



## Formulation and Anti-Aging Effect of Cream Containing Breadfruit (*Artocarpus altilis* (Parkinson) Fosberg) Leaf Extract

Nazliniway<sup>1\*</sup>, Anayanti Arianto<sup>1</sup>, Kiki Rizky Andani Nasution<sup>1</sup>

<sup>1</sup>Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Sumatera Utara, Indonesia, 20155  
Jl. Tri Dharma No. 5, Pintu 4, Kampus USU, Medan, Indonesia, 20155.

**Abstract :** Free radicals are compounds that have unpaired electrons, so these compounds tend to be reactive to attack other molecules. Free radicals attack on the tissue can damage fatty acids and reduce elasticity, so the skin become dry and wrinkled. Flavonoids are found in the leaves of breadfruit can neutralize and reduce free radicals and inhibit oxidation in cells, by reducing the occurrence of cell damage and can combat premature aging. Breadfruit leaf extract formulated into cream with various concentration of 0.5; 1.5; 2.5 and 3.5%. For comparison was used O cream. Physical properties (homogeneity, emulsion type, pH, stability), irritation and anti-aging effect of cream are tested. The results of the study showed that all the cream preparations were homogeneous, it had a pH 6.72 to 7.10, stable during storage of 12 weeks, and did not irritate the skin. The results of measurements of the effect of anti-aging showed that breadfruit leaf extract cream 3.5% better increase water levels and reduce stain compared to other formula and O cream, while the parameters of smoothness, pore, and wrinkles showed similar results with O cream.

**Keywords :** Formulation, breadfruit leaf extract, skin analyzer, cream, anti-aging.

### Introduction

The aging problem is even more complex and severe in cases where the skin has lost its protective mechanical function<sup>1</sup>. Clinically, aging skin, especially facial skin is marked with several signs, including wrinkles, hyperpigmentation spots and lost firmness<sup>2</sup>. Skin aging is a complex biological process influenced by a combination of endogenous and exogenous factors, which leads to structural and physiological alterations in the skin layer as well as changes in skin appearance, especially on the sun-exposed skin areas<sup>3</sup>.

Environmental influences produce obvious alterations to the texture and quality of the skin, the major extrinsic insults being chronic exposure to UV radiation. Both UVA and UVB initiate a number of cellular responses, including ROS production within both dermal and epidermal cells<sup>1</sup>.

Antioxidants are compounds that protect cells against the damaging effects through the formation of phenoxy radical which combine with reactive oxygen species, such as superoxide, peroxy radicals, hydroxyl radicals, and terminate the unwanted free radical chain reaction in cells<sup>4</sup>.

Aging can be inhibited by using anti-aging. Anti-aging is a cosmetic that has bioactivity that can prevent or improve signs of aging such as wrinkles, sagging skin, hyperpigmentation, and others so that the

better skin's appearance<sup>5</sup>. With advances in technology and science cosmetics, degradation and inhibition of aging can be done so that the skin can look younger<sup>6</sup>.

Leaves of *A.altilis* contain flavonoid, tannins, phenolics, glycosides, saponins, steroids, terpenoids and anthraquinones<sup>7</sup>. Bioactive phenols, especially bioflavonoids, are very interesting as antioxidants because of their natural origin and the ability to act as efficient free radical scavengers<sup>8</sup>. IC<sub>50</sub> of the ethanolic extract of *A.altilis* was found to be 140.54 µg/ml<sup>7</sup>.

## Experimental

### Instruments

Laboratory glassware (Pyrex), analytical scales (Boeco), pH meter (Kedida), and Skin Analyzer (Aramo).

### Material

Breadfruit leaf extract, stearic acid, propylene glycol, sodium edetat, triethanolamine, cetyl alcohol, glyceryl monostearate, butyl hydroxy toluene, methyl paraben, vaseline, perfume, distilled water and Olay's cream (will be called as O cream).

### Extraction Process

The method of extraction was maceration. Breadfruit leaves was extracted using ethanol 96%.

### Preparation of breadfruit leaf extract cream

The components of the formulation were shown in Table 1.

Vaselin, cetyl alcohol, stearic acid, glyseril monostearate were melted over a water bath with temperature of 70-75°C, after that add BHT (mixture 1). Propilen glycol, sodium edetat, methyl paraben and triethanolamine were dissolved in hot water (mixture 2). Admixed mixture 1 and 2 gradually and add the breadfruit leaf extract and perfume then homogenized it.

**Table 1. Formula of breadfruit leaf extract cream**

Component	Concentration (%)				
	F0	F1	F2	F3	F4
Breadfruit leaf extract	-	0.5	1.5	2.5	3.5
Propylene glycol	7	7	7	7	7
Sodium edetat	0.05	0.05	0.05	0.05	0.05
Triethanolamine	1	1	1	1	1
Vaseline	5	5	5	5	5
Cetyl alcohol	3	3	3	3	3
Stearic acid	3	3	3	3	3
Glyceryl monostearate	3	3	3	3	3
Butyl hydroxy toluene	0.1	0.1	0.1	0.1	0.1
Methyl paraben	0.2	0.2	0.2	0.2	0.2
Parfume	3 drops	3 drops	3 drops	3 drops	3 drops
Distilled water ad	100	100	100	100	100

### Physical Quality Evaluation of the Preparation

#### Homogeneity test

A certain amount of preparations were applied on a piece of glass or other suitable transparent material, preparations should show a homogeneous composition and no visible coarse grains.

### Emulsion type test

Determination of the type of emulsion preparation is done by adding a little methyl blue into the preparation, if homogeneous in the external phase while stirring, then such emulsions are the type of oil in water (o/w), but when only blue spots means emulsions are the type water in oil (w/o).

### pH measurements

Determining pH of the preparation is done by using a pH meter. Instrument must first be calibrated using pH neutral buffer solution (pH 7.01) and acidic pH buffer solution (pH 4.01) until the instrument shows the pH values. Then, washed the electrode with distilled water then dried with paper towels. Sample prepared by dissolved 1 g of cream into distilled water ad100 ml. Place the electrode in the solution, pH of the solution appears in the display.

### Stability test

A total of 100 grams of each formula were put into plastic pots. Furthermore, the observations are in the form of changes in consistency, color and scent at the time of the preparation is finished as well as in storage for 12 weeks at room temperature.

### Irritation test

Irritation test conducted on 24 volunteers with patch test technique by attaching the preparation on the back of the ear.

### Anti-Aging Effect test

Using Aramo SG<sup>®</sup> skin diagnosis system. Treatment conducted for 4 weeks by applying the cream twice a day for four weeks. Parameters measured including moisture, evenness, pore, spot and wrinkles. Each formula consists of 3 volunteers.

### Volunteer

18 volunteers were used to conduct this experiment who has been analyzed beforehand for having signs of premature aging, such as dry skin, wrinkles and black spots.

The criterias of volunteers are :

1. Women
2. Age between 20-30 years
3. No medical history associated with allergies
4. Not using any other cosmetic that functioning as anti-aging in facial area

## Results and Discussion

### Physical Quality Evaluation of the Preparation

The result of physical quality evaluation of the preparation were shown in table 2.

**Table 2. Physical quality evaluation of the preparation**

Parameter	Formula					
	F0	F1	F2	F3	F4	F5 (O Cream)
Homogeneity	✓	✓	✓	✓	✓	✓
Emulsion type	o/w	o/w	o/w	o/w	o/w	o/w
pH (after preparation)	7,10	7,03	6,98	6,90	6,83	6,74
pH (after 12 weeks)	7,02	6,96	6,92	6,77	6,72	6,74
Stability	Stable	Stable	Stable	Stable	Stable	Stable
Irritation	-	-	-	-	-	-

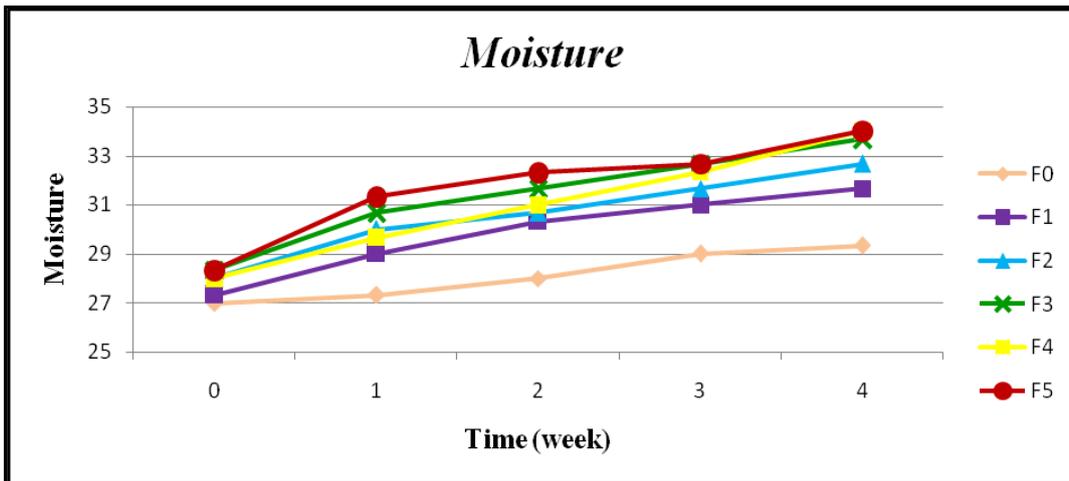
Note: ✓ = homogeneous, - = no irritation, o/w = oil in water

Based on the data in Table 2 above shows that each formula was homogeneous.pH value was 6.00-6.70 which was within the range of permitted pH requirements for cosmetics (5-8). Each formula were stable during storage and were non-irritating to the skin and it can be said that the overall preparation cream are safe to use.

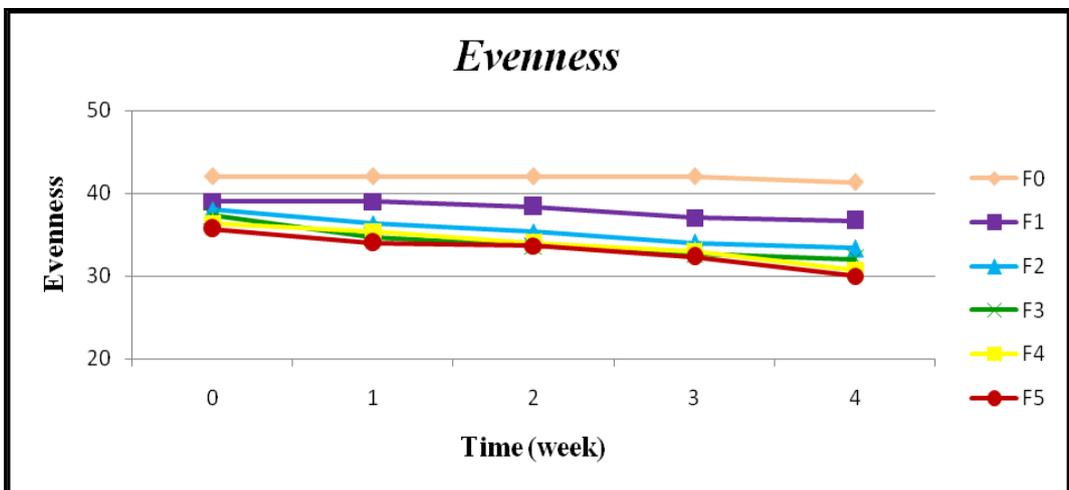
**Anti-aging test**

The result of the anti-aging effect using cream of breadfruit leaf extract on volunteer’s skin were shown in Figure 1, Figure 2, Figure 3, Figure 4, and Figure 5.

**Figure 1.Improvement of skin moisturein 4 weeks treatment**



**Figure 2.Improvement of skin evenness in 4 weeks treatment**



**Figure 3.Improvement of skin pore size in 4 weeks treatment**

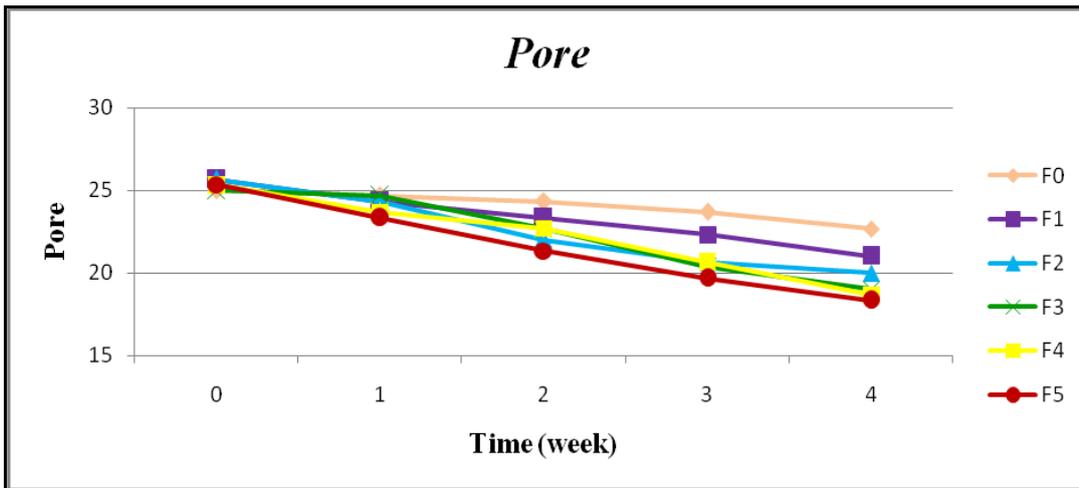


Figure 4. Improvement of skin spot in 4 weeks treatment

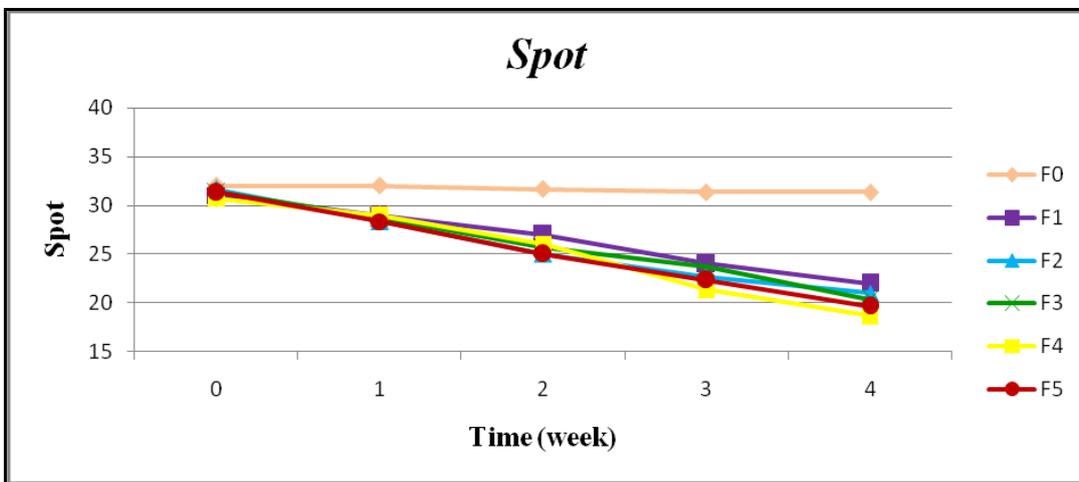
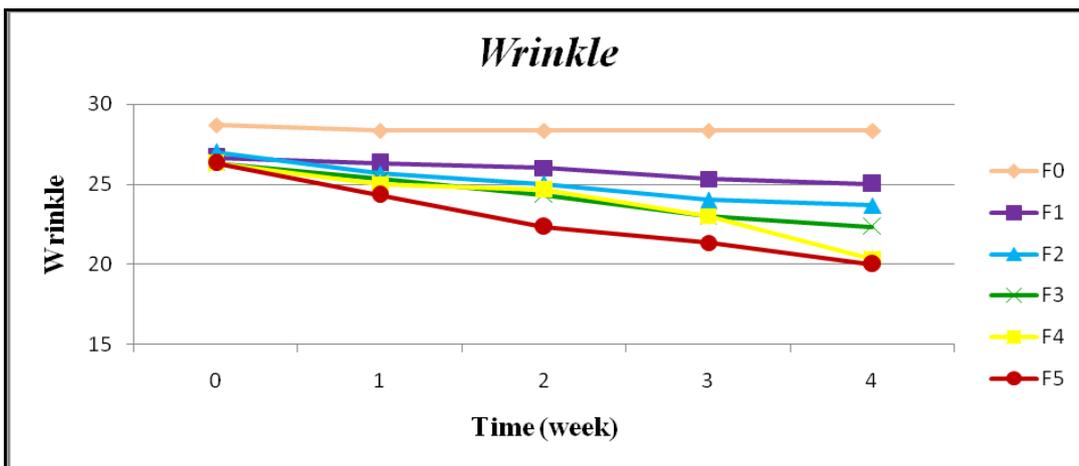


Figure 5.Improvement of wrinkle level in 4 weeks treatment



From Fig 1. Fig 2, Fig 3, Fig 4, and Fig 5, can be seen that breadfruit leaf extract can improve skin condition after 4 weeks treatment.

**Moisture**

Breadfruit leaf extract can increase the moisture content of the skin by the mechanism as a humectant that is able to bind water.Humectant caused increasing the skin moisture.Moisture related to the protective of

the stratum corneum. Flavonoid compounds resulting increased extracellular collagen. The synthesis of collagen caused increasing the skin more moisture and elastic<sup>9</sup>.

### Evenness

Flavonoids, the most common naturally occurring antioxidants are found ubiquitously in plants as pigments for flower coloration, in fruits, vegetables and beverages. Antioxidants are compounds that protect cells against the damaging effects through the formation of phenoxy radical which combine with reactive oxygen species, such as superoxide, peroxy radicals, hydroxyl radicals, and terminate the unwanted free radical chain reaction in cells. The flavonoids have aroused considerable interest recently because of their potential beneficial effects on human health specially its antiaging effect. Flavonoid compounds resulting in increased extracellular collagen that will maintain elasticity, flexibility, and smoothness of the skin<sup>4</sup>.

### Pore

Flavonoids as antioxidants can inhibit lipid peroxidation reaction and a reducing compound which was good. Flavonoids apply as a good inhibitory for hydroxyl and superoxide radicals thus protected lipid membrane. it can cause a diminution of pore size and improving the texture of skin<sup>10</sup>.

### Spots

Skin pigmentation is caused by different levels of melanin in the skin, synthesised in melanosomes in the melanocyte cells by the action of tyrosinase, an enzyme which hydroxylates the amino acid tyrosine to dihydroxyphenylalanine (DOPA) and catalyses its oxidation to DOPA quinone. Many products which aim to reduce skin pigmentation, target tyrosinase inhibition, as this is one of the key steps in pigment formation and can block other pigment-forming pathways. Flavonoidshave activity as inhibitors of the enzyme tyrosinase<sup>11</sup>.

### Wrinkle

Flavonoids as antioxidants can inhibit the increase levels of MMP-1 (Matrix Metalloproteinase-1), which will cause an increase in the amount of collagen. Matrix metalloproteinase-1 is a key mediator that degrade collagen in skin that has photoaging. Barriers to MMP-1 is one way to prevent skin damage from UV exposure. Flavonoids inhibit and prevent skin damage by free radicals that caused by exposure ultra violet rays on the skin, by binding to singlet oxygen and inhibit lipid peroxidation. By the occurrence of these barriers, the synthesis of MMP-1 will decrease and the process of collagen degradation is inhibited so that the skin is protected from aging process from exposure ultra-violet B<sup>12</sup>.

### Conclusion

- a. Breadfruit leaf extract may be formulated in a cream dosage form homogeneous with the type of oil in water emulsion, pH value 6.72 to 7.10, did not irritate the skin and stable in storage for 12 weeks at room temperature.
- b. Cream of breadfruit leaf extract 3.5% showed the best effectiveness of anti-aging compared to other creams and Olay's cream.

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