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Hair Growth Promotion of Argan Oil (Argania Spinosa Skeels) Nanoemulsion Hair Tonic Preparation With Mice (Mus Musculus)

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Abstract.
Argan oil is not only used in facial treatments but can also be used for hair care. Argan oil has hair growth activity as it contains oleic acid and linoleic acid, which act to prevent hair loss, strengthen hair, and protect against harmful hair cosmetics, as well as containing tocopherol, which has antioxidant properties. Tocopherol can help to protect from the effects of UV radiation which can damage hair through the melanin pigment and protein fraction. This study aimed to determine the effect of variations in the concentration of argan oil (*Argania spinosa Skeels*) with levels of 1%, 2%, 3%, in hair tonic nanoemulsion preparations on the hair growth of mice. Hair growth activity was carried out using mice for 21 days. The data were analyzed using one way ANOVA and paired-sample t test. The results showed that after 21 days of testing, there was an increase in hair growth from each formula and the positive control, of 1.891 mm, 2.33mm, 3.484 mm and 2.225 mm, respectively. The hair weights of formula 1, 2, 3, and the positive control were 0.0028, 0.0059, 0.0111 and 0.0070, respectively. The negative control led to a decrease in length and weight by 0.641 mm and -0.0023, respectively. In conclusion, the preparations of hair tonic nanoemulsion using argan oil at concentrations of 1%, 2%, and 3% promoted hair growth in mice.

Keywords: argan oil, hair tonic, nanoemulsion, hair growth activity test, mice

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1. INTRODUCTION

Hair is an icon of appearance and beauty in several parts of the human body that serves as a determinant of identity and as protection against environmental conditions, such as exposure to the sun and cold climates.. In addition, hair does not only function as a protective agent, but also as an aesthetic function and supports appearance [1]. Healthy hair is the dream of every human being and is an important aspect of supporting appearance.However, not everyone has healthy hair. This is caused by several factors including air pollution, excessive sun exposure, lack of maintaining clean water when washing hair, lack of nutrients and too tight ponytail.

The most common hair problem is hair loss. Hair loss is a serious problem for both men and women.Therefore,Hair must receive adequate care and nutrition. One of the cosmetics in preventing hair loss is using hair tonic

A natural ingredient that can be used to treat hair loss is argan oil. Argan oil contains vitamin E (λ-tocopherol) and unsaturated fats such as oleic acid and linoleic acid [2]. Oleic acid has the activity of slowing hair loss and stimulating hair growth, and also has antioxidant properties that are very important for hair [1]. -Tocopherol acts as an antioxidant antioxidant which is very important for protection agents from the effects of UV radiation that can damage hair [3]. The preparations made in this research are hair tonic preparations in the form ofnanoemulsion because the size of the droplets produced is very small, making it easier to penetrate the stratum cormeum on the skin.

This research was conducted to scientifically prove the effect of variations in the concentration of argan oil (Argania spinosa) in the hair tonic nanoemulsion preparation on the hair growth of mice.

2. RESEARCH METHODS

This research was carried out using an experimental method, namely to determine the proportion of the best active ingredients by comparing the effect of increasing levels of active ingredients of argan oil on hair growth activity of argan oil nanoemulsion hair tonic preparations with concentrations of 1%, 2%, and 3%.

Statistical analysis used is one way ANOVA and Paired-Sample T Test which is processed using the SPSS application

2.1. TOOL

The tools used are analytical gram balance, watch glass, beaker glass, porcelain cup, measuring cup, dropper, stirring rod, homogenizer, Particle Size Analyzer, caliper, hair shaver.

2.2. INGREDIENTS

Research materials used for the preparation of hair tonic nanoemulsion were argan oil (Argania spinosa(L) Skeels), tween 80, glycerin, ethanol 96%, Aquadest, and hair tonic ginseng as positive controls.

2.2.1. Argan Oil Nanoemulsion Hair Tonic Preparation Formula

Table 1: Argan Oil Nanoemulsion Hair Tonic Preparation Formula.

Ingredients	Function	F1	F2	F3
Argan Oil	Active Ingredients	1	2	3
Tween 80	Surfactant	30	30	30
Ethanol 96%	Cosurfactant	11	11	11
Aquadest	Solvent	Ad 100	Ad 100	Ad 100

2.2.2. Argan Oil Nanoemulsion Hair Tonic Preparation Method

The first step is to put aquadest into a glass beaker then heated on a hot plate ad 50˚C. Then tween 80 was added and stirred with a homogenizer at 400 rpm for 5 minutes. Then added the 96% ethanol mixture, stirred with a homogenizer at 450 rpm for 5 minutes, then added argan oil little by little and stirred with a homogenizer at 1000 rpm for 5 minutes.

2.2.3. Hair Growth Activity Test

The test animals used had inclusion criteria, namely white local mice, male sex, healthy (marked by active movement), and no wounds on the skin area. while the exclusion criteria were mice that had wounds on the skin area, were sick (diarrhea, fever).Before testing, the mice to be used were acclimatized for 7 days.At least 24 hours before the test, the hair on the back of the mice was shaved with a hair clipper with an area of 2x2 cm for the test preparation exposure site. Shaving was done carefully so as not to injure the back of the mice. The test preparation was applied to the back of the mice once a day with a volume of ± 1 ml for 3 weeks.

These sections include:

1. Group 1 smeared with negative control
2. Group 2 was smeared with Formula 1, namely 1% argan oil hair tonic preparation.
3. Group 3 was smeared with formula 2, namely 2% argan oil hair tonic preparation.
4. Group 4 was smeared with formula 3, namely the preparation of 3% argan oil hair tonic.

5. Group 5 was smeared with a positive control, namely hair tonic ginseng on the market.

2.2.4. Determination of Hair Length

Observation of hair length on the back of mice was carried out on day 0, and 21. A total of ten longest hairs of mice were measured using a caliper and the 10 longest hairs were selected to measure the average. From the average hair length obtained, it was statistically processed to see if there was a significant difference between the test preparation and the negative control.

2.2.5. Hair Weight Determination

Measurement of hair thickness was carried out on day 0 and day 21 by shaving the hair that grows in the test area, then weigheduse analytical balance. The results obtained Data analysis used was normality test, univariate test and bivariate test.In this study, univariate analysis was used to measure each of the independent and dependent variables with the help of the SPSS 23.0 application. In this study, bivariate analysis was used, namely to determine whether there was an influence or behavioral relationship on the accuracy of self-medication use of diarrhea drugs. The analysis used is the Chi-square test.

3. RESULTS

3.0.1. DeterminationMice Hair Length

Table 2: Average Hair Length Results.

Treatment Group	Time	Average Hair Length (mm) ± SD	Difference (mm)
Negative Control	Day 0 Day 21	5.504 ± 0.2981 5.043±0.3634	-0.461
Formula 1 (1%)	Day 0 Day 21	5.681 ± 0.5921 7.572 ± 0.3495	1,891
Formula 2 (2%)	Day 0 Day 21	5.826 ± 0.2901 8.159 ± 0.1202	2,333
Formula 3 (3%)	Day 0 Day 21	5.807 ± 0.3023 9.291 ± 0.1389	3,484
Positive Control (Hair tonic ginseng)	Day 0 Day 21	5.348 ±0.3033 7.573 ± 0.1383	2.225

Based on Figure ??.**1**, it can be seen that the average hair length on day 21 (after treatment) shows an increase in the average hair length of mice. When compared with the negative control, all formulas of hair tonic nanoemulsion argan oil (Argania spinosa) had a higher average and formula 3 had the highest average hair length.

3.0.2. DeterminationMice Hair Weight

TABLE 3: Results of Average Hair Weight.

Treatment Group	Time	Average Hair Weight (g) ± SD	Difference (g)
Negative Control	Day 0 Day 21	0.0068 ± 0.0015 0.0045 ± 0.0013	-0.0023
Formula 1 (1%)	Day 0 Day 21	0.0044 ± 0.0013 0.0072 ± 0.0011	0.0028
Formula 2 (2%)	Day 0 Day 21	0.0056 ± 0.0027 0.0115 ± 0.0015	0.0059
Formula 3 (3%)	Day 0 Day 21	0.0049 ± 0.0017 0.0160±0.0020	0.0111
Positive Control (Hair tonic ginseng)	Day 0 Day 21	0.0045 ± 0.0009 0.0115 ± 0.0028	0.0070

Based on Table 3 shows that there was an increase in the average hair weight of mice on day 21 (after treatment). When compared with the negative control, all formulas of hair tonic nanoemulsion argan oil (Argania spinosa) had a higher average and formula 3 had the highest average hair length. Based on the results above, it can be stated that argan oil with a concentration of 1%, 2%, 3% has hair growth activity in mice as evidenced by

4. DISCUSSION

The results of the analysis using one way ANOVA test and Paired T-Test which meet the requirements. The greater the concentration of active ingredients, the greater the hair growth activity. This is because argan oil contains vitamin E (λ-tocopherol) and unsaturated fats such as oleic acid and linoleic acid. Oleic acid has the activity of slowing hair loss and stimulating hair growth, and also has antioxidant properties that are very important for hair [1]. Tocopherol acts as an antioxidant by stimulating hair

growth by causing muscle relaxation in the blood vessels around the follicles so as to encourage blood circulation to the scalp area. Thus, more oxygen and nutrients are provided to the cells in the hair, one of which is the hair follicle [4].

5. CONCLUSION

In this study, it was concluded thatthere is an effect of variations in the concentration of argan oil (Argania spinosa) with levels of 1%, 2%, and 3% in the hair tonic nanoemulsion preparation on the hair growth of mice. Where the higher the concentration of argan oil, the higher the activity or ability of hair growth

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