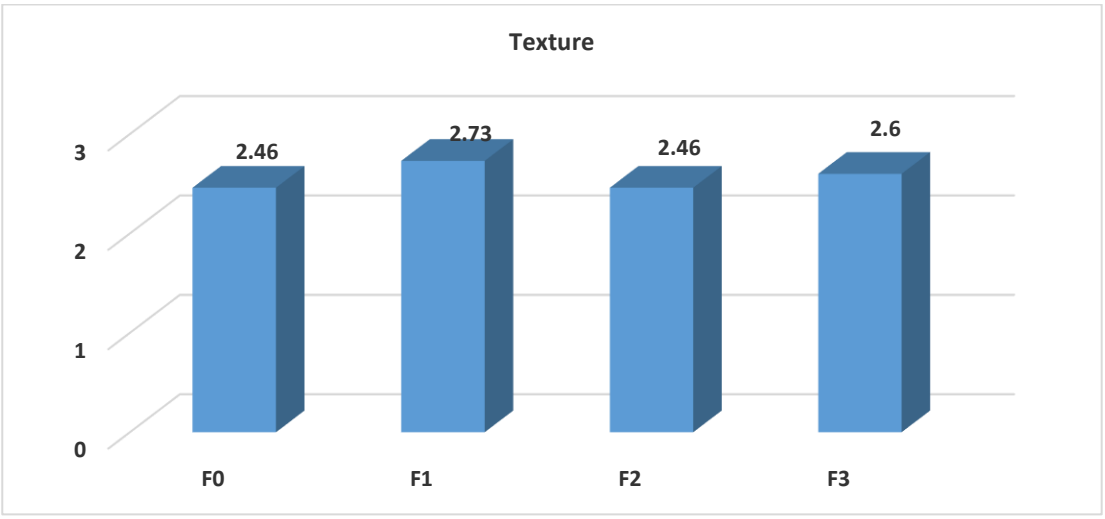

Figure 4. Texture Parameter Preference Test Results

Based on the results of the ANOVA test, it shows that the F-count value is 10.526, which means that H0 is rejected and Ha is accepted. Meanwhile, the probability or significant value is 0.078 (sig=0.000<0.078). It can be concluded that there are differences in texture in each formulation because when making preparations, HPMC which is dissolved with distilled water at a temperature of 70 – 80oC is less homogeneous so that the preparations have air bubbles. Based on the results of the texture aspect test, F1 has the highest score, namely 2.73 and the lowest average score is F0 and F2, namely 2.46.

DISCUSSION

Based on the results of the ANOVA test, it shows that the F-count value is 5.276, which means that H0 is rejected and Ha is accepted. As for the probability or significant value at 0.05 (sig = 0.000 <0.05). It can be concluded that there is a difference in the color of the preparations. The color of the preparation has an influence on the results of the preference test for the mask preparation made. The color aspect preference test results for the highest peel-off gel masks were on F2 and F3 with the addition of 0.16 gr and 0.32 gr of tea leaf extract, resulting in a brown color.

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which stated that the manufacture and physical evaluation of the peel-off gel mask preparation of the ethanol extract of tea leaves (*Camelia sinensis* L.) obtained a thick brown peel-off gel mask preparation with the distinctive aroma of tea leaves and from the results of the evaluation of the preparation the pH value of the gel mask preparation was obtained. peel-

off test was 5, the dry time test result was 20 minutes, the spreadability test results of the preparations still met the spreadability range, the adhesion test results were 08.73 seconds, and the irritation test results showed no irritation in the use of peel-off gel mask preparations.

The mechanism of action of a face mask is to cause the temperature of the facial skin to increase, so that blood circulation becomes smoother and the delivery of nutrients to the surface layer of the skin is accelerated, so that the facial skin looks fresher (Saputri et al., 2023).

Evaluation of peel-off gel mask preparations, including: Organoleptic testing was carried out by observing the changes in shape, odor and color of the preparations which were carried out visually after making the base. The preparation is usually clear with a semi-solid consistency. The most important tea content is catechin polyphenols which are flavonoid compounds. In addition, tea also contains caffeine, vitamin K, flavonols, alkaloids, saponins, proteins, nucleic acids, minerals, and fluoride. Tea contains alkaloids and minerals which are good for health (Tranggono, 2007). Octarian research (2021) obtained that peel-off facial mask gel preparations of jasmine leaf extract (Jasminum sambac L.) were able to inhibit the growth of Propionibacterium acnes bacteria.

Peel-off masks have the advantage of being easy to use, and easy to rinse, lift or remove like an elastic membrane (Rieger, 2000) in (Dwi et al., 2022). In addition, the gel mask reduces inflammation that occurs because the water content in the gel is high enough to hydrate the stratum corneum so that it gives a cold impression. (Fajar et al., 2018). according to Yuhara et al., (2022), peel-off facial masks have the ability to rejuvenate the skin and prevent premature aging. With advances in technology and cosmetic science, aging can be inhibited so that the skin looks younger by utilizing nanoparticle technology that can be used to make cosmetics. (Jancikova et al., 2016). Nanoparticles have advantages including the ability to penetrate into the skin more effectively, controlled and sustainable release of cosmetic compounds, high stability, specific targeting and efficiency, so that side effects are less likely to occur (Martien et al., 2012).

CONCLUSIONS

Based on the results of the research that has been done, it can be concluded that:

1. Green tea leaf extract can be formulated into gel peel off mask preparations with concentrations of 0.08%, 0.16% and 0.32% to produce preparations that are homogeneous and do not irritate when used.
2. Green tea leaf extract peel-off gel masks with concentrations of 0.08%, 0.16%, 0.32% meet the quality test requirements (evaluation).

Future researchers are expected to be able to compare the effectiveness of peel off gel mask preparations with a variety of other types of tea and with different concentrations.

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