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Formulation and Evaluation of Peel-off Gel Masks from Red Rice Bran Extract with Various Kind of Bases

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Abstract : Rice bran is a side product of rice milling which contains antioxideant compounds such as tocopherols, tocotrienos, and gamma oryzanol. Red rice bran has higher antioxidant activity (IC_{50} 43.2249 ppm) compared with white rice bran. This study aims to formulate and evaluate peel-off gel mask containing red rice bran extract. Dosage formulations of gel peel-off mask made in various types of bases that F1 (using base of polyvinyl alcohol, F2 (base of HPMC) and F3 (base of gelatin). Further preparation gel peel-off gel mask evaluated physical properties (organoleptic, homogeneity, pH, power of spread, test the strength of the film layer and irritation test) and antioxidant activity during the 8 weeks of storage. The results showed that the F1 shows the physical properties of the most well during 8 weeks of storage. While F3 showed the highest antioxidant activity than the other formulas with percent inhibition 88.81%.

Keywords : Red Rice Bran Extract, Peel-off Gel Mask, Antioxidant.

Introduction

Premature aging is the process of skin aging faster than it should. This is commonly caused by various factors both internal and external. The aging process in the skin characterized by the appearance of wrinkles, scales, dry, chapped, look dull and wrinkled . The skin becomes older faster and appear black spots more are caused by free radicals[1,2].

The use of cosmetic skin care is an effort to protect the skin from free radical effect. Numerous studies have reported on the preparation of formulations for anti aging such as the preparation sheet masks[3], face masks, creams[4,5], and other . A peel-off mask is applied as a liquid film that is thinly spread with fingers on the face or body part. It is allowed to dry for several minutes, then pulled away from face with fingers. It peels-off as a thin plasticized film. It is usually preferred that such masks require a relatively short period of time to dry down to be pulled-off. Such peel-off masks usually provide deep pore cleansing and skin debris removal[6]. Peel-off gel mask containing antioxidants are one form of cosmetic practical to treat the skin to prevent premature aging. Antioxidants are compounds that can counteract or reduce the negative impact oxidants in the body[7].

Some antioxidants can be produced from natural materials, such as fruits[8], seeds[9], herbs[10], vegetables[11], and spices[12]. One of the natural antioxidants that have high antioxidant activity found in the red rice bran. Rice bran is a side-product of rice milling. Colored rice is one of such variety. In these varieties, high amounts of anthocyanin pigment are deposited in the rice coat to form its red colors. Rice bran of red rice contains phenolic,

flavonoid and anthocyanins compounds. Phenolic compounds have a spectrum or species are numerous, ranging from the simple to the complex that binds to glucose group as glikon. One group of phenolic compounds that have antioxidant benefits are a group of flavonoid compounds. The group is divided into several groups among flavone, flavone-3-ol, flavonone, flavaran-3-ol and antocyanidin[13,14].

Antioxidant activities of 40% acetone extracts of pigmented rice bran, measured in the range of 0 to 1500 µg/mL. At 500 µg/mL concentration, red rice bran, which had the highest total phenolic (259.5 µg/mg) and total flavonoid (187.4 µg/mg) contents, showed the highest antioxidant activity: 83.6%, 71.5%, 1.2%, and 16.4% for DPPH radical assay[15.]

In addition to the red rice bran also contains gamma oryzanol compound of 1-2%, which serves as a natural antioxidant. The largest source of gamma oryzanol rice bran, followed by brown rice, milled rice, and husk[16,17,18]. Based on the preliminary test of red rice bran etanol extract known it has a very strong antioxidant potential which percent inhibition is 96.997 % and IC_{50} value of 43.2349 ppm.

When a drug is used topically , then the medicine will come out of its carrier and diffuse into the surface of the skin tissue. It really depends on the type of the base used. A base that has a high viscosity will cause the diffusion coefficient of a drug in the base to be low, so the release of the drug from the base will be small[19]. Besides the content of the base also affects the activity of antioxidant preparations. Base hydrophilic with a hydrophilic active substance has a strong affinity when compared with the base lipophilic with hydrophilic active ingredient. Besides, it's kind of different bases will also affect the physical properties of the preparation. Based on the above, then do research on the formulation and evaluation of peel-off gel mask from red rice bran extract with various kind of bases.

Experimental

1. **Material**:

Red rice bran, Etanol 96%, HCl 37%, DPPH (2,2-diphenyl-1-picrylhydrazly) Polivinil Alkohol (PVA), *HydroxyPropylMethylCellulose* (HPMC), Gelatin, Gliserin, Nipagin, Aquadest.

2. Preparation of the red rice bran extract

Red rice bran has been sieved (500 g) in autoclaf at a temperature of 121°C for 3 minutes, followed by a drying oven at a temperature of 100°C for 1 hour. Then put in a dark glass bottle was added 96% ethanol which has been acidified with 37 % HCl to pH 1. The sample was macerated for 30 hours and then filtered. The filtrate obtained was concentrated using a rotary evaporator to obtain brown rice rice bran extract[20].

3. Antioxidant Activity Determination of Red Rice Bran Extract

Red rice bran extract dissolved in methanol were plated out in triplicate in a 96-well microtiter plate. The methanolic DPPH (50 µM) solution (Aldrich) was added to alternating columns of the test samples and methanol was used for control of test samples, in the remaining columns. The plate was shaken for 2 minutes and incubated for 20 minutes in darkness at 37˚C, in a water bath. The percentage of decolourisation was obtained spectrophotometrically at 520 nm. The percentage of decolourisation was plotted against the concentration of the sample, and the IC_{50} values were determined. The DPPH absorbance decreases with an increase in DPPH radical scavenging activity. Results were expressed as IC_{50} concentration where 50% inhibition of the DPPH radical is obtained. This activity is given as the percent of DPPH radical scavenged, which is calculated with the equation:

$$\text{DPPH radical scavenging activity (\%)} = [(Abs_{control} - Abs_{sample})/(Abs_{control})] \times 100$$

where $Abs_{control}$ is the absorbance of DPPH radical + methanol and Abs_{sample} is absorbance DPPH radical + sample

Extract/standard.

3. Formulation of peel-off gel mask from red rice bran extract as show in table 1.

Table 1. Formula of peel-off gel mask from red rice bran extract

Ingredient	Concentration (%)					
	FB_1	FB_2	FB_3	F_1	F_2	F_3
Polivinil alkohol	14	-	-	14	-	-
HPMC	-	2	-	-	2	-
Gelatin	-	-	30	-	-	30
Gliserin	5	5	5	5	5	5
Nipagin	0,2	0,2	0,2	0,2	0,2	0,2
Alkohol 96%	12,5	12,5	12,5	12,5	12,5	12,5
Aquadest ad	100	100	100	100	100	100
Red rice bran extract	-	-	-	0,5	0,5	0,5

4. Evaluation Parameters

a. Organoleptic : The consistency and the colour was checked visually. The odour was evaluated manually by smelling the product.
b. Homogeneity : This parameter was checked visually.
c. pH : 1% solution was prepared and checked for the pH using pH meter.
d. Observation of physical stability at room and cold temperatures by observing organoleptic during storage
e. Spreadability : A small amount of the mask was applied on paper charts coated transparent glass given the particular load (1 g , 2 g , 5 g) and then left to stand for 60 seconds . Then calculate the area given by the dosage is calculated .
f. Irritation test : This parameter checked with patch test. Irritated skin at the patch site may indicate an allergy.
g. Peeling time : A small amount of the mask was applied on the skin, left for fewminutes and the time was noted until it formed a mask.
h. Antioxidant activity : This parameter was checked with calculate percent inhibition (DPPH radical scavenging activity (%).

Results and Discussion

In this study, the sample used is the red rice bran, which has a high antioxidant activity. Before the sample extraction process, first performed the stabilization process. Stabilization is done to eliminate the unfavorable properties of rice bran that is easy to rancidity, as fatty acids in the bran increased during the storage process. Stabilization is done using autoclaf at a temperature of 121° for 3 minutes and proceed with drying oven (heater) at 100° for 1 hour. The purpose of this process is to deactivation of lipase. Intensive lipase activity in bran resulted in the bran rancid during storage.

Sample extraction is done by maceration using ethanol solvent acidified to pH 1 with the addition of HCl. The purpose of the addition of HCl that is because HCl able destruction o plant cells so that the antioxidant compounds found in cells can be extracted properly and bran stable in acidic than alkaline conditions, under acidic conditions showed high antioxidant activity[20].

Measurements of antioxidant activity were conducted at wavelength 520 nm. Which is the maximum DPPH wavelength at concentration of 80 ug / mL. Based on testing the antioxidant activity IC_{50} values obtained to red rice bran extract is 43.2349 ppm and percent inhibition is 96.997 %, at a concentration of 1000 ppm .

Based on the evaluation of bases and peel-off gel mask gel mask of organoleptic , homogeneity can be seen in the table 2. The results showed that all of formulas is stable and homogeneity during 8 week of storage. Measurement of pH at each formula indicates decrease in pH , this is because the red rice bran extract of the

preparation that is acidic . In addition to the decrease in pH can occur due to hydrolysis acidic compounds which can be triggered by a rise in temperature during storage . The evaluation results obtained pH range from 4.7 to 6.3 , where the normal skin pH range is 4.5 to 7. It can be that the pH of the formulas included in the pH range of normal skin.(Table 2 & 3)

Table 2. The result of evaluation bases of peel-off gel mask

No	Parameters	Observation		
		FB_1	**FB_2**	**FB_3**
1	Organoleptic	Consistency : Semisolid Colour : White Odor : Specific	Consistency : Semisolid Colour : Transparent Odor : Specific	Consistency : Semisolid Colour : Dark Yellow Odor : Specific
2	Homogeneity	Homogeneity	Homogeneity	Homogeneity
3	pH	5.6 (1^{st} week) 5.2 (8^{th} week)	6.2 (1^{st} week) 5.3 (8^{th} week)	5.0 (1^{st} week) 4.7 (8^{th} week)
4	Physical stability at room and cold temperatures	Stable	Stable	Stable
5	Spread ability at load 5 g	25.50 cm^2 (1^{st} week) 29.44 cm2 (8^{th} week)	12.56cm^2(1^{st} week) 12.87cm^2(8^{th} week)	3.79cm^2 (1st week) 6.83cm^2 (8^{th} week)
6	Irritation test	Not Irritate	Not Irritate	Not Irritate
7	Peeling Time	16 minutes, 27 second	19 minutes, 13 second	17 minutes, 44 second
8	Percent Inhibition	34.60% (1^{st} week) 33.67% (8^{th} week)	26.36% (1^{st} week) 25.25% (8^{th} week)	63.13% (1^{st} week) 61.85% (8^{th} week)

Table 3. The result of evaluation peel-off gel mask red rice bran

No	Parameters	Observation		
		F_1	**F_2**	**F_3**
1	Organoleptic	Consistency : Semisolid Colour : Brownies Red Odor : Specific	Consistency : Semisolid Colour : Dark Red Odor : Specific	Consistency : Semisolid Colour : Dark Brown Odor : Specific
2	Homogeneity	Homogeneity	Homogeneity	Homogeneity
3	pH	5.5 (1^{st} week) 5.1 (8^{th} week)	6.0 (1^{st} week) 5.1 (8^{th} week)	5.0 (1^{st} week) 4.7 (8^{th} week)
4	Physical stability at room and cold temperatures	Stable	Stable	Stable
5	Spread ability at load 5 g	24.38 cm^2 (1^{st} week) 27.32 cm^2 (8^{th} week)	9.61 cm^2 (1^{st} week) 11.33cm^2(8^{th} week)	2.98 cm^2 (1^{st} week) 4.80cm^2 (8^{th} week)
6	Irritation test	Not Irritate	Not Irritate	Not Irritate
7	Peeling Time	20 minutes, 37 second	25 minutes, 14 second	23 minutes, 26 second
8	Percent Inhibition	78.75% (1^{st} week) 77.74% (8^{th} week)	83.34% (1^{st} week) 83.24% (8^{th} week)	88.81% (1^{st} week) 87.28% (8^{th} week)

The observation of the physical stability at room and cold temperature during 8 week of storage indicates that all of formulas is not separation and preparation is stable. Spread ability is done by using weights, the goal is to see how much power and the ability of spreading on the surface of the skin. Based on observations obtained with a base spread power range from 2.404 to 25.504 cm^2 , F_1 with a range from 15.896 to 24.389 cm^2,

F_2 with a range of 6.154 to 9.616 cm^2 , and F_3 with a range of 2.333 to 2.984 cm^2 . Based on results F_1 have spread power more dilute than F_2 and F_3. (Table 3).

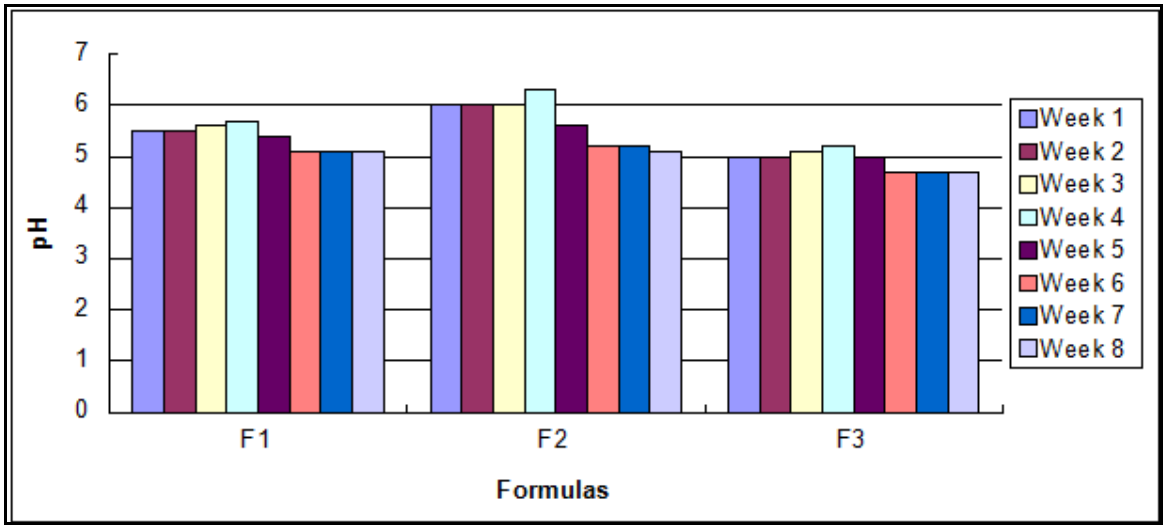


Figure 1. pH test for 8 weeks of storage of peel-off gel mask of red rice bran

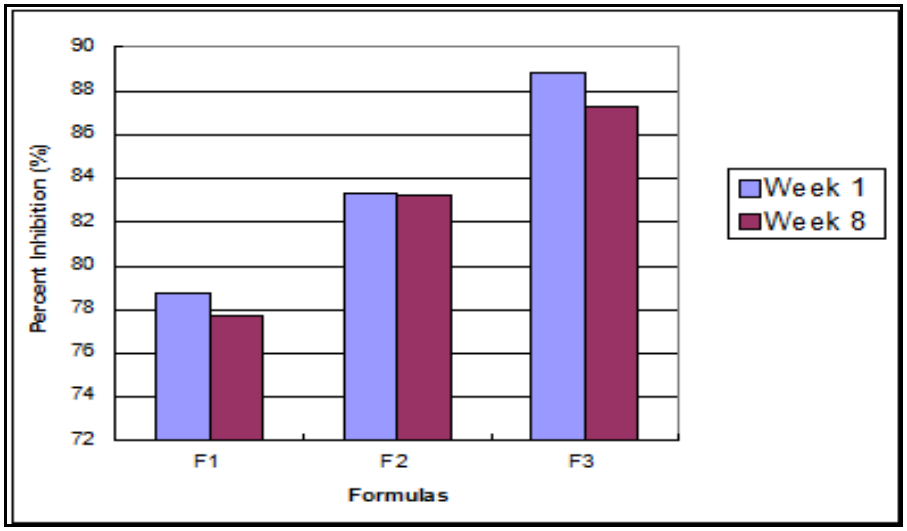
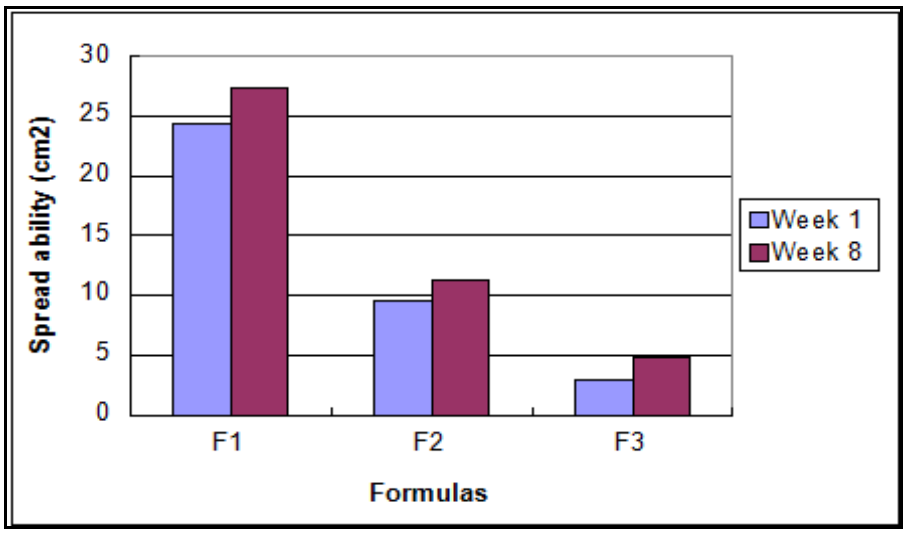


Figure 2. Antioxidant activity at 1st week and 8th week of peel-off gel mask of red rice bran



Figur 3. Spread ability for storage of peel-off gel mask of red rice bran

Figure 4. Picture of peel-off gel mask of red rice bran

Irritation test of peel-off gel mask is done by three panelists on each formula . The test is performed on inside the arm with a diameter of 2 cm during 24 hours (Patch test). From the analysis of all panelists showed no skin irritation occurs to panelists.

Test the speed of drying up is done by applying a gel mask perfomed peel- off on the back of his hand to smear 5 cm long and with an area of 2.5 cm . Then calculated the time necessary preparations to form a dry layer. Then layer formed exfoliated and observed. From the results obtained speed range observation dries base with a range of 16-17 minutes , while the dosage range at speeds dries gel peel- off mask ranges between 20-25 minutes . These test results show that the time to dry on the F_1, F_2, and F_3 is still in the categories of a mask product dries on the market is 15-30 minutes. The higher the viscosity of the preparation , the longer it dries required by preparations to dry out. While based on the results of exfoliation film , F_1 produces the most elastic film.

Based on determination of antioxidant activity that percent inhibition of the base showed no antioxidant activity in FB_1 and FB_2 as percent value of less than 50% inhibition to free radicals. While the value of percent inhibition FB_3 showed their antioxidant activity can counteract free radicals amounted to 63.1396%. This happens because FB_3 contain amino acids that act as antioxidants are compounds cystine[21] (Table 2).

Antioxidant activity of F_1 have percent inhibition 78.75% (the first week) and 77.74% of eighth week, F_2 in the first week amounted to 83,34% and 83.24% of eighth week, and F_3 on the first week amounted to 88.81% and the eight week amounted to 87.85%. The results show that F_3 is the higher antioxidant activity more than F_1 and F_2. This is because the base containing gelatin already have high antioxidant activity.

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