Effect of *Artocarpus heterophyllus* Leaf Ethanol Extract on Skin Smoothness

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**Abstract.** *Artocarpus heterophyllus* (Ah) is a plant that grows in many parts of Indonesia. Its leaves are widely used for traditional uses, one of which is for facial skin care. The present study was conducted to evaluate the effect of its extract on facial skin smoothness. Ethanol extract of Ah (EEA) was prepared as clay mask formulation (F1: 1, F2: 3 and F3:5%) and then was applied on volunteer face. Skin smoothness improvement was measured using a skin analyzer. Standardization of simplicia and phytochemical screening of EEA were done before the test. Data were analyzed using Kruskall Wallis and Mann Whitney. Standardization yielded as follows: total water - 5.33%, total water-soluble 15.67%, total ethanol-soluble 13.61% and total ash 10.29%. Smoothness value showed as normal skin with improvement to smooth level on EEA-treated group: F1: 9.4%; F2: 5.6%; F3:10.0%. The highest improvement percentage of skin was found in F3. Statistically, there was significantly different (p=0.046) between F0-F3. The study concludes that F3 is able to improve facial skin smoothness.

1. **Introduction**
Facial skin is one part of the body that can support someone's aesthetic [1]. Facial skin care should be started early, especially for females who have turned in their 20s [2] to keep the skin healthy. One of the efforts to achieve this condition is using facial mask [3] that contain herbs or natural ingredient [4]. Already known, that the increasing trend of consumption of herbal remedies [5] not only for the internal body but also for skin including face part. The natural ingredient from a plant that used for skin care commonly from the leaves, roots or stem.

The *Artocarpus heterophyllus* (*A. heterophyllus*), is a species of tree that commonly known by other names as jackfruit (Eng.), Panas (Hindi) and nangka (Indonesia) [6]. *A. heterophyllus* is rich in nutrients including carbohydrates, proteins, vitamins, minerals, and phytochemicals [7]. Phytochemical studies identified the presence of tannins, sterol, carotenoids, tocopherols, and flavonoids [8,9]. Traditionally, many Balinese women in Indonesia use face mask containing *A. heterophyllus* leaf for their facial skin care [10]. Therefore, the present study was conducted to investigate its effect on facial skin smoothness in mask formulation.

2. **Material and Methods**
The study was conducted from April to September 2019 at the Medical Faculty and Pharmacy Faculty, Universitas Sumatera Utara. The protocol has been approved by Health Research Ethical Committee, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia: No.652/TGL/KEPK FK USU-RSUP HAM/2019.

2.1. Materials
The fresh leaves were collected from Galang, Deli Serdang, Indonesia. After washing in running water, the leaves then were dried in drying cabinet. The dried leaves then were ground into powder from A. heterophyllus leaf ethanol extract (EEAh) was obtained by maceration using ethanol 96%. EEA then were prepared into 3 concentration in clay mask formulations (F1:1%; F2:3%; F3:5%). F0 contained a basic clay formulation was prepared as control. Basic clay consists of bentonite, xanthan gum, kaolin, glycerine, sodium lauryl sulphate, TiO2, nipagin, Na. metabisulphite, rose perfume, aquadest.

2.2. Methods
A total of selected 12 female volunteers were divided into 4 groups that treated with F0 (basic clay formulation) or F1 (basic clay formulation + EEAh 1%) or F2 (basic clay formulation + EEAh 3%) or F3 (basic clay formulation + EEAh 5%).

Before mask application, skin test for irritation effect was evaluated. The volunteers that have no irritation signs only were included in the study. Skin smoothness was measured using a skin analyzer (Aroma, SG) before and after masking. Skin smoothness was classified as: smooth:0-31; normal:32-51; rough:52-100. Data were analyzed with Kruskall Wallis and Mann Whitney test using IBM SPSS Statistic 22.

3. Results
Table 1 showed the effect of clay mask containing EEA on skin smoothness. Before and after treatment, the skin was in the normal range. All extracts showed the potency to increase the skin smoothness as in order: F2<F1<F3. Statistically, there were no significant differences among groups and intra groups (p>0.05). However, the Mann Whitney test showed that the smoothness between F0-F3 different significantly (p<0.05).

### Table 1. Effect of clay mask containing EEAh on skin smoothness.

| Group | Skin smoothness | P* |
|-------|----------------|----|
|       | Before Median (min-max) | After Median (min-max) |     |
| F0    | 44 (43-48)       | 42 (42-46)       | 0.102 |
| F1    | 47 (45-50)       | 41 (39-49)       | 0.102 |
| F2    | 42 (41-44)       | 41 (37-42)       | 0.109 |
| F3    | 40 (39-41)       | 36 (35-37)*      | 0.083 |

KW test Chi square = 8.74, p = .033, df = 3  
Chi square = 7.21, p = .065, df = 3

(a.Wilcoxon signed rank test; KW: Kruskall Wallis; Mann Whitney:*p<0.05)

Furthermore, we evaluated the percentage of skin changes to evaluate the possible as shown in Figure 1. The results showed that the percentage of skin smoothness increased in all treated groups. The highest improvement was found in F3.
Figure 1. Skin smoothness improvement (%) after clay mask contained EEA administration.

4. Discussion
Facial masks are the most prevalent cosmetic products utilized for skin rejuvenation [1]. They may function as carriers of active ingredients that are useful for skin health [11]. The active ingredient activity that believed to posses as skin care is an antioxidant. It is known that natural antioxidants obtained from plants have been developed to decrease the damaging effects in the body [12]. Thus, pharmacological investigations have been conducted on A. heterophyllus, including as anti-inflammatory [13], antifungal [14], antibacterial [15], and antioxidant [16,17]. These activities could be of benefit to skin care as well.

Clay facial masks have become of special interest due to specific properties presented by clays [18]. At the present study, the selection of base components based on stability and compatibility with ethanol extract of A. heterophyllus leaves. The basic components consist of bentonite, xantham gum, kaolin, glycerin, sodium lauril sulfate, TiO2, nipagin, natrium metabisulfite and aquadest. The amount of each component was determined based on Harry, 2000 with modification [19].

The present study showed that before and after mask application, the volunteer facial skin was at the normal level (32-51). However, there were different appearance after application by evaluating the skin changes. Three concentration of the masks in this study showed their ability to improve skin smoothness. This condition suggests that the extract has the potency to improve skin evenness. Furthermore, it will be beneficial for facial skin health.

5. Conclusion
Clay mask containing A. heterophyllus leaf ethanol extract improves facial skin smoothness. To optimize the results, data collection should be followed for up to 4 weeks.

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