

The Effect of Mango Leaf Extract Cream (*Mangifera indica* L. var. *kelong*) 3% on Facial Skin Aging Based on Dermoscopic and Skin Characteristic Analysis

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Abstract

Background The progressive aging of the skin is a multi-faceted and intricate process. The anti-elastase, anti-collagenase, anti-hyaluronidase, and anti-tyrosinase properties of the polyphenols found in mango leaves, especially mangiferin, contribute to the improvement of the look of aged skin.

Objective We aimed to evaluate the effects of a 3% mango leaf extract cream (*Mangifera indica* L. var. *kelong*) on facial skin aging.

Methods Forty participants showing signs of facial aging were enrolled in study using pre and post test design without a control group, as this study was intended as a preliminary evaluation of the effects of *Mangifera indica* extract. Detailed medical history and clinical evaluation were done by using skin analyzer and dermoscope using the dermoscopic photoaging scale (DPAS) before and after administering 3% mango leaf extract cream. At the end of study side effects and degree of satisfaction were also recorded.

Results After 8 weeks, individuals experiencing facial skin aging had a significantly lower DPAS score. According to the skin analyzer, there were significant differences in spot evaluation, roughness, and ultraviolet moisture, while wrinkles, ultraviolet damage, and ultraviolet pigmentation showed a decrease in the mean results, although the difference was not significant. None of the subjects had any side effects with mango leaf extract cream.

Conclusion Topical application of a 3% mango leaf extract cream effectively improves the appearance of aging facial skin, as demonstrated by skin analyzer assessments showing enhanced spot appearance, reduced roughness, and improved ultraviolet moisture levels. The treatment was well tolerated, with no reported side effects and a high level of user satisfaction.

Keywords Skin aging; Mango leaf; *Mangifera indica* L. var. *kelong*.

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Introduction

Assessment of skin aging is essential for determining the level of skin aging and evaluate

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effect of therapeutic applications for skin aging. Objective and standardized methods are increasingly emphasized to complement clinical evaluation. The Dermoscopic Photoaging Scale (DPAS), to evaluate photoaging by using dermoscope.¹ In addition, digital skin analyzers equipped with specialized software enable the conversion of facial images into measurable data, allowing for precise analysis and statistical comparison.² Glogau scale is also used to evaluate skin aging, research by Jusuf *et al.* found a

strong and statistically significant correlation between DPAS and the Glogau Scale, reinforcing the reliability of both tools across different populations.³

Alongside these developments, increasing attention has been directed toward natural, plant-derived anti-aging therapies due to their beneficial safety profiles and rich bioactive composition. This is particularly pertinent in tropical regions such as Indonesia, where *Mangifera indica* L. is extensively cultivated, including the *Mangifera indica* L. var. kelong variety found in North Sumatra. Mango leaves are recognized as a valuable source of bioactive constituents, including flavonoids, xanthenes, phenolic acids, and triterpenoids, which have demonstrated notable antioxidant and anti-aging activities.^{4,5} Accordingly, this study is justified to investigate the efficacy of mango leaf extract as a topical anti-aging agent using.

Methods

Women aged between 30 to 55 with signs of facial aging were enrolled in this pre-experimental clinical trial. The trial used a pretest-posttest design without a control group. Patients were excluded if they had dermatosis on the facial skin or were using topical anti-aging skin care products containing retinoids and their derivatives, antioxidants, vitamin C, vitamin E, alpha hydroxy acids within the last 1 month, were taking oral isotretinoin, antioxidants or oral vitamin C or vitamin E within the last 1 month, were undergoing routine facial skin rejuvenation procedures within the last 3 months, were using contraceptives containing estrogen or hormone replacement therapy, and were pregnant and/or breastfeeding. Drop-out criteria included the following: had not applied the cream for 3

consecutive days; total application of the cream was less than 7 weeks; if using oral or topical anti-aging facial skin products, were undergoing procedures for facial skin rejuvenation during the study period, or had not used the cream according to the study protocol.

Clinical evaluation was done by using the Dermoscopic Photoaging Scale (DPAS) and facial skin analyzer (magic mirror system™), which has been previously validated for objective skin assessment. Evaluations were performed before and after the application of 3% mango leaf extract cream at weeks 0, 2, 4, 6, and 8. Side effects were recorded during the study were assessed at the end of the study period. The Health Research Ethics Committee of Universitas Sumatera Utara Faculty of Medicine (1113/KEPK/USU/2023 dated 10.11.2023) granted ethical authorization.

Result

A total of 40 females were enrolled and out of these 13 subjects were in the age group of 40 to 44 years old (32.5%), as shown in **Table 1**. Mean DPAS before the application of 3% mango leaf extract cream (week 0) was 11.93±1.88, and there was significant reduction in mean DPAS at end of study and it was found to be 8.88±1.74 ($P<.001$) as shown in **Table 2**. **Figure 1** shows DPAS picture from baseline and 8th week.

Table 1 Distribution subject based on age group.

| Age (year) | n | % |
|------------|----|------|
| 30–34 | 10 | 25 |
| 35–39 | 5 | 12.5 |
| 40–44 | 13 | 32.5 |
| 45–49 | 7 | 17.5 |
| 50–55 | 5 | 12.5 |
| Total | 40 | 100 |

Table 2 Evaluation Based on DPAS Score.

| | Baseline Mean±SD | 2 nd week Mean±SD | 4 th week Mean±SD | 6 th week Mean±SD | 8 th week Mean±SD |
|------------|---------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| DPAS score | 11.93 ± 1.88 | 11.83 ± 1.76 *** | 11.15 ± 1.86 *** | 10.03 ± 1.90*** | 8.88 ± 1.74*** |

Statistical analyses comparing results with baseline data, * $P<.05$, ** $P<.01$; *** $P<.001$.
DPAS = Dermoscopic Photoaging Scale; SD = standard deviation

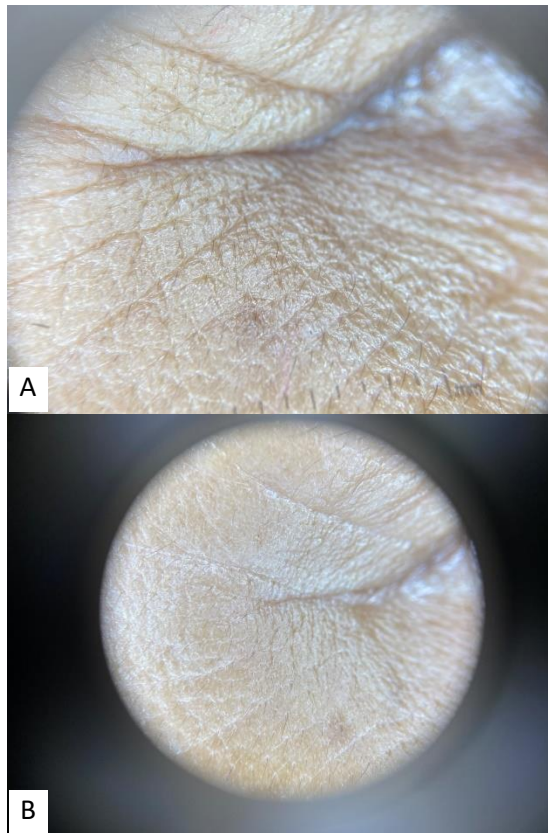


Figure 1 (A) Baseline: Dermoscopic photoaging scale (DPAS) picture shows deep wrinkle and crisscross wrinkle at baseline. (B) 8th week: DPAS picture shows improvement in deep wrinkle and crisscross wrinkle.

Table 3 shows evaluation of spot, roughness, wrinkle, ultraviolet moisture, ultraviolet damage and ultraviolet pigmentation based on skin analyzer. In most cases, it went down, which is good news for skin aging, when looking at the individual factors.

A significant reduction in skin mean spot score

($P < .001$) and skin roughness score ($P < .012$) were found at eighth week after treatment.

A significant improvement in skin ultraviolet moisture was also observed ($P < .001$) after the eighth week. No side effects were recorded in this study and all subjects were satisfied with this treatment.

Discussion

This study suggests that use of cream containing extracts of mango leave may provide improvements in signs of facial skin aging. A statistically significant reduction in Dermoscopic Photoaging Scale (DPAS) scores was observed ($P < .001$), indicating improvement in overall photoaging severity. Furthermore, significant statistical differences were observed in several skin analyzer parameters, including spots, roughness, and ultraviolet moisture, at 0 and 8th week ($P < .001$). Meanwhile wrinkles, ultraviolet damage, and ultraviolet pigmentation show reduction but is not statistically significant. Despite these limitations, all subjects were satisfied with no side effects recorded, suggesting that the formulation was well tolerated.

Extrinsic and intrinsic factors both contribute to the complex process of skin aging.^{6,7} There are various theories regarding skin aging, the most well-known of these theories is oxidative stress, induced by Reactive Oxygen Species (ROS).^{7,8} reactive oxygen species (ROS) contribute significantly to skin aging by destroying important skin proteins like collagen and elastin by activating collagenase and elastase.⁵

Table 3 Evaluation Spot, Roughness, Wrinkle, Ultraviolet moisture, Ultraviolet damage and Ultraviolet pigmentation based on skin analyser.

| Outcome | Evaluation at | | | | |
|-----------------|---------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | Baseline Mean±SD | 2 nd week Mean±SD | 4 th week Mean±SD | 6 th week Mean±SD | 8 th week Mean±SD |
| Spot | 17.55±6.15 | 16.67±5.27 | 15.97±4.8 | 15.02±3.75** | 14.60±3.40*** |
| Roughness | 28.22±9.68 | 25.72±7.78 | 25.05±7.70 | 24.87±7.08 | 23.97±7.40* |
| Wrinkle | 25.17±10.64 | 24.12±9.07 | 23.27±7.74 | 22.4±7.26 | 21.67±6.99 |
| UV Moisture | 52.60±10.31 | 56.45±6.47 | 59.1±7.37*** | 60.07±7.35*** | 61.57±7.12*** |
| UV Damage | 34.82±11.17 | 34.5±13.37 | 33.17±13.7 | 32.45±13.57 | 31.77±13.9 |
| UV Pigmentation | 40.05±9.69 | 39.77±7.79 | 39.02±7.23 | 38.12±7.61 | 37.92±6.89 |

Statistical analyses comparing results with baseline data, * $P < .05$, ** $P < .01$; *** $P < .001$. SD = standard deviation.

There is also activation of hyaluronidases leading to breakdown of hyaluronic acid, which in turn causes significant loss of skin moisture.⁵ Under oxidative stress, the body's free radical burden exceeds the capacity of its antioxidant defences contributing to skin aging. Consequently, to combat skin aging and free radical damage, it is essential to use antioxidants which can be obtained from food, cosmetics, or medications. Recent research has shown that various natural secondary metabolites, especially flavonoids and polyphenols, play a major role in the overall antioxidant activity of many plants.^{5,9}

Mangifera indica L.; known as mango, is a tropical fruit plant native to Asia and can now be found in all tropical countries, such as Indonesia.¹⁰ Mango leaf is part of mango that is rich source of polyphenols, benzophenones and xanthenes.^{5,11} Polyphenols identified in mango leaves include mangiferin, gallic acid, gallotannins, quercetin, isoquercetin, ellagic acid, and β -glucogallin.¹¹ Mangiferin is the main contributor of most of the biological activities of *Mangifera indica* L. leaves extract; including antioxidants and antiaging. It is also known as C-glycosyl xanthone associated with C-glycosides and has applications in cosmetics.^{5,12}

Mangiferin has antioxidant activity that prevents UVB-induced wrinkle formation by reducing matrix metalloproteinase (MMP-9) expression induced by UVB and the enzyme activities that triggers phosphorylation of mitogen-activated protein kinase 1 (MAPK-1) and extracellular-signal-regulated kinase (ERK) induced by UVB. In vivo studies show that mangiferin inhibits UVB-induced skin wrinkles, epidermal thickening, and collagen damage, demonstrating its effect as an anti-photoaging agent.¹²⁻¹⁴

Antioxidant properties are provided by the high concentration of mangiferin in mango leaf extract. The presence of hydrophilic groups, such as hydroxyl and carboxyl groups, positively influences competitive enzyme inhibition by inhibiting collagenase enzymes that contribute to wrinkle

formation, while inhibition of elastase enzymes may enhance skin firmness and elasticity.^{5,15} Mangiferin produces antityrosinase effects through a mechanism involving carbonyl and phenolic group structures.⁵ Mangiferin suppresses tyrosinase activity by acting as a substrate that binds with enzyme facilitated by the presence of hydroxyl groups in tyrosine, which play a crucial role as proton donors during tyrosinase activation.¹⁶

Conclusion

Mangifera indica L.; with its antioxidant, has the potential to act as an agent that can inhibit skin aging. This study supports previous findings that show mango leaf extract cream has antioxidant and anti-inflammatory effects that can help improve the appearance of aging skin on the face. Applying a lotion containing 3% mango leaf extract can help diminish the signs of facial skin aging without causing any adverse effects.

Limitations It is important to take into account several limitations while assessing the outcomes of our investigation. Several methodological limitations should be considered when interpreting the findings of this study. These include the relatively small sample size, the short duration of follow-up, the absence of a control group, and the lack of blinding due to the open-label design, all of which may introduce potential bias and limit the generalizability of the results. Nevertheless, to enhance the robustness of the evaluation, a dual assessment approach to skin aging was employed, incorporating both clinical and instrumental measurements.

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Author's contribution

RK, NKJ, FML: Substantial contributions to conception and design, acquisition of data, analysis & interpretation of data, drafting the article and revising it critically for important intellectual content.

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