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ANTI-AGING PEEL-OFF MASK OF DRAGON FRUIT PEEL EXTRACT (*Hylocereus Polyrhizus*)

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ABSTRACT

Antioxidants can be used to protect the skin from damage caused by oxidation to prevent premature aging. The more increasing consumption level of red dragon fruit (*Hylocereus polyrhizus*) affects the amount of unused remaining fruit peels. In fact, the peel of red dragon fruit is considerably potential for natural antioxidant. Pitaya or dragon fruit is reported to contain betacyanin color pigment, with antioxidant activity. The use of cosmetics containing antioxidant compounds can prevent premature aging due to free radicals. One of the interesting forms of cosmetic preparations for skin care is the peel-off gel mask. The base that can be used as a film former for peel-off gel facial masks is polyvinyl alcohol (PVA). This study aims to determine the effectiveness of red dragon fruit peel extract peel-off masks as anti-aging. Anti-aging effectiveness testing was carried out on 10 volunteers and divided into two groups, namely the blank group (F0) and the extract group (FIII) for four weeks, and anti-aging activity was measured using a skin analyzer). Based on the results and discussions in this study, it can be concluded that the application of a peel-off mask of red dragon fruit peel extract (*Hylocereus polyrhizus*) is effective for repairing the skin and providing an anti-aging effect.

Keywords: Anti-aging; Peel-off mask; Red dragon fruit peel

1. INTRODUCTION

The skin is a layer or tissue that covers and protects the body from external hazards (Grace et al., 2015). As we get older, the skin will experience an aging process. It is caused by various factors from within and outside the body. Factors from outside the body, such as exposure to sunlight, can cause skin damage. The process of damaging the skin will appear dull and wrinkled, the skin will age faster, and black spots will appear. Exposure to sunlight comes from ultraviolet (UV) rays, and ultraviolet is a component that contributes to various diseases of the skin (D'Orazio et al., 2013). UV light is oxidative because it can induce oxidative stress by producing free radicals and reactive oxygen species (ROS). The presence of ROS that accumulates in the skin is believed to be an inducer of cell damage, premature aging, erythema, and skin cancer (Hassan et al., 2013). Antioxidants can inhibit oxidation or radical reactions caused by oxygen or peroxide so that these free radicals can be suppressed. Currently, the use of synthetic antioxidants used in industry such as BHT (Butylated Hydroxy Toluene) is being avoided due to the questionable health risks and toxicity. Therefore, the use of antioxidants from natural sources can be formulated to prevent oxidation to replace synthetic antioxidants (Haerani et al., 2018).

Pitaya, also known as dragon fruit, is a tropical fruit that belongs to the Cactacea tribe and has been widely developed in Indonesia. The shape of the fruit is unique and attractive; the skin has red and green scales similar to the scales of a dragon, and the taste is sweet, sour, and fresh. Red dragon fruit has thick skin, although it has quite a lot of flesh, which is 30-35% of the dragon fruit's whole weight (Utami et al., 2020). In addition, red dragon fruit skin also has considerable

potential in its utilization as a natural antioxidant in the form of phenolic compounds, flavonoids, carotenoids, and anthocyanins. Methanol extract, the ethyl acetate soluble fraction, and the ethyl acetate insoluble fraction of red dragon fruit peels had antioxidant activities of 241.19 µg/mL, 8.34 µg/mL, and 46.84 µg/mL, respectively (Wahdaningsih et al., 2017). Red dragon fruit skin also contains pectin compounds and other compounds such as galacturonic acid, manossa, galactose, xylose, and ramnose (Muhammad et al., 2014)

The use of cosmetics containing antioxidant compounds can prevent premature aging due to free radicals. Various types of skin care cosmetic preparations have been circulating in the market in attractive dosage forms and packaging, including the peel-off gel mask. Gel peel-off facial masks are unique in that they form a film after the mask is dry and provide several benefits including easy use, improving the appearance of facial skin by providing a skin tightening effect, and cleansing the skin of impurities. Anti-aging or anti-aging are preparations that function to inhibit the process of damage to the skin (degenerative), and to inhibit the appearance of signs of aging on the skin. One type of preparation that can be used in anti-aging products is a peel-off mask preparation (Muliyawan, D., & Suriana, 2013).

2. METHODS

2.1. Tools

The tools used were a beaker glass (Pyrex®) and tube, maceration container, pH meter (Hanna HI 96107), rotary evaporator (Heldoph type Hei-VAP®), water bath, hot plate, oven (Memmert®, desicator (Pyrex®), analytical balance (Precisa XB 4200C®), mortir and stamper, spectrophotometer UV-Vis (Shimadzu type 2450®), Brookfield viscometer DV-E, thermometer, vortext, UV lamp, and skin analyzer.

2.2. Materials

The materials used were used Methanol 96%, methanol p.a (Merck®), aquadest, PVA, glycerin, DMDM-hydantoin, DPPH, Wagner reactor, Mayer reactor, Dragendrof reactor, HCl, FeCl3 (Merck®), NaCl (Merck®), Mg, acetic acid (Merck®), dragon fruit peel, filter paper, aluminum foil.

2.3. Population and Sample

The sample used was the skin of a red dragon fruit (*Hylocereus lemairei* Britton & Rose). The red dragon fruit was obtained from the Alam Cemerlang Sejahtera Agricultural and Rural Training Center (P4S), Raya Sui-Kunyit Street Km. 84.5 Kunyit Laut Village, Mempawah, Kalimantan Barat.

2.4. Place and time of research

The research was conducted at the Pharmaceutical Technology Laboratory and Pharmaceutical Biology Laboratory, Faculty of Medicine, Pharmacy Study Program, Tanjungpura University.

2.5. Methods

Testing the effectiveness of anti-aging was carried out on ten volunteers and divided into two groups, namely:

a. Group I: 5 volunteers for F0 peel-off masks (blank)
b. Group II: 5 volunteers for FIII peel-off masks (Sample)

All volunteers measured the initial condition of the skin in the marked test area using a skin analyzer which included:

a. Moisture content, using the moisture checker tool included in the Aramo skin analyzer.
b. Skin smoothness (evenness), using a 60x magnification lens (normal lens) with a blue sensor.
c. Facial pore (pore), using a 60x magnification lens (normal lens) with a blue sensor.

d. Spots), using a 60% magnification lens (polarizing lens) with an orange sensor.
e. Wrinkles, using a 10x magnification lens (normal lens) with a blue sensor

Treatment begins by applying a peel-off mask evenly on the face that has been marked once a week for use. Peel-off masks are applied based on the groups specified above. Changes in skin condition were measured every week for 4 weeks using the Aramo skin analyzer.

3. RESULTS AND DISCUSSION

Treatment begins by applying a peel-off mask evenly on the face that has been marked once a week for use. Peel-off masks are applied based on the groups specified above. Changes in skin condition were measured every week for 4 weeks using a skin analyzer. Skin analyzer is a tool used to diagnose skin conditions directly according to measuring parameters. Skin measurements using this skin analyzer will automatically display the results in numerical form quickly and accurately. The results obtained are then compared based on the parameters listed in **Table 1**. Measurements on the skin analyzer are used to determine moisturizer (moisture content), smoothness, skin pigment, and sebum (oil content).

Table 1. Parameter Measurement Results with Skin Analyzer

Parameter	Result		
Evenness	0.31 Smooth	32-51 Normal	52-100 Rough
Sebum (oil content)	0.15 Low	16-50 High	51- 100 Very high
Moisturizer (moisture content)	0.9 Dry	10 – 30 Normal	31- 100 Very high
Spot (pigment)	0-19 Pigments are not visible	20-44 Some Pigmen	45-100 Lots of Pigment

(Source: Digital Test System EH-900U User Manual)

3.1. Anti-Aging Activity test results

3.1.1. Moisture Content

Measurement of water content found an increase in numbers measuring water content (moisture) during the use of masks within four weeks. The higher the number shown on the tool, the more hydrated the skin is. In the sample group, there was an increase in water content compared to the blank group, there was no increase in water content. The results of measuring the moisture content in the skin of sample volunteers and blanks can be seen in **Figure 1**.

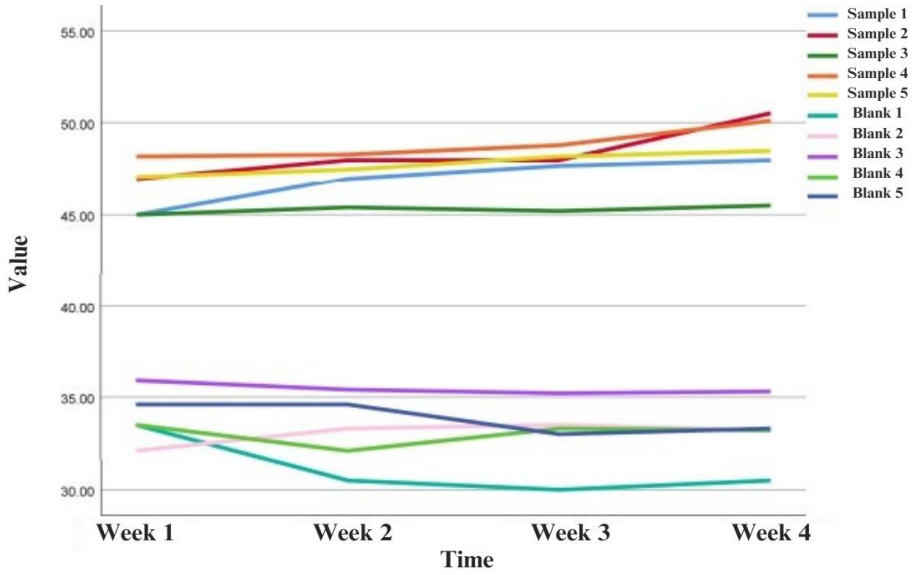

Figure 1. Results of measurements of water content in the skin of volunteers for 4 weeks

The graph shows that there is an increase in the water content of the skin. As shown in the graph, there is a comparison between the skin water content in the sample and the blank, in which the sample shows an increase in water content. After using the peel-off gel mask for 4 weeks, the moisture content of the volunteer's skin increased. In week 4, sample 1 increased by 3%, sample 2 was 3.5%, sample 3 was 0.5%, sample 4 was up to 1.9% and sample 5 was 1.4%. Testing with ANOVA showed no significant difference ($p<0.05$) from the percentage of skin moisture content to the time variable.

3.1.2. Evenness

The evenness parameter was found to decrease in numbers in the measurement of smoothness (evenness) during the use of masks within four weeks. The smaller the number shown on the tool, the finer the skin condition. The results of measuring the smoothness (evenness) of the skin of volunteers can be seen in **Figure 2**.

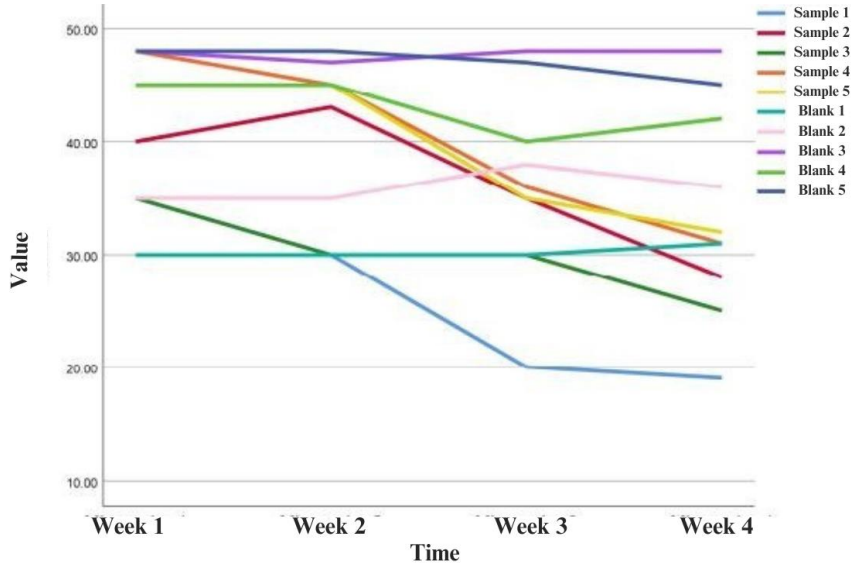

Figure 2. Results of measurements of smoothness of the skin of volunteers for 4 weeks.

The graph shows that there is a decrease in skin smoothness. When compared with blanks, both showed a decrease in skin smoothness. After using the peel-off gel mask for 4 weeks, the smoothness of the volunteer's skin decreased. In week 4, sample 1 decreased to 19%, sample 2 was 12%, sample 3 was 9%, sample 4 to 17%, and sample 5 was 13%. Testing with ANOVA showed no significant difference ($p<0.05$) in the percentage of skin smoothness to the time variable.

3.1.3. Oil Content (Sebum)

Data from sebum measurements showed that there was a decrease in the number of measurements of sebum (oil content) during the use of masks within four weeks. The smaller number shown on the tool indicates the condition of the skin with less blemishes. The results of measuring stains on the skin of volunteers can be seen in **Figure 3**. The graph shows that there is a significant decrease in oil (sebum) content in the five samples. It can be seen that there is a comparison between the levels of oil (sebum) on facial skin volunteers using extract and blank peel-off gel masks. After using the peel-off gel mask for 4 weeks, the sebum on the volunteer's facial skin decreased significantly. In week 4, sample 1 decreased by 5%, sample 2 and sample 3 by 5%, sample 4 by 3%, and sample 5 by 7.5%.

3.1.4. Stain (Pigment)

Based on data from pigment measurements, it was found that there was a decrease in the number of stain measurements during the use of masks within four weeks. The smaller number

shown on the tool indicates the condition of the skin with fewer blemishes. The results of measuring stains on the skin of volunteers can be seen in **Figure 4**.

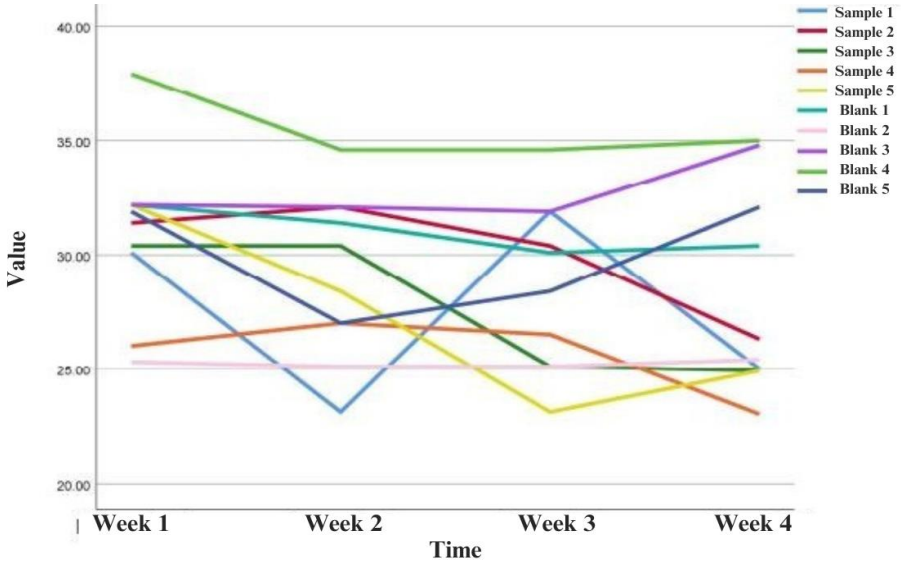

Figure 3. The results of measuring the oil content in the skin of volunteers for 4 weeks

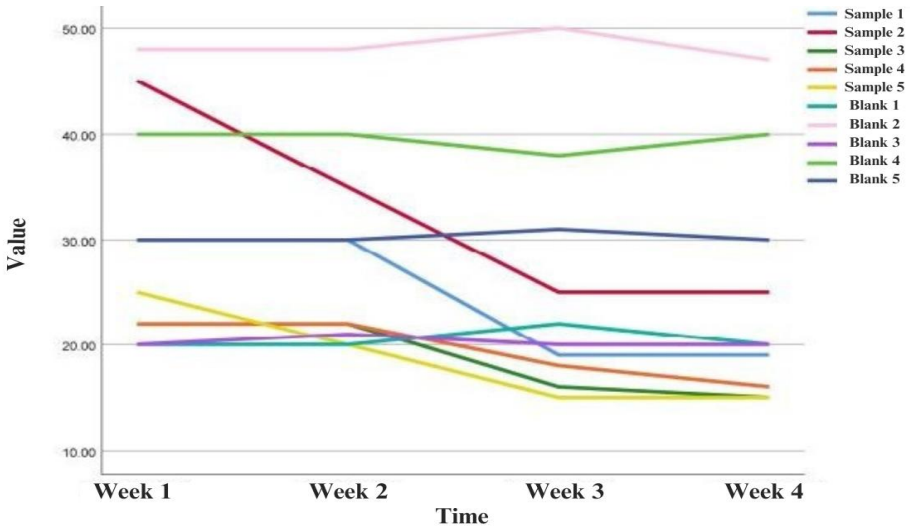

Figure 4. Results of measurements of stains on the skin of volunteers for 4 weeks.

The graph shows that there is a significant decrease in stain levels in the five samples. It can be seen that there was a comparison between the facial skin blemishes of volunteers who used extract peel-off gel masks and blanks. After using the peel-off gel mask for 4 weeks, the blemishes on the volunteer's facial skin decreased significantly. In week 4, sample 1 decreased by 5%, sample 2 and sample 3 by 5%, sample 4 by 3%, and sample 5 by 7.5%.

The skin is the most important complex organ in the integumentary system which interacts with most other organs both physiologically and pathologically. Therefore, its function is essential for survival. Skin aging is a process that occurs when our skin is exposed to factors such as ultraviolet rays. Exposure to ultraviolet light causes the aging of our skin. Ultraviolet rays also have the potential to cause skin cancer in the long run. The mechanism of skin aging is quite complicated. This is because in areas sheltered from the sun, the most pronounced changes occur within the epidermis and affect most of the basal cell layer. Consequently, although aged skin protected from the sun appears thin, finely wrinkled, and dry, sun-aged skin is characterized by deep wrinkles, sagging, and roughness (Amaro-Ortiz et al., 2014).

Skin aging can be delayed or reversed with the help of face masks. An example of a face mask is a gel mask. The type of gel mask used in this study was obtained from red dragon fruit skin extract (*Hylocereus polyrhizus*). Red dragon fruit is a plant source that is rich in vitamins and minerals, namely vitamin B complex, as well as vitamin C, niacin, cobalamin, betacyanin protein, fat, carbohydrates, fiber, flavonoids, polyphenols, and carotenoids. As much as 30-35% of the fruit of Hylocereus polyrhizus is the rind. Hylocereus polyrhizus rind compounds contain various secondary metabolites such as saponins, terpenoids, tannins, and alkaloids (Nani Wijayanti et al., 2022). Red dragon fruit peel extract also showed antioxidant activity by reducing malondialdehyde (MDA) levels in the livers of rats exposed to cigarette smoke. MDA is an indication of free radical activity produced by lipid peroxidase. Increased MDA levels in the liver indicate a process of oxidative stress due to free radicals (Cristovao et al., 2019). This effect becomes one of the important roles in preventing skin aging (skin aging).

In addition, the skin of *Hylocereus polyrhizus* also contains anthocyanin which is a color pigment that gives red dragon fruit its red color (Harjanji, 2016). Anthocyanins, which are also contained in *Hylocereus polyrhizus* peel extract, are powerful antioxidants because of their high reactivity as electron donors and can stabilize unpaired electrons (Fitri et al., 2016). Previous literature stated that anthocyanins have 3 mechanisms in protecting collagen which will be degraded by free radicals by inhibiting tyrosine kinase phosphorylation which prevents activation of MAP kinase, JNK, and AP-1 complex transcription, protection against TGF-β and procollagen so that new collagen synthesis is not inhibited, and inhibition of NFKB transcription so that MMP-8 activation is inhibited. This combination of mechanisms will inhibit cAMP (cyclic Adenosine monophosphate) protein kinase A inhibitor which is one of the MMP activators, where MMP plays a role in degrading collagen (Jit et al., 2018).

4. CONCLUSION

Based on the results of this study, it can be concluded that the application of a peel-off mask of red dragon fruit peel extract (*Hylocereus polyrhizus*) is quite effective for repairing the skin and providing an anti-aging effect.

5. ACKNOWLEDGEMENT

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6. CONFLICT OF INTEREST

All authors declare no conflict of interest.

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