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Utilization of Daker (Buffalo Dadih) as A Natural Mask to Prevent Acne and Brighten Face

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ABSTRACT

This study aims to determine the effect of adding coffee and tea powder to the quality of mask products from buffalo dadih (curd). This study was conducted on a quality control laboratory of Payakumbuh State Agricultural Polytechnic University from July 16 to September 15, 2022. The mask was made with a dilution using 1:1 with distilled water. Furthermore, the daker was added with 5% coffee and tea powder, with the following treatment MD0 mask without adding coffee and tea, MD1 5% coffee powder addition, MD2 5% tea powder addition. The quality analysis on the Daker mask is the antioxidant activity, inhibition and growth of acne bacteria, and pH value. This study's results indicate that adding coffee and tea powder has antioxidants ranging from 29.93-55.60 ppm. This Buffalo dadih (curd) mask has a pH between 5.33-5.44, which does not irritate the skin. At the same time, this curd mask has an inhibition range from 10.00-11.23 mm. Adding coffee and tea powder did not significantly affect the resistance of P. acne bacteria and pH but increased the antioxidant activity value of the DAKER mask.

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1. Introduction

Consumption of raw milk in Indonesian society every year increases continuously. This increase is because milk is one of the animal foods that can sufficient the daily needs of protein, energy, vitamins, and minerals. Based on the 2021 data from the Central Bureau of Statistics, Indonesians' annual raw milk consumption per capita in 2020 was 16.27kg, an increase of 0.25% compared to 2019. One of the livestock that can produce milk in Indonesia is buffalo. Buffalo milk production increased by 1,188,438 liters in 2014, 1,219,395 liters in 2015, and 1,231,588 liters in 2016 compared to West Sumatra production [1].

There are various types of milk that are usually consumed by the community, one of which is buffalo milk. Buffalo milk has a distinctive thick texture compared to cow's milk [2]. People in Indonesia mainly consume raw buffalo milk or processed buffalo milk, such as dadih (curd). Dadih is a typical West Sumatran delicacy made from buffalo milk that has been naturally fermented at room temperature in bamboo tubes covered with banana leaves for 24-48 hours. [3]. Lactic acid bacteria (LAB), fungus, and yeast are among the microorganisms found in dadih and are involved in the

fermentation process that results in dadih. [4]. The bacteria involved in this process are *Lactobacillus* sp. dominant. [5].

Dadih can also be further processed into non-food products such as face masks. A Buffalo Dadih Processing Business (DAKER) can operate as an initiative to secure animal food and income streams. Animal protein plant is widely used, especially in West Sumatra, and can be used as a facial ingredient. Curd contains compounds that have the potential to be used as antioxidant and antibacterial agents [6]. The use of antioxidant-rich compounds in masks help minimizing oxidative stress issues that causes acne surfacing in human face, fighting free radicals, and inhibiting melanin pigment development in the skin. [7]. *Lactobacillus plantarum*, a lactic acid bacterium contained in Whey Fermented Curd, inhibit the ability of *Propionibacterium* to grow and cause acne. [8]. Based on the potential of these ingredients, DAKER has good potential to be developed as an alternative skin care product for the community.

Health products for skincare are now an indispensable part of society, especially for women, because the treatment aims to improve and maintain healthy skin on the face [9]. Regular facial care with a mask for fair, spotless, and beautiful skin. The benefits of using a mask depend on the content of the mask. Based on a study by Sitompul (2016), adding coffee and tea powder at the rate of 5% in a goat milk kefir mask can reduce facial acne as the tea and coffee ingredients protect the skin from acne [10]. UV rays are anti-inflammatory and regenerative. Dead skin cells and antioxidants can prevent cell damage.

Based on the above potential, it is necessary to research the use of DAKER by adding coffee and tea grounds as a natural face mask that can whiten facial skin and eliminate acne. DAKER has never previously been used as an ingredient for facial care, even though it has the potential as an antibacterial and antioxidant. This research aims to increase additional value of DAKER and develop the potential of DAKER as a non-food product. Natural skin care masks from DAKER can also help increasing the economic value of DAKER as a traditional fermented milk in West Sumatra.

2. Method

The masking medium used in this study was buffalo dadih from the DADIAH livestock farmers group in Batu Payung Halaban, Lima Puluh Kota Regency, West Sumatra. The mask is diluted in a 1:1 ratio with diluted water. Afterwards, each mask was added with 5% coffee and tea powder. The treatments were MD0 = mask without coffee and tea powder, MD1 = 5% mask with coffee powder addition, MD2 = 5 % mask added tea powder (as shown in the diagram below).

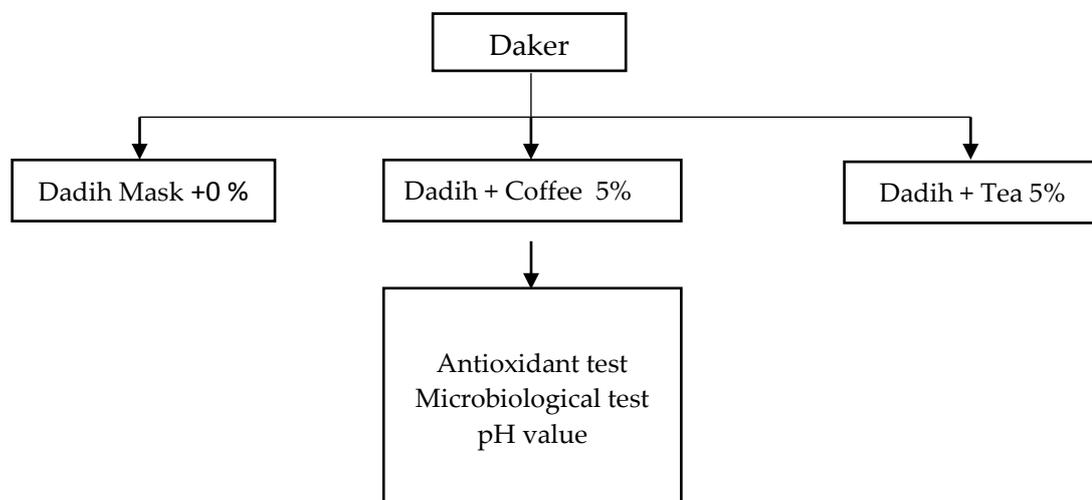


Figure 1. Daker mask flowchart with the addition of coffee and tea

The variables measured during the study were the antioxidant activity, inhibition and growth of acne bacteria, and pH value.

3. Result and Discussion

Buffalo dadih mask antioxidant test

Table 1. The results of testing the antioxidant content in the mask

PARAMETER/ TREATMENT	MD0	MD1	MD2
ANTIOXIDANT Value	29.93 ± 3.18 c	55.60 ± 6.42 b	96.16 ± 3.48 a

Based on Table 1 above, the addition of coffee and tea powder in a daker mask increases antioxidant activity. The highest antioxidant levels were found in the DAKER mask with the addition of tea powder (MD2) of 96.16 ± 3.48 ppm. Meanwhile, the daker mask with the addition of coffee powder produced an antioxidant of 55.60 ± 6.42. This increase occurred as coffee and tea powders contain compounds that are antioxidants. Therefore, the addition of coffee and tea powders to DAKER mask increases the antioxidant content compared to masks that are not.

Coffee has relatively high antioxidant content even though it has undergone a roasting process that uses heat which can damage the antioxidants [11]. According to Ciptaningsih (2012), melanoidin is a brown biopolymer thought to have antioxidant properties [12]. This compound is formed during the roasting process, whose amount can increase up to 25 compared to the initial conditions. In addition, coffee has phenolic compounds such as caffeine, chlorogenic acid, coumarin, ferulic and synaptic acid, which also fight free radicals.[13].

The increase in antioxidants in tea powder is caused by the tea's high phenol content, which increases the DAKER mask's antioxidant compounds. The main content of tea is polyphenol catechins which are flavonoid compounds. In addition, tea also contains caffeine compounds, vitamin K, flavanols, alkaloids, saponins, proteins, nucleic acids, minerals, and fluoride.[14]. The content of active compounds to fight free radicals is still mostly contained in tea. This is because there are fewer tea production processes that damage antioxidants. Therefore, the antioxidant content in tea is higher than in coffee, which has many processes that cause damage to antioxidants.

Testing the Inhibitory Power of Daker Mask against Propionibacterium acnes.

Table 2. Test results of the mask's ability to inhibit zone the bacteria Propionibacterium acnes

Treatment	Resistance (mm)	Information
MD0	10.79±0.83	Weak
MD1	11.23±1.37	Weak
MD2	10.00±1.75	Weak

Description: Weak category: 10-15 mm, medium category: 16-20 mm, and strong category: >20 mm (Rohan, 2017)

Based on Table 1, a dilution factor of 1:1 diluted water (MD0), coffee-added mask (MD1), and black tea-added mask (MD2) can suppress the growth of acne bacteria. The results of statistical analyses of antimicrobial activity of masks revealed no significant difference (P 0.05) between treatment groups MD0, MD1, and MD2. The maximum zone of inhibition, nonetheless, was 11.23 mm in the MD1 group. Zones of low category inhibitory potency were found in all three treatment groups. Chalid et al. (2013) discovered that curd had antibacterial action against the pathogenic gram-positive bacterium *Staphylococcus aureus*. [6]. There is no data on Dadih's ability to suppress the growth of *Propionibacterium acnes* and other acne-causing bacteria. Nevertheless, lactic acid bacteria in

fermented milk products can suppress *Propionibacterium acnes* growth by 4.35 mm more than lactic acid bacteria in whey yogurt. [15]. In the MD1 treatment, the daker mask was combined with coffee grounds, which were efficacious as anti-acne. Research by Maulidin et al. (2022) used Robusta coffee as a face mask that can inhibit the growth of *P. acnes* bacteria at maximum 100% concentration of 7.90 mm, while the 75% concentration is 6.81 mm [16]. This result is in line with previous in vitro studies. Setiawan's research proves that Robusta coffee extract inhibit the growth of *Staphylococcus epidermidis* bacteria, which also contributes in acne formulation, at concentrations of 100%, 50%, and 25%.

Related to the addition of coffee, the MD2 mask is treated with green tea powder, which can also act as an inhibitor of acne-causing bacteria. This result is supported by the research of Herwin et al. (2018) which showed the results of testing the antibacterial activity of ethanol extract of leaves and green tea dregs by diffusion agar against *Propionibacterium acnes* and *Staphylococcus epidermidis* bacteria with six concentration series, namely 0.1%, 0.5%, 1%, 2%, 4%, and 8%. The diameter of the zones of inhibition against *Propionibacterium acnes* ranged from 18.11 mm to 18.05 mm at the concentration of 8% against *Staphylococcus epidermidis*. The average diameter of the zones of inhibition against *Propionibacterium acnes* in green tea pulp is 17.45 mm and against *Staphylococcus epidermidis* is 15.68 mm [17].

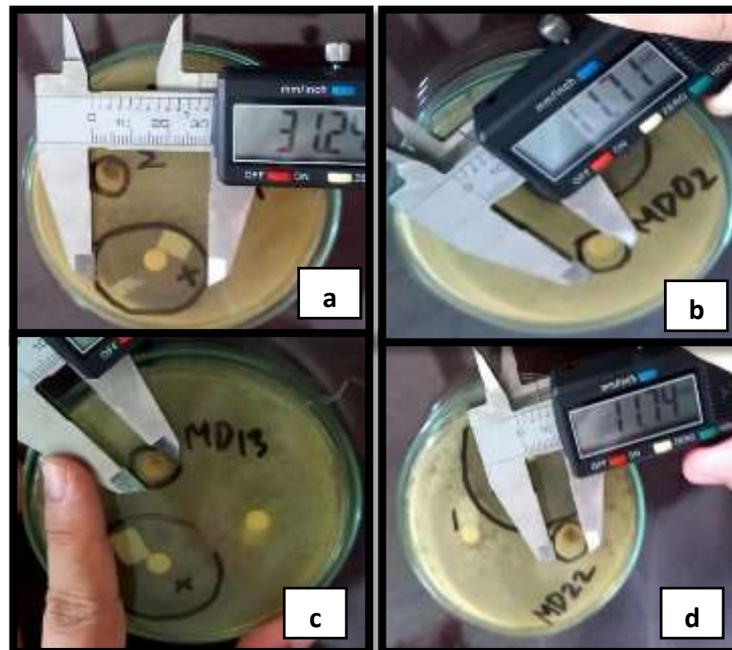


Figure 2. Positive control inhibition zone (a) MD0 inhibition zone (b) MD1 inhibition zone (c) MD2 inhibition zone (d)

Figure 1 shows the inhibition zones for masks MD0, MD1, and MD2. A translucent zone on the agar plate can be seen, representing an inhibitory zone for the growth of *Propionibacterium acnes*. This positive supervision is an anti-acne gel with larger area of inhibition that is more inhibitive than face masks. The mask's weak inhibitory effectiveness could be attributed to *Propionibacterium acnes*, Gram-positive bacteria with a thick cell wall and peptidoglycan layer. According to Prescott et al. (2020), variations in cell walls and peptidoglycan layers that make up the cell wall influence the capacity of lactic acid bacteria to suppress pathogenic microorganisms. [18].

Buffalo dadih mask pH test

The research result shows that there is no significant change in the pH value of masks made with coffee and tea. Adding 5% coffee or tea has no influence on the pH of the dadih. Figure 3 illustrates that the pH values of the MD0, MD1, and MD2 treatments do not differ significantly. Nonetheless, the three treatment groups can be employed as natural ingredients for facial treatment.

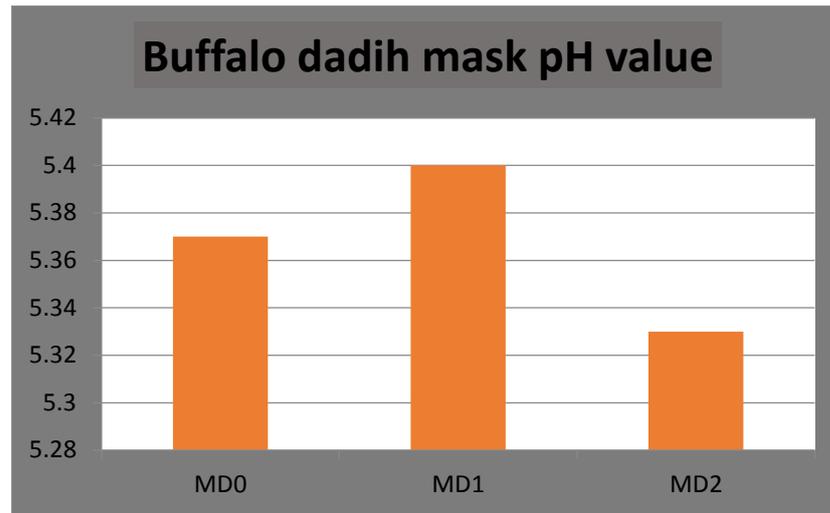


Figure 3. Buffalo dadih mask pH value

The pH level of dadih is safe and usable for non-irritating face treatments. The pH of DAKER masks ranges from 5.33 to 5.44. pH fluctuations suggest reactions or damage to formulation constituents, resulting in a lower or higher pH. The more alkaline or acidic a material is on the skin, the more difficult it is to neutralize it, causing it to become dry, cracked, sensitive, and at risk for infection. A pH that is overly alkaline, on the other hand, cause the skin to peel. In contrast, an alkaline pH produces dry skin. [19].

Conclusion

Based on the results of this study, it can be concluded that adding coffee powder increase antioxidant compounds in DAKER masks. DAKER masks have a pH that do not irritate the skin. Therefore, they are safe to use. Additionally, the masks have weak inhibitory ability against *P. acne*.

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