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

Amalia Khairunnisa  
Pratika Viogenta  
Nani Kartinah  
Fathur Rahman  
Mulia

Department of Pharmacy, *Universitas Lambung Mangkurat*, Banjarbaru, South Kalimantan, Indonesia  
*email: nanikartinah@ulm.ac.id*

**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 IC50 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.

**Received:** August 20th, 2021  
**Revised:** November 15th, 2021  
**Accepted:** February 15th, 2022  
**Published:** February 28th, 2022

**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. It also contains CO₂, ethyl alcohol, and aromatic compounds that make it is unique organoleptic. Kefir can be made from nuts milk, and it does not contain cholesterol.

*Arachi* or peanut (*Arachis hypogaea* L.) is one of the raw materials that can be processed into kefir milk. *Arachis hypogaea* juice is proven to have higher nutrition than red bean and soybean extract and is a source of vitamin E and magnesium. *Arachis hypogaea* were evaluated for total phenolic and flavonoid contents, antioxidants, and vitamins essential for optimum health. *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. 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.

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. The peel-off masks can minimize pores and is valuable for recovering and treating facial skin. 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.

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. 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 CO₂-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 CO₂-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>
<thead>
<tr>
<th>Table I. Peel-off mask formulation with <em>A. hypogaea</em> kefir</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials (%w/w)</td>
</tr>
<tr>
<td>Arachis hypogaea Kefir</td>
</tr>
<tr>
<td>HPMC</td>
</tr>
<tr>
<td>Glycerin</td>
</tr>
<tr>
<td>Nipagin</td>
</tr>
<tr>
<td>CO₂-free water</td>
</tr>
</tbody>
</table>

Physical evaluation of peel-off mask

Physical evaluation includes organoleptic test, homogeneity, spreadability test, and pH with the procedure as reported by Priani et al14.

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]. _A₀_ was the absorbance of the blank solution, and _A₁_ was the absorbance of the sample solution. The inhibition concentration of 50% (IC₅₀) was determined using the linear equation \( y = bx + a \).

\[
\text{Inhibition percentage (\%)} = \frac{A_0 - A_1}{A_0} \times 100 \quad \text{... [1]}
\]
RESULTS AND DISCUSSION

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

*Anchin 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. Variants 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. 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.

![Figure 1](image_url)

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>
<thead>
<tr>
<th>No</th>
<th>Formula</th>
<th>Color</th>
<th>Odor</th>
<th>Consistency</th>
<th>Homogeneity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F1</td>
<td>Clear</td>
<td>Characteristic <em>A. hypogaea</em> odor</td>
<td>Gel</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>2</td>
<td>F2</td>
<td>Clear</td>
<td>Characteristic <em>A. hypogaea</em> odor</td>
<td>Gel</td>
<td>Homogeneous</td>
</tr>
</tbody>
</table>

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. 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. 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. 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

<table>
<thead>
<tr>
<th>Properties</th>
<th>F1</th>
<th>F2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homogeneity</td>
<td>Homogenous</td>
<td>Homogenous</td>
</tr>
<tr>
<td>Spreadability (cm)</td>
<td>5.33±0.061</td>
<td>5.45±0.133</td>
</tr>
<tr>
<td>Dry time (minutes)</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>pH</td>
<td>6.54±0.021</td>
<td>6.08±0.015</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Concentration (ppm)</th>
<th>F1</th>
<th>F2</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.650</td>
<td>0.721</td>
</tr>
<tr>
<td>15</td>
<td>0.737</td>
<td>0.716</td>
</tr>
<tr>
<td>20</td>
<td>0.938</td>
<td>0.742</td>
</tr>
<tr>
<td>25</td>
<td>1.002</td>
<td>0.835</td>
</tr>
<tr>
<td>30</td>
<td>1.031</td>
<td>0.912</td>
</tr>
</tbody>
</table>

Table V. % inhibition and IC\(_{50}\) of peel-off mask formulation with A. hypogaea kefir

<table>
<thead>
<tr>
<th>Concentration (ppm)</th>
<th>% inhibition (%)</th>
<th>F1</th>
<th>F2</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>50.943</td>
<td>45.585</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>44.377</td>
<td>45.962</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>29.208</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>24.377</td>
<td>36.981</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>22.189</td>
<td>31.170</td>
<td></td>
</tr>
</tbody>
</table>

| 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.

ACKNOWLEDGMENT

The authors would like to acknowledge the Universitas Lambung Mangkurat for funding this research (PNBP ULM), the Laboratory of Pharmacy Technology of Universitas Lambung Mangkurat for supporting the facilities used in the research, and those who helped carry out the research.
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.

REFERENCES


