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Research Article

Peel-off Kefir Mask Arachi (*Arachis hypogaea* L.): Characterization and Antioxidant Activity

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Abstract

This study aims to determine the best formulation for the peel-off mask Arachi or peanut (*Arachis hypogaea* L). *Arachis hypogaea* kefir as an active ingredient is added with variations in the concentration of F1 (0.5%) and F2 (2%) (w/v). Organoleptic tests, homogeneity, dry time, and pH were carried out on the peel-off mask that had been made. Antioxidant test (DPPH methods) was performed on masks F1 and F2. The results showed that the peel-off mask of *A. hypogaea* kefir had the best antioxidant activity at a concentration of 2% (F2) kefir with an IC_{50} value of 1.865 ppm and was very active. The characteristics of the peel-off mask have good physical stability, proven by not experiencing a change in color, odor, being homogeneous, having good dispersion power, and having a dry time ranging from 10-23 minutes. The pH value of the peel-off mask preparation is 4.52, and it is appropriate with SNI and the pH balance of normal human skin. The peel-off mask of *A. hypogaea* kefir can be produced because it has good physical stability and antioxidant activity.

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INTRODUCTION

Kefir fermented milk is produced from grains, a specific and complex mixture of bacteria and yeast. Kefir produces a sour taste from lactic and acetic acids[1,2]. It also contains CO_2, ethyl alcohol, and aromatic compounds that make it is unique organoleptic[3]. Kefir can be made from nuts milk, and it does not contain cholesterol[4].

Arachi or peanut (*Arachis hypogaea* L.) is one of the raw materials that can be processed into kefir milk[5]. *Arachis hypogaea* juice is proven to have higher nutrition than red bean and soybean extract and is a source of vitamin E and magnesium[6]. *Arachis hypogaea* were evaluated for total phenolic and flavonoid contents, antioxidants, and vitamins essential for optimum health[7]. *Arachis hypogaea* contain Vitamin E, known as α-tocopherol. Vitamin E has been in use for more than 50 years in dermatology and is an essential ingredient in many cosmetic products[8]. They are associated with obstructing the formation of free radicals by preventing oxidation and are believed to prevent damage to collagen and elastin fibers, increase skin cell regeneration, treat acne, and reduce the risk of decreased skin firmness and wrinkles[9].

The cosmetic preparation chosen in this study is in the form of a peel-off mask. This form was chosen because the peel-off mask is a popular facial treatment, does not cause dependence, and is easy to apply[10]. The peel-off masks can minimize pores and is valuable for recovering and treating facial skin[11]. Peel-off masks are usually made from polyvinyl alcohol (PVA) or hydroxypropyl methylcellulose (HPMC), developed in a hot aquadest of 80°C. This material has adhesive properties to form a film membrane that can be peeled off when dry[12].

The research on peanut kefir has been carried out, in which *A. hypogaea* kefir with a concentration starter lactic acid bacteria of 2% (w/v) with the fermentation of 48 hours was the best composition reported[13]. However, antioxidant activity and the

development of kefir in cosmetic product has not been carried out. This research will continue making formulation peel-off kefir mask with 2% yeast (w/v) and fermentation for 48 hours to have good physical stability and antioxidant activity.

MATERIALS AND METHODS

Materials

Arachis hypogaea was obtained and determined in Badan Penelitian dan Pengembangan Daerah Kebun Raya Banua (050/492-LIT/KRB) and the yeast "Fermipan" used in the study were obtained from the Banjarbaru market, South Kalimantan. Meanwhile, D-glucose was purchased in Prida Lab (Central Jakarta) and De Man, Rogosa and Sharpe (MRS) agar Merck was purchased in Nitrakimia (Yogyakarta). The antioxidant activity test was performed with UV-Vis Spectrophotometry (Genesys 10 UV-Vis).

Methods

Material preparation

Arachis hypogaea were peeled and washed with clean water. *Arachis hypogaea* were grounded using a blender with a ratio of water : beans (8 L : 1 kg of beans). The resulting *A. hypogaea* slurry was filtered and given the *A. hypogaea* filtrate. A total of 300 mL of *A. hypogaea* milk in Erlenmeyer was added with 12 g of D-glucose (4% w/v) and pasteurized at 80°C for 15 minutes. Then, 300 mL of *A. hypogaea* milk was added with 6 g of yeast (2% w/v) and fermented for 48 hours.

Preparation of peel-off mask

Nipagin was dissolved into CO_2-free water with a ratio of 1 : 30 at 80°C while stirring continuously with a magnetic stirrer. The nipagin solution was removed from the water bath and mixed with glycerin while continuing to stir. The HPMC powder was dissolved in CO_2-free water with a ratio of 1 : 15 at a temperature of 80°C, then left to stand until the HPMC expanded utterly. The two mixtures were stirred until homogeneous and added with the *A. hypogaea* extract kefir, then added with CO2-free aquadest until it reached 100% of the total weight. The formulations used are presented in **Table I**.

Table I. Peel-off mask formulation with *A. hypogaea* kefir

Materials (%w/w)	Function	Composition (%)	
		F1	F2
Arachis hypogaea Kefir	Active agent	0.5	2
HPMC	Gelling Agent	4	4
Glycerin	Humectant	12	12
Nipagin	Preservatives	0.2	0.2
CO_2-free water	Solvent	ad 100	ad 100

Physical evaluation of peel-off mask

Physical evaluation includes organoleptic test, homogeneity, spreadability test, and pH with the procedure as reported by Priani *et al*[14].

Antioxidant activity of peel-off mask

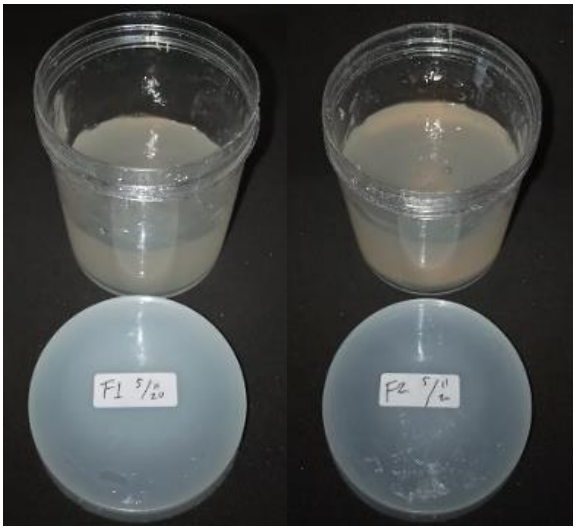
Antioxidant activity was tested using the DPPH method. *Arachis hypogaea* kefir was diluted and made at a concentration of 1000 ppm. Peel-off mask preparation with concentrations 0.5% and 2% each dissolved in 25 mL of ethanol. A series of solutions invariant peel–off mask concentrations were prepared (10, 15, 20, 25, and 30 ppm) until 10 mL volumetric flask. Furthermore, 1 mL of DPPH 0.4 mM was added to the solutions and incubated at room temperature and avoid light. The absorbance was measured at a maximum wavelength to calculate the inhibition percentage using the equation [**1**]. A_0 was the absorbance of the blank solution, and A_1 was the absorbance of the sample solution. The inhibition concentration of 50% (IC_{50}) was determined using the linear equation $y = bx + a$.

$$Inhibition\ percentage\ (\%) = \frac{A0-A1}{A0} \times 1 \qquad \ldots [1]$$

RESULTS AND DISCUSSION

Physical and chemical evaluation of A. hypogaea kefir and peel-off mask

Arachis hypogaea kefir was optimized with the addition of 2% yeast within 48 hours of fermentation and got pH of the kefir was 3.646. After the kefir was formed, the peel-off mask was formulated into two variance concentrations of *A. hypogaea* kefir as an active ingredient. Varian of kefir concentrations in the formula were 0.5% (F1), and 2% (F2) w/w. The various kefir concentrations were aimed to get the best formulation of mask and activity antioxidant. The physical evaluation of the peel-off mask was organoleptic, pH, drying time, and gel spread[15]. The peel-off masks in the two formulas were transparent yellow tended to be precise. For the two formulas, the distinctive aroma of *A. hypogaea* was produced. When applied to the skin layer, the gel was easily distributed and did not feel hot. Both F1 and F2 formulas had a good consistency. The physical appearance of the peel-off mask can be seen in **Figure 1.**



a **b**

Figure 1. Peel-off mask with (**a**) 0.5% and (**b**) 2% *A. hypogaea* kefir concentration

The organoleptic test was aimed to see the physical appearance by observing the color, smell, consistency, and homogeneity. The results of organoleptic observations can be seen in **Table II**. The homogeneity test was conducted to determine that the resulting peel-off mask preparation did not experience clumping when the active substance mixed with the base. Peel-off kefir mask, when applied to the skin layer, was homogeneous. There were no fibers and lumps or color differences.

Table II. Organoleptic observations of peel-off mask formulation with *A. hypogaea* kefir

No	Formula	Color	Odor	Consistency	Homogeneity
1.	F1	Clear	Characteristic *A. hypogaea* odor	Gel	Homogeneous
2.	F2	Clear	Characteristic *A. hypogaea* odor	Gel	Homogeneous

The spreadability test determines the ability to spread the gel on the skin layer. The peel-off mask is good if, when applied to the skin, the dispersibility of the gel has a standard diameter of 5-7 cm, and it can spread evenly that the effect can work optimally[16,17]. The peel-off mask spreadability test obtained for both formulas was 5.33 and 5.45 cm.

The dry time test in a peel-off mask preparation aims to determine the speed at which the mask forms a film when applied to the skin. The dry time of both peel-off mask formulas was 25 minutes. The drying time requirement for peel-off mask preparation is 15-30 minutes[18]. If the film forms faster, so active substances will be released so that consumers can immediately benefit from using these masks. The peel-off masks' pH was around 4.5-7.0, and it was appropriate with *Standar Nasional Indonesia* (SNI) and the pH balance of normal human skin[19]. The physical and chemical properties of the peel-off mask can be seen in **Table III**.

Table III. Physical and chemical properties of peel-off mask formulation with *A. hypogaea* kefir

Properties	F1	F2
Homogeneity	Homogenous	homogenous
Spreadability (cm)	5.33±0.061	5.45±0.133
Dry time (minutes)	25	25
pH	6.54±0.021	6.08±0.015

Antioxidant activity test of peel-off mask

The antioxidant activity test for the peel-off mask of *A. hypogaea* kefir was performed using the DPPH radical scavenging method at λ 519 nm. The proton radical scavenging activity with DPPH is quite reproducible and relatively simple[20]. The absorbance of the peel-off mask was linear with concentration according to the Lambert-Beer law (**Table IV**). The absorbance value was then used to calculate the % inhibition based on equation [**1**], and the results were presented in **Table V**. The IC_{50} value was then calculated based on a linear regression between concentration vs. %inhibition. The result shows that the peel-off mask F2 had better antioxidant activity than F1 with an IC_{50} value of 1.865 ppm and is included as a very strong antioxidant[21]. Meanwhile, F1 had an IC_{50} value of 6.950 ppm. This result shows that the concentration of *A. hypogaea* kefir added to the peel-off mask affects the antioxidant activity of the mask, with a higher concentration increasing its antioxidant activity. This result is in line with a study on *A. hypogaea* oil as an antiaging, in which 10% *A. hypogaea* oil has an antiaging effect. Another study reported that the antioxidant activity of 10% *A. hypogaea* shells was obtained IC_{50} of 380.18 µg/mL.

Table IV. Absorbance vs concentration of peel-off mask formulation with *A. hypogaea* kefir

Concentration (ppm)	Absorbance	
	F1	F2
10	0.650	0.721
15	0.737	0.716
20	0.938	0.742
25	1.002	0.835
30	1.031	0.912

Table V. %inhibition and IC_{50} of peel-off mask formulation with *A. hypogaea* kefir

Concentration (ppm)	% inhibition (%)	
	F1	F2
10	50.943	45.585
15	44.377	45.962
20	29.208	44
25	24.377	36.981
30	22.189	31.170
IC_{50} (ppm)	6.950	1.865

CONCLUSION

Based on the physical properties of the peel-off *A. hypogaea* kefir mask, including the organoleptic test, spreadability, dry time, and pH test, it shows that the F1 and F2 formulas had good physical properties of peel-off masks. The best antioxidant activity was obtained in F2 with the addition of 2% *A. hypogaea* kefir, indicating an IC_{50} value of 1.865 ppm.

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AUTHORS' CONTRIBUTION

All authors have an equal contribution in carrying out this study.

DATA AVAILABILITY

None.

CONFLICT OF INTEREST

The author declares there is no conflict of interest.

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