

## Utilization of *Artocarpus heterophylla* Lamk. as UV Protector in mice exposed to UV-B

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### ABSTRACT

In daily life, *Artocarpus heterophylla* Lamk., the leaves are rarely used even just as animal feed. In the bark of *Artocarpus heterophylla* Lamk there are new flavonoid compounds namely morusin, artokarpin, artonin E, cycloartobilosantone, and artonol B. This research is an experimental design with randomized posttest only with control group design. A total of 21 mice were divided into 3 groups, each consisting of 7 mice, group 1: negative control given oral placebo and exposed to UV-B rays, group 2: giving Vitamin C cream 4% mg and exposed to UV-B rays, group 3: giving cream of *Artocarpus heterophylla* Lamk leaf extract 4% and exposed to UV-B rays. The total of UV radiation dose of 600 mJ / cm<sup>2</sup> for 3 weeks, then performed a biopsy for examination of the amount of dermis collagen. The average number of collagen in the three groups after treatment was given significantly different ( $p < 0.05$ ). Mean and Significant level of collagen density of group 1 : 51,42 ± 5,16; group P2 ± 91,18 ± 1,13; and P3 group: 88,77 ± 1,10. Conclusion : Cream of 4% *Artocarpus heterophylla* Lamk leaf extract can increase the amount of collagen density in mice exposed to UV-B rays.

**Key words:** *Artocarpus heterophylla* Lamk; artokarpin; uv-protector; collagen

### INTRODUCTION

UV light exposure in addition to providing beneficial effects to help the formation of vitamin D required by the bone, but also has an adverse effect. These effects depend on the intensity of the sun, the frequency of irradiation, the duration of irradiation, and the exposed surface area of sun exposure (Hadinoto *et al.*, 2000). Overall, the effects of UV radiation on the dermis result in collagen degradation, collagen synthesis barriers, inflammation and oxidative stress, as well as decreased cell capability and eventually apoptosis. Various research has been done by experts to prove that the increase of UV-B radiation in the earth resulted in an increase in cases of skin cancer. For example, WHO estimates that in 2008 worldwide there are about 2 million new cases every year for nonmelanoma skin cancer, while melanoma skin cancer is about 132,000 new cases each year. In Indonesia, skin cancer patients are fewer than the United States, Australia and Britain, but skin cancer needs to be avoided because in addition to causing disability (damaging appearance) also at an advanced stage can be fatal for the patient. One way that can be done to reduce the negative impact of sunlight, namely by using sunscreen. According to Permenkes RI number 376 / menkes / per / VIII / 1990, sunscreen is a substance that can absorb at least 85% of sunlight

at wavelengths of 290 to 320 nm but can continue the light at wavelengths greater than 320 nm. The effectiveness of sunscreen preparation in resisting exposure to sunlight and heat is influenced by the stability of the active ingredient and the stability of the sunscreen preparation.

The development of skin protective cream from UV rays to the use of natural materials has become a trend because it is more easily accepted by the community. This is due to the assumption that the use of natural materials (herbs) is safer to use and has relatively little negative impact. The use of herbs as a medicine is a cultural heritage based on skills, knowledge and experiences passed down from generation to generation by previous generations.

One of the herbs that can be used is jackfruit leaf (*Artocarpus heterophylla* Lamk.). In life, *Artocarpus heterophylla* Lamk plants, especially on the leaves are rarely used even just as animal feed. In the bark of *Artocarpus heterophylla* Lamk there are new flavonoid compounds, namely morusin, artokarpin, artonin E, cycloartobilosantone, and artonol B (Ersam, 2001). Artokarpin result of wood isolation on *Artocarpus heterophylla* Lamk also has potent activity as whitening agent and anticancer skin (Arung *et al.*, 2008).

### METHODOLOGY

This research is an experimental research using *Randomize Post Test Only With Control Group Design*.

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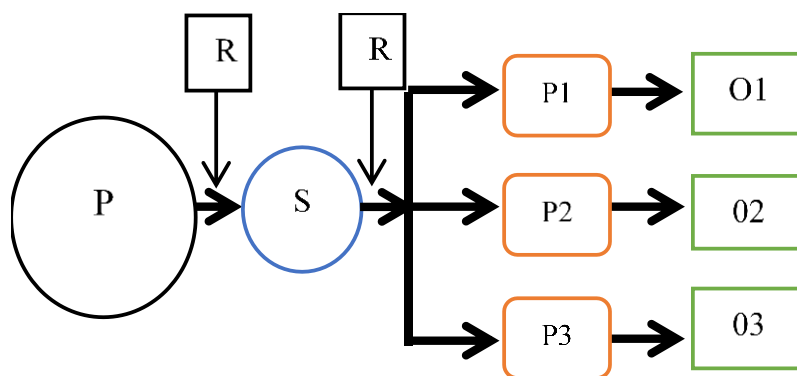


Figure 1. Research design

P : Population; S : Sample; R : Random; P1 : Placebo; P2 : Positive Control; P3 : *heterophylla* Lamk extract cream

### ***Artocarpus heterophylla* Lamk simplisia preparation**

Generally simplicia making through the following stages: collection of raw materials, washing, chopping, drying, drying, packing and storage.

### **Preparing the *Artocarpus heterophylla* Lamk extract**

The *Artocarpus heterophylla* Lamk leaf ethanol extract was prepared by using ethanol solvent, then macerated with magnetic stirrer until the sample sample was colorless and the filtrate was evaporated with a temperature evaporator of 40°C until a concentrated sample (ethanol extract) was obtained.

### **Preparation of Extract Ethanol Leaf cream 4%**

<b>Ingredients</b>	<b>Base Formulation (%)</b>
Stearic acid	3
Setil alcohol	4
Propylene glycol	-
Glycerine	2
Trietanolamin	-
Cera alba	1
Liq. Parafin	6
Tween 80	3
Methyl paraben	0,1
Phospat buffer pH 7,4 ad	100

The cream base in this research is the type of oil emulsion in water (M /A). In each formula, the oil phase is melted in a vapor plate above the waterbath at ± 75 °C (first mixture), and the water phase is dissolved in phosphate buffer pH 7.4 ±

75°C (second mixture). The two mixtures are stirred on a hot, homogeneous mortar and form a cream mass. Added methyl paraben and glycerin bit by bit while crushed to homogeneous.

### **Research procedure**

Implementation of research through the following stages:

1. A total of 21 mice were adapted for 1 week.
2. Randomly, mice were divided into groups. control group, group 1, group 2, and group 3
3. Mice of all groups shaved back feathers, then smeared cream base ingredients in the control group, 4% Vitamin C cream in group 2, cream ethanol extract of 4% *Artocarpus heterophylla* Lamk leaves in group 3, each cream smeared 0.2 mg / cm<sup>2</sup> surface of mice leather.
4. Chronic exposure of UV-B was given to the control group, group 2, group 3. Exposure was done 3 times a week (Monday, Wednesday and Friday) for 3 weeks with exposure of 50 mJ / cm<sup>2</sup> in the first week, with exposure of 70 mJ / cm<sup>2</sup> at week second, and with an exposure of 80 mJ / cm<sup>2</sup> in the third week.
5. The basic ingredients of cream, 4% Vitamin C cream, 4% *Artocarpus heterophylla* Lamk ethanol extract cream were applied twice daily, about 20 minutes before exposure (to give absorption time of topical material into the skin) and 4 hours after irradiation. Topical application of the material remains on a day without irradiation.
6. 48 hours after the last irradiation, to exclude the effects of acute irradiation, all mice from all three groups were rested for 48 hours after the last irradiation. After that euthanasia and then taken back skin tissue, inserted in 40%

**Group I : Placebo**

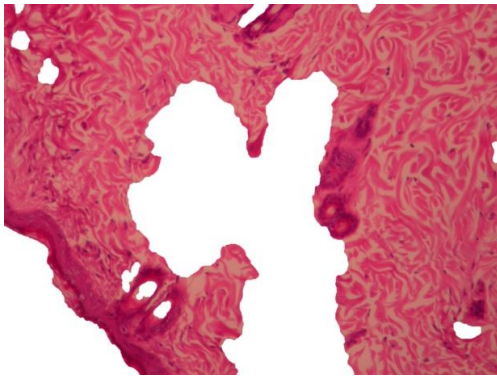


Figure 2. Collagen Density : 50,79%

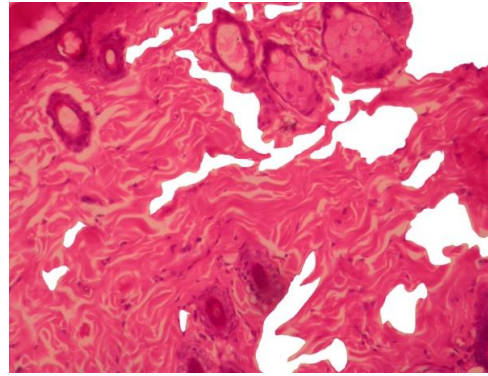


Figure 3. Collagen Density : 51,16%

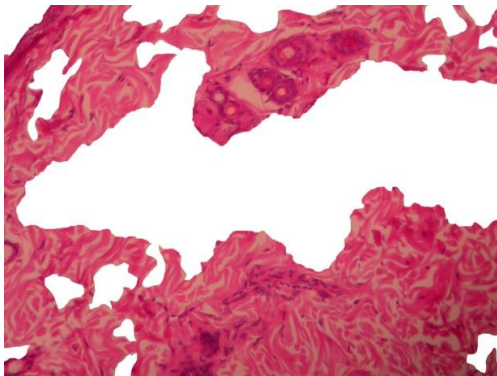


Figure 4. Collagen Density : 45,13%

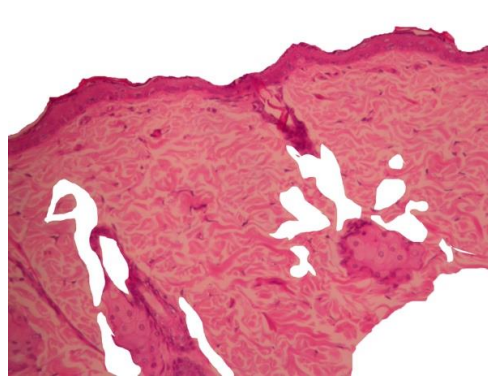


Figure 5. Collagen Density : 46,75%

Table I. Collagen Density *Artocarpus heterophylla* Lamk

No	Placebo	Positive Group Vitamin C 4%	Jackfruit leaf cream extract 4%
1	50.79	91.11	90.12
2	51.16	93.85	87.60
3	45.13	91.55	87.81
4	46.75	91.56	88.93
5	52.83	89.01	88.16
6	52.15	91.10	89.97
7	61.19	91.17	90.19
Mean ± SD	51,42 ± 5.16	91.18 ± 1,13	88.77 ± 1.10

formalin solution. Skin tissue mice made histologic preparations for examination of skin collagen count.

**RESULTS AND DISCUSSION**

**Collagen Histopatological**

All test animals in each group were analyzed immunohistochemically, to see the collagen density.

The results of the statistical analysis were started with the normality test showing that the

treatment of Group 1 (Plasebo) was 0.094 ( $p > 0.05$ ), while for treatment Group 2 (positive control) and group 3 (Treatment of extract) were 0.330 and 0.323 ( $p > 0.05$ ). The test results state that all data is normally distributed.

The average number of collagen cells between the negative control group (P1) the positive control group (Vit C 4%) (P2) was significantly different with the p value = 0.000, indicating that there was a difference in collagen density between the negative control group and

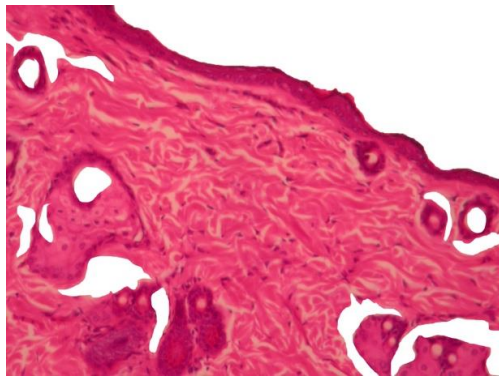


Figure 6. Collagen Density : 52,15%

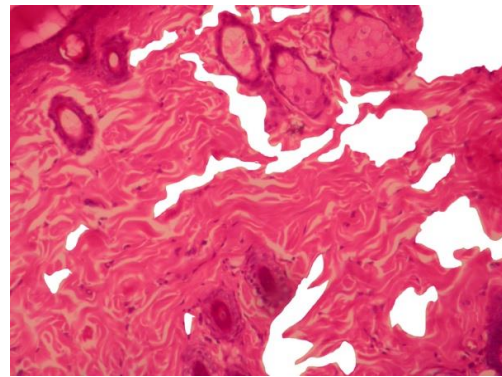


Figure 7. Collagen Density : 52,15%

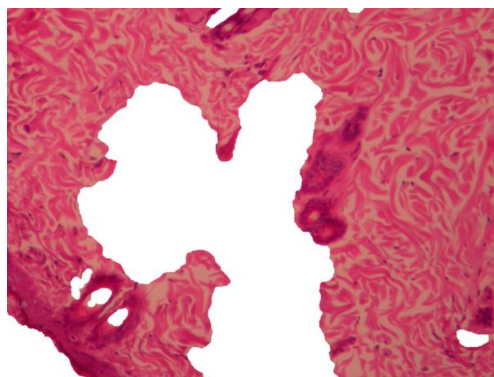


Figure 8. Collagen Density : 46,75%

**Group 2 : Positive Control ( Cream With 4% As.Ascorbic)**

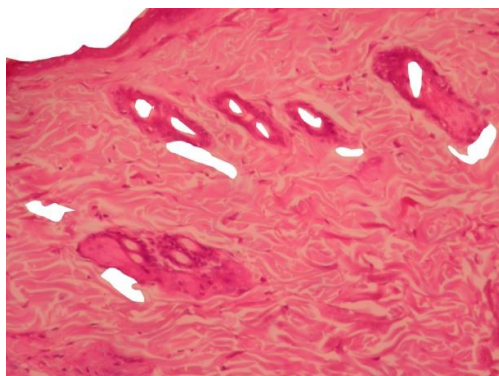


Figure 9. Collagen Density : 91,11%

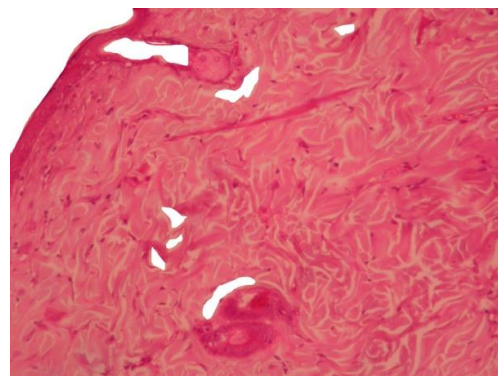


Figure 10. Collagen Density : 93,85%

the administration of vitamin C. Group 2 (P2) of vitamin C has a greater density. The mean number of collagen cells between the placebo group (P1) and the group of 4% leaf extract (P3) significantly differed with  $p = 0,000$ , indicating that there was a difference of collagen density between the negative control group and the administration group Extract cream jackfruit leaves 4%. Visible Group of extract of cream of jackfruit leaves 4% have bigger density. The average number of collagen cells between the positive control group (P2) and the 4% jackfruit collecting group (P3) did

not differ significantly with  $p = 0.175$ . Indicates that both groups give the same density results.

Excessive UV exposure, in addition to reducing the amount of mature collagen in the dermis, also destroy the synthesis of collagen in a sustainable manner. Cream *Artocarpus heterophylla* Lamk. contribute secondary metabolites in the form of: morin, sianomaklurin (tannic), flavonoids, and tannins. In addition, in the bark also contain new flavonoid compounds, namely morusin, artonin E, artokarpin, sikloartobilosanton, and artonol B.

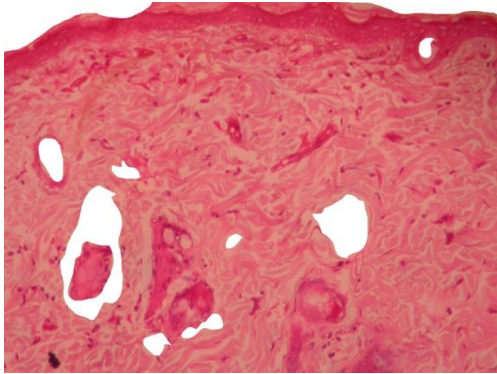


Figure 11. Collagen Density : 91,55%

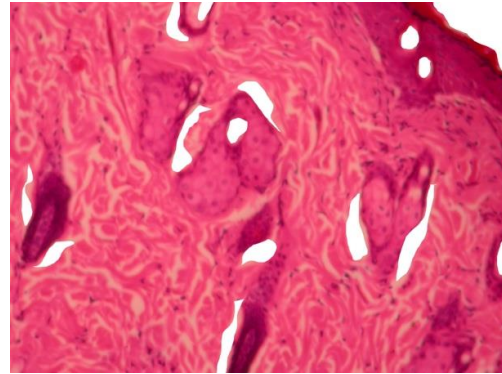


Figure 12. Collagen Density : 91,56 %

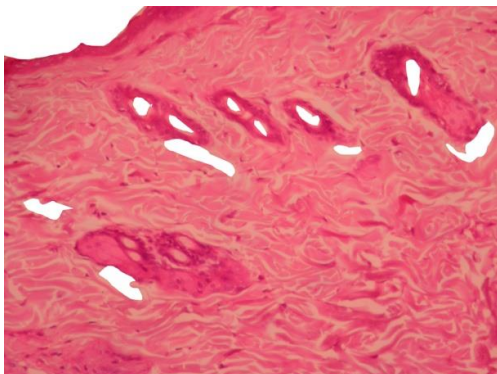


Figure 13. Collagen Density : 89,01%

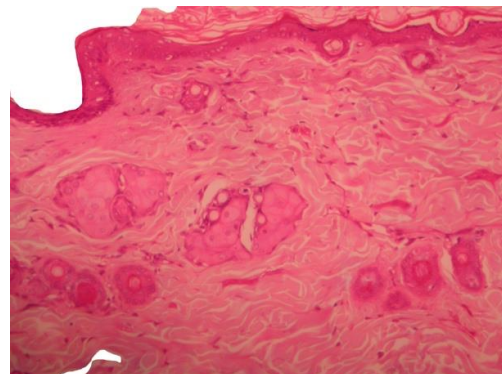


Figure 14. Collagen Density : 91,10

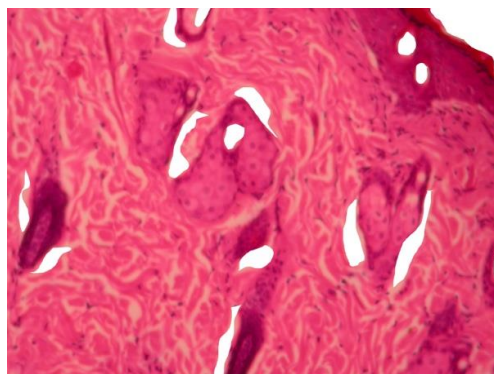


Figure 15. Collagen Density : 91,56 %

UV-B exposure in experimental animals will cause damage to collagen tissue characterized by decreased concentration of collagen density. Flavonoids contained Cream *Artocarpus heterophylla* Lamk. extract containing morin, cyanomaclurin (tannin), flavonoids, and tannins have a role as UV-Protector by inhibiting exposure to UV rays so that no reduction in the amount of mature collagen in the dermis, Flavonoid also allegedly able to protect the synthesis collagen continuously, so there is no decrease in regulation of procollagen gene expression of type I and type

III. Two mechanisms are responsible for the reduced expression of the procollagen gene so that 4% *Artocarpus heterophylla* Lamk. leaf extract is able to maintain the production of collagen.

### CONCLUSION

From the results of this study can be concluded that the gift of jackfruit leaf extract 4% can be used as an alternative as UV protective. *Artocarpus heterophylla* Lamk leaf extract 4% statistically has average density level which is not significantly different compared with Vitamin C as

**Group 3 : Cream With 4% *Artocarpus heterophylla* Lamk**

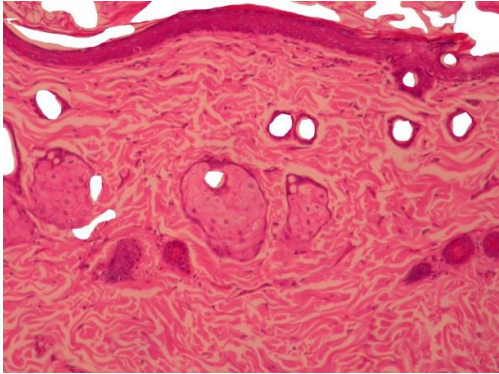


Figure 16.Collagen Density : 90,12%

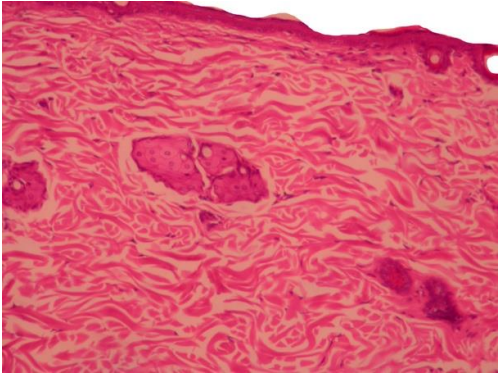


Figure 17.Collagen Density : 87,60%

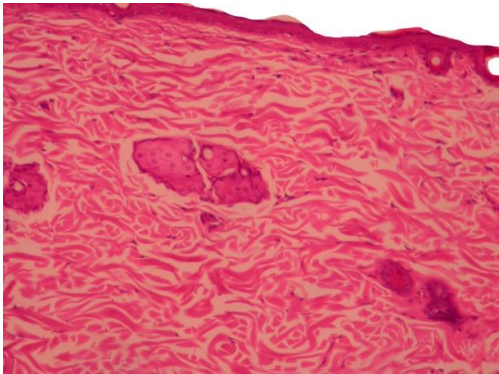


Figure 18.Collagen Density : 87,81

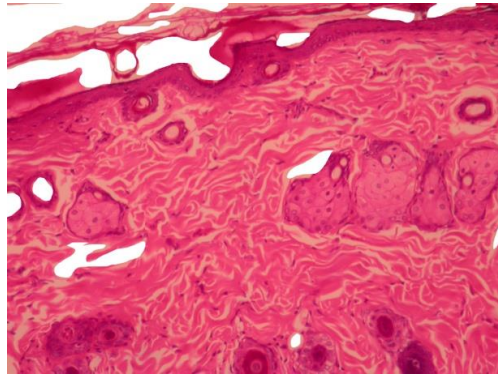


Figure 19.Collagen Density : 88.93%

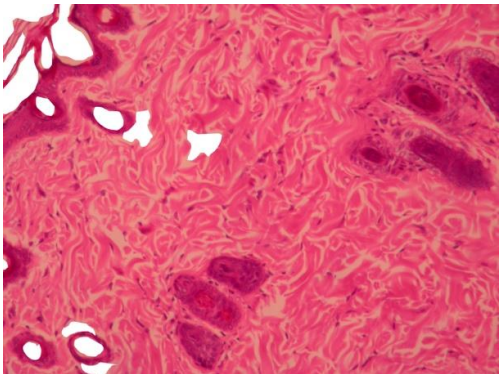


Figure 20.Collagen Density : 88,16%

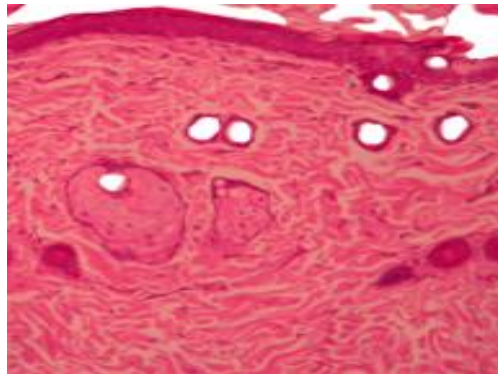


Figure 21.Collagen Density : 89,97%

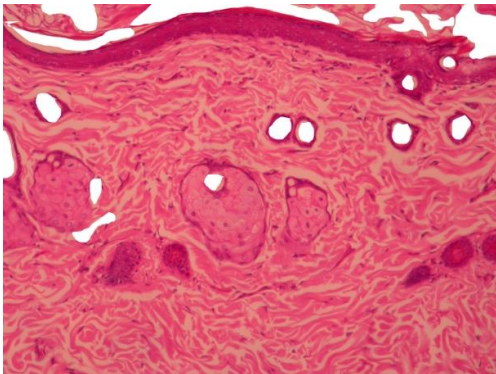


Figure 22.Collagen Density : 90,19 %

Table II. Statistical analysis of comparism collagen density between group

Group	Group Reference	p Value
P1	P2	0,000
	P3	0,000
P2	P1	0,000
	P3	0,175
P3	P1	0,000
	P2	0,175

positive control. And it can be said that the use of jackfruit leaf extract has the same effectiveness as vitamin C as uv-protection.

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