The Effectiveness Test Of Natural Hair Growth Tonic: Avemor (*Aloe Vera* And *Moringa Oleifera*) For Thickening Hair And Anti-Licknes

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Abstract.

Avemor (Aloe vera and Moringa oleifera) is a natural hair growth tonic manufactured with a combination of aloe vera gel and dried moringa leaf extract as its active ingredients. Aloe vera includes a variety of vitamins and minerals, including vitamins A and C, amino acids, copper, inositol, and others. The extract from moringa leaves also includes tanins, vital amino acids, vitamin C, vitamin E, and other nutrients. One of the products with 2% minoxidil is employed as a positive control. Several hair diseases are treated off-label with the powerful arteriol vasoconstrictor minoxidil, which can also promote hair growth. In order to determine the effectiveness of Natural Hair Growth Tonic, tests were done on male New Zealand white rabbit hair. Avemor (Aloe vera and Moringa oleifera) is one of the products containing 2% minoxidil, with variations in the content of dried moringa leaf extracts of 2%, 4%, and 6% in comparison to the positive control. On the backs of five rabbits, six test regions were created, and each area received a different treatment every day using a sample volume of 0.5 ml. Results of the Natural Hair Growth Tonic's physical evaluation: Avemor (Aloe vera and Moringa oleifera) has a liquid shape, a distinct aroma, a pH of 6, and is homogeneous with the yellow-golden color of the formulae 1 and 2 as well as the golden brown in the formula 3. It also varies in the concentration of the dried moringa leaf extracts. Formula 4 (negative control) has the appearance of a liquid, is dazzling white in color, and emits a distinct odor. Additionally, formula 5 (positive control) has a liquid-like consistency, a vivid yellowish color, and a distinguishable scent. The average reserve viscosity for formula 1 was 2.96 ± 0.14 cPs, for formula 2 it was 2.99 ± 0.10 cPs, and for formula 3 it was 4.05 ± 0.07 cPs. Formula 4 (negative control) had a value 2.96 ± 0.10 cPs, and formula 5 (positive control) had a value of 1.82 ± 0.03 cPs. The average result of rabbit hair growth on the seventh day for treatment 1 is 0.22 ± 0.17 cm, treatment 2 is 0.30 ± 0.23 cm, treatment 3 is 0.42 ± 0.42 cm, treatment 4 is 0.58 ± 0.47 cm, treatment 5 is 0.68 ± 0.36 cm, and treatment 6 is 0.90 ± 0.42 cm. On the 14th day of treatment 1, the average result of rabbit hair growth was 0.43 ± 0.06 cm; on the same day, treatment 2, 0.27± 0.18 cm; on the same day, treatment 3, 0.42 ± 0.33 cm; on the same day, treatment 4, 0.77 ± 0.22 cm; on the same day, treatment 5, 0.28 ± 0.24 cm; and on the same day, treatment 6, 0.43 ± 0.38 cm. The average length of rabbit hair on the 21st day for treatment 1 was 0.43 ± 0.26 cm, for treatment 2 was 0.73 ± 0.19 cm, for treatment 3 was 0.32 ± 0.23 cm, for treatment 4 was 0.48 ± 0.31 cm, for treatment 5 was 0.13 ± 0.17 cm, and for treatment 6 was 0,43 ± 0.30 cm.

Keywords: *Aloe vera, Moringa oleifera, hair tonic, and effectiveness test.*

I. INTRODUCTION

According to Junlalat and Srikulchai (2014), hair is a special derivative structure that is a distinctive feature for defining human characteristics. Hair growth phases include growth, regression, and rest phases [1]. According to Priskila (2012), hair for women is often referred to as the crown, while in men, hair affects self-confidence. Healthy hair is characterized, among other things, by being thick, shiny black, not fainting, and not falling out. Almost all of the body has hair, and the hair has different functions, one of which is the aesthetic function for humans [2]. In order to have healthy hair, it is necessary to take care of it. Products that can be used for hair care have circulated widely on the market, one of which is a hair tonic. A hair tonic is one of the types of cosmetic products used to treat hair growth [3]. Cosmetic products using natural ingredients have now been extensively researched and circulated in the market, including hair tonic preparations. Plants that can be formulated into hair tonic preparations are aloe vera and kelor leaves. Aloe vera contains good substances for hair health, namely vitamin A, vitamin C, amino acids, Cu, inositol, enzymes, minerals, and others. The substances in aloe vera can reduce hair loss and strengthen hair roots [2].The plant that also has benefits for hair health is moringa.

The moringa leaf extract contains minerals, essential amino acids, vitamin C, vitamin E, flavonoids, tanins, and many more that have been known to have benefits for caring for and nourishing the scalp and hair [4]. The use of aloe vera gel with a concentration of 7.5% in the formulation of hair tonic preparations shows good results [5]. The moringa leaf extract with concentrations of 2%, 4%, and 6% can be formulated into a hair tonic with the best results using a concentration of 6% [4]. The results of the stability test using the

cycling test showed the preparation Natural Hair Growth Tonic: Avemor (Alo vera and Moringa oleifera) with variations in the concentration of dried leaf extracts of 2%, 4%, and 6% has good physical stability with a constant pH of 6, does not sink, does not change color and smell, as well as the viscosity of preparation remains eligible is < 5 cPs [6]. Based on the results of the study, the researchers were interested in conducting a test of the effectiveness of Natural Hair Growth Tonic: Avemor (Aloe vera and Moringa oleifera) with variations in the concentration of dried leaf extracts on the growth of male rabbit hair.

II. MATERIAL AND METHODS

Collection and Authentication of Plant Material

Aloe vera gel is made from the aloe vera plant that grows in the villages of Mojopuro, Sumberlawang, Sragen. While the dry extracts of kelor leaves are obtained from Highway of Solo, Km. 32 and no. 33, Karang Pandan, Lempo, Salam, Karanganyar subdistrict, Karanganyar regency, Central Java.

Chemical material

The components of this product are aloe vera gel, dried leaf extract, 96% alcohol, sodium metabisulfite, methyl and propyl parabens, menthol, propyle glycol, aquades, and the X brand (minoxidil 2%).

Making Aloe Vera Gel

Aloe vera should be washed and cleaned. A flanel fabric is used to filter the cleaned aloe vera after it has been chopped into little pieces and mixed. The end product is heated until it boils. Switch off the stove and allow it to cool. Following that, scratch paper is used to filter the aloe vera gel once again [7]

Table 2.1. Formulation Hair Tonic Avemor

Materials	Concentration (%)					Function
	Formula 1	Formula 2	Formula 3	Formula 4 (-)	Formula 5 (+)	
Aloe vera gel	7,5	7,5	7,5	7,5	7,5	Active ingredient
Dried moringa leaf extract	2	4	6	-	-	Active ingredient
Sodium metabisulfit	0,1	0,1	0,1	0,1	-	Antioxidants
96% alcohol	15	15	15	15	-	Solvents,antimicrobials, regulators of viscosity
Propylene glycol	30	30	30	30	-	Cosolvent, humectant
Methyl paraben	0,2	0,2	0,2	0,2	-	Antimicrobial preservatives
Propyl paraben	0,02	0,02	0,02	0,02	-	Antimicrobial preservatives
Menthol	0,3	0,3	0,3	0,3	-	Cooling effect, penetration-enhancing
Aquades	Add 100	Add 100	Add 100	Add 100	-	Solvent
X brand	-	-	-	-	30 mL	Positive control

Procedur of Making Hair Tonic

Weighing the ingredients is how hair tonics are manufactured. Sodium metabisulfit dissolves with the residual aquades after the leaf extract has been diluted in a little amount of aquades. 96% alcohol is used to completely dissolve the parabens (methyl, propyl, and menthol). A solution of leaf extracts, sodium metabisulfit, methyl paraben, propyl paraben, and 96% alcohol are added to the homogenized aloe vera gel after it has been dissolved in propylene glycol to achieve homogeneity. Remove residues by filtering the solution using filter paper [6].

Physical Test

1. Organoleptic Test

Organoleptic tests are performed by observing the shape, color, and smell of the hair tonic preparations made [8].

2. Test of Homogeneity

In order to determine whether or not there are particles that are not uniformly disseminated, the homogenity test is carried out by putting a hair tonic on a glass plate [8].

3. pH Test

Using the pH stick, check the pH. After waiting a time for the color to change, compare it to the indicator's color. To prepare a hair tonic, a pH between 3 and 7 is needed [8].

4. Viscosity Test

Using the Oswald Viskometer instrument, the viscosity of hair tonic mixtures is tested. Viscosity levels of under 5 cPs are ideal for hair tonic formulations [9].

Hair Growth Test

1. Preparation of Test Animals

Each of the test animals had to undergo a 2-week adaptation period before being given a number using a permanent spigol on the head area. Six portions of hair with a four-sided shape of 4x4 cm each make up the hair on the right and left sides of the shave. The test area in the fourth segment is 2x2 cm and is labeled 1 to 6, and the boxes are 1.5 cm apart [10]. The rabbits' adaption process can last a week [11]. The test animal is given a 24-hour wait period after the measurement before the hair tonic formulation is applied [4].

2. Hair Growth Activity Test

Each test area is applied with 0.5 ml of hair tonic. P1, a normal control, was not smeared with any hair tonic products. Formula 4 was applied to P2 as a negative control, as it contains neither aloe vera gel nor moringa leaf extract. A positive control, P3, was applied using Formula 4 (Minoxidil 2%). Formula 1 (2% Moringa leaf extract) was applied to P4 in a thin layer. Formula 2 was applied to P5; this formula contains 4% moringa leaf extract. Formula 3, which contains 6% of Moringa leaf extract, was applied to P6. Figure 2.1 displays the baste pattern. Once daily for 21 days, up to 0.5 mL of the hair tonic mixture was applied.

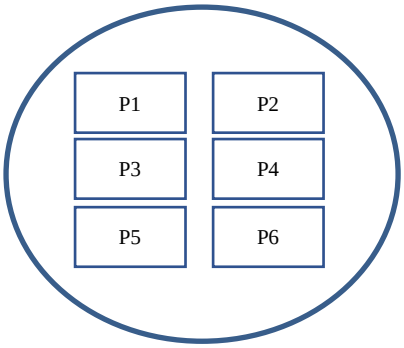


Fig 2.1. Pattern of Applying Hair Tonic [11]

Data Analysis

In order to understand how the concentration of leaf extract influences the viscosity and growth of rabbit hair, the data are analyzed using the normality and homogeneity tests. When data is not uniform or not distributed normally, Kruskal-Wallis is used to assess whether there are significant differences across treatments. One-Way ANOVA is used to examine data that is uniform and distributed regularly.

III. RESULT AND DISCUSSION

Aloe vera gel and a dried extract of Moringa leaves are the active ingredients in Avemor (Aloe vera and Moringa oleifera), a natural hair growth tonic. Propylene glycol serves as a plasticizer, humectant, and solvent in the formula. Both a penetration increase and a cold sensation are provided by menthol. Preservatives (antimicrobials) nipagin and nipasol are also employed, and sodium metabisulfite is another chemical that serves as an antioxidant [12].

Physical Evaluation

1. Organoleptic Test

Hair tonic formulations' organoleptic test findings come in liquid form. Golden yellow (F1 and F2) and brown (F3) colors can be found in formulas made with different dry extracts of moringa leaves. This demonstrates that the color of the hair tonic solution gets darker the more the dry extract of Moringa leaves is concentrated. The preparation for the hair tonic has a distinct aroma. The results of the organoleptic tests are shown in Table 3.1.

Table 3.1. Organoleptic Test Results

	F1 (Moringa leaf extract: 2%)	F2 (Moringa leaf extract: 4%)	F3 (Moringa leaf extract: 6%)	F4 (-)	F5 (+)
Form	Liquid	Liquid	Liquid	Liquid	Liquid
Color	Golden yellow	Golden yellow	Golden brown	Clear white	A bit yellow.
Smell	Specifically	Specifically	Specifically	Specifically	Specifically

2. Test of Homogeneity

The purpose of the homogeneity test for hair tonic formulations is to determine whether the formulations are homogenous. The even distribution of the active ingredients and other ingredients in hair tonic solutions is what defines the product as homogenous [12]. All preparations passed the homogeneity test, which revealed that they were all homogeneous. The absence of unevenly distributed particles serves as proof of this. Table 3.2 contains the results of the homogeneity test.

Table 3.2. Homogeneity Test Results

Formula	Homogeneity
F1	Homogeneous
F2	Homogeneous
F3	Homogeneous
F4	Homogeneous
F5	Homogeneous

3. pH Test

The purpose of the pH test is to determine what the preparation's pH level is. The pH preparation must match the pH of the scalp since a pH that is too basic might lead to scaly skin, and a pH that is too acidic will cause irritation. For formulations of hair tonics, a pH of 3 to 7 is ideal [8]. All formulations of hair tonics fulfill the specified pH value according to the findings of the measurement of the pH value of the preparation created. Table 3.3 contains the findings of the pH test.

Table 3.3. pH Test Results

Formula	pH
F1	6
F2	6
F3	6
F4 (-)	6
F5 (+)	5

4. Viscosity Test

Using an Oswald viscometer, the viscosity of the hair tonic formulations was evaluated. The viscosity of the hair tonic preparation must satisfy the specifications because if it has a viscosity that is too high, it may create a crust, which then causes dandruff. For hair tonic compositions, a viscosity of 5 cPs is required [8]. According to the viscosity test results, the formulations for hair tonic were eligible for the test. Using the Kruskal-Wallis test, the impact of variations in the concentration of dried leaf extracts on the preparation's viscosity was examined. Although the homogeneity test suggested that the data were distributed uniformly, the normality test findings indicated that the dispersed data was abnormal, with a significance value of 0.047. The data was then subjected to Kruskal-Wallis analysis, which revealed a significant difference with a significance value of 0.028. With a significant value of 0.050, Man-Withney's advanced tests on the data revealed differences between F1 and F3, F1 and F5, F2 and F3, and F5. The mass, shape, or size of the particles, as well as temperature, are variables that may have an impact on viscosity levels [13]. A higher concentration of the extract and a higher viscosity of hair tonic compared to straight. Due to the extract's higher concentration, which also causes a rise in viscosity, the extract will include more of the dissolved component [9].

The viscosity of formula 1 is higher than that of formula 3, because formula 1 contains 2% of the dry extract of moringa leaves, while formula 3 contains 6% of the dry extract of moringa leaves. The viscosity of formula 1 is higher than that of formula 5, because formula 1 contains 2% dry extract of moringa, while formula 5, which is the positive control, does not contain the extract. The viscosity of formula 2 is higher

than that of formula 3, because formula 2 contains 2% of the dry extract of moringa leaves and formula 3 contains 6% of the dry extract of moringa leaves. The viscosity of formula 2 is higher than that of formula 5, because formula 2 contains 2% dry extract of Moringa leaves, while formula 5, which is the positive control, does not contain the extract. The viscosity of formula 3 is higher than that of formula 4 because formula 3 contains 6% dry extract of Moringa leaves, while formula 4, which is a negative control, does not contain dry extract of Moringa leaves or aloe vera gel. The viscosity of formula 3 is higher than that of formula 5 because formula 3 contains 6% dry extract of Moringa leaves, while formula 5, which is the positive control, does not contain the extract. The results of the viscosity test can be seen in the table 3.4.

Table 3.4. Viscosity Test Results

Formula	Viscosity (cPs)			Average + SD
	R1	R2	R3	
F1	2,85	2,79	3,10	2,96 ± 0,14
F2	2,84	2,98	3,07	2,99 ± 0,10
F3	4,10	4,14	3,99	4,05 ± 0,07
F4 (-)	2,89	2,83	3,06	2,96 ± 0,10
F5 (+)	1,84	1,85	1,80	1,82 ± 0,03

5. Hair Growth Test

a. 7th Day

Tabel 3.5. Rabbit Hair Growth Day 7

Test Animal Number	1	2	3	4	5
Picture					

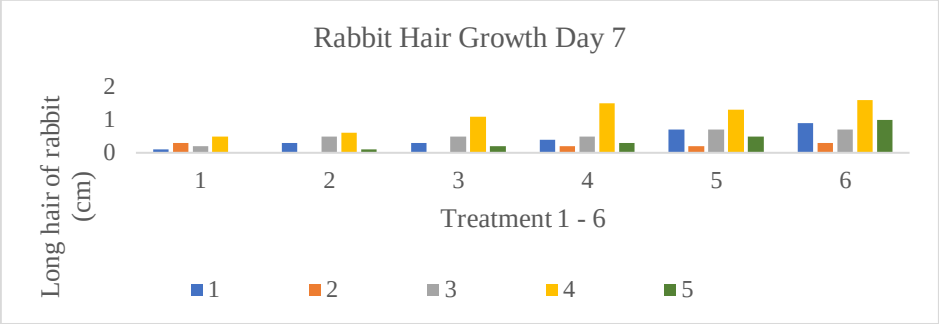
Tabel 3.6. 7th Day Rabbit Hair Measurement Results

Treatment	Long Hair of Rabbit (cm)					Average + SD
	1	2	3	4	5	
1	0,1	0,3	0,2	0,5	0	0,22 ± 0,17
2	0,3	0	0,5	0,6	0,1	0,30 ± 0,23
3	0,3	0	0,5	1,1	0,2	0,42 ± 0,42
4	0,4	0,2	0,5	1,5	0,3	0,58 ± 0,47
5	0,7	0,2	0,7	1,3	0,5	0,68 ± 0,36
6	0,9	0,3	0,7	1,6	1	0,90 ± 0,42

The average growth of rabbit hair on the 7th day for treatment 1 was 0.22 ± 0.17 cm, treatment 2 was an average of 0.30 ± 0.23 cm, treatment 3 was an average of 0.42 ± 0.42 cm, treatment 4 averaged 0.58 ± 0.47 cm, treatment 5 averaged 0.68 ± 0.36 cm, and treatment 6 averaged 0.90 ± 0.42 cm. Data analysis using SPSS showed that the results of the normality test showed that the data were not normally distributed with a significance value of 0.006, but the results of the homogeneity test showed that the data were homogeneously distributed with a significance value of 0.921. Data analysis was continued using Kruskal-Wallis, showing that there was a significant difference marked by a significance value of 0.091, which means that there was a significant difference in hair growth on day 7. Data analysis was carried out to determine differences between each treatment on rabbit hair growth.

The Mann-Whitney results showed that there was a difference between treatment 1 (normal control) and treatment 5 (formula 2), treatment 1 (normal control) and treatment 6 (formula 3), and treatment 2 (negative control) and treatment 6 (formula 3). Treatment 3 (Formula 5) resulted in smaller hair growth of 0.42 ± 0.42 cm when compared to treatment 4 (Formula 1), treatment 5 (Formula 2), and treatment 6 (Formula 3), which resulted in rabbit hair growth of 0.58 ± 0.47cm; 0.68 ± 0.36cm; and 0.90 ± 0.42 cm,

respectively. There are differences in the length of rabbit hair in different rabbits with the same treatment due to differences in hair measurement results based on the location of the extraction.



*Information:
Blue = Test animal 1
Orange = Test animal 2
Gray = Test animal 3
Yellow = Test animal 4
Green = Test animal 5

b. 14th Day

Table 3.7. Rabbit Hair Growth Day 14

Test Animal Number	**1**	**2**	**3**	**4**	**5**
Picture					

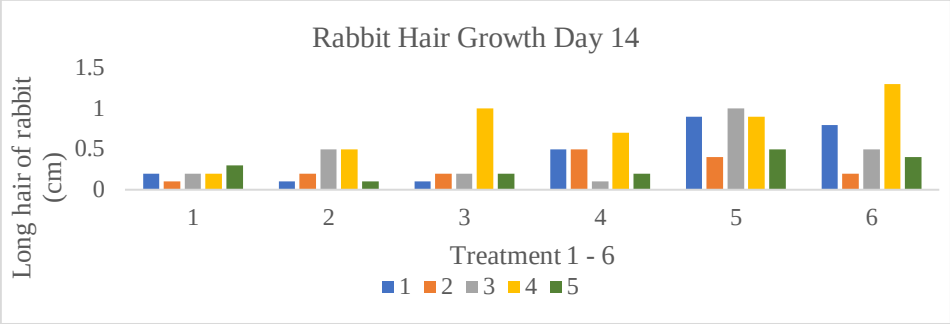
Table 3.8. 14th Day Rabbit Hair Measurement Results

Treatment	**Long Hair of Rabbit (cm)**					**Average + SD**
	1	**2**	**3**	**4**	**5**	
1	0,2	0,1	0,2	0,2	0,3	0,43 ± 0,06
2	0,1	0,2	0,5	0,5	0,1	0,27 ± 0,18
3	0,1	0,2	0,2	1	0,2	0,42 ± 0,33
4	0,5	0,5	0,1	0,7	0,2	0,77 ± 0,22
5	0,9	0,4	1	0,9	0,5	0,28 ± 0,24
6	0,8	0,2	0,5	1,3	0,4	0,43 ± 0,38

The average growth of rabbit hair on the 7th day for treatment 1 was 0.22 ± 0.17 cm, treatment 2 was an average of 0.30 ± 0.23 cm, treatment 3 was an average of 0.42 ± 0.42 cm, treatment 4 averaged 0.58 ± 0.47 cm, treatment 5 averaged 0.68 ± 0.36 cm, and treatment 6 averaged 0.90 ± 0.42 cm. Data analysis using SPSS showed that the results of the normality test showed that the data were not normally distributed with a significance value of 0.006, but the results of the homogeneity test showed that the data were homogeneously distributed with a significance value of 0.921. Data analysis was continued using Kruskal-Wallis, showing that there was a significant difference marked by a significance value of 0.091, which means that there was a significant difference in hair growth on day 7. Data analysis was carried out to determine differences between each treatment on rabbit hair growth.

The Mann-Whitney results showed that there was a difference between treatment 1 (normal control) and treatment 5 (formula 2), treatment 1 (normal control) and treatment 6 (formula 3), and treatment 2 (negative control) and treatment 6 (formula 3). Treatment 3 (Formula 5) resulted in smaller hair growth of 0.42 ± 0.42 cm when compared to treatment 4 (Formula 1), treatment 5 (Formula 2), and treatment 6 (Formula 3), which resulted in rabbit hair growth of 0.58 ± 0.47cm; 0.68 ± 0.36cm; and 0.90 ± 0.42 cm,

respectively. There are differences in the length of rabbit hair in different rabbits with the same treatment due to differences in hair measurement results based on the location of the extraction.



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Yellow = Test animal 4
Green = Test animal 5

c. 21st Day

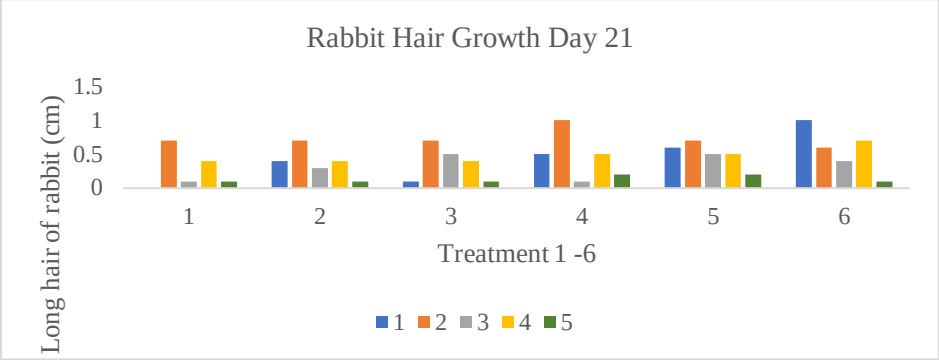
Table 3.9. Rabbit Hair Growth Day 21

Test Animal Number	**1**	**2**	**3**	**4**	**5**
Picture					

Table 3.10. 21st Day Rabbit Hair Measurement Results

Treatment	**Long Hair of Rabbit (cm)**					**Average + SD**
	1	**2**	**3**	**4**	**5**	
1	0	0,7	0,1	0,4	0,1	0,43 ± 0,26
2	0,4	0,7	0,3	0,4	0,1	0,73 ± 0,19
3	0,1	0,7	0,5	0,4	0,1	0,32 ± 0,23
4	0,5	1	0,1	0,5	0,2	0,48 ± 0,31
5	0,6	0,7	0,5	0,5	0,2	0,13 ± 0,17
6	1	0,6	0,4	0,7	0,1	0,43 ± 0,30

The results of measuring the length of the rabbit's hair on the 21st day obtained results, namely at P1 an average of 0.433 ± 0.26 cm, P2 an average of 0.73 ± 0.19 cm, P3 an average of 0.32 0.23 cm, P4 averaged 0.48 ± 0.31 cm, P5 averaged 0.13 ± 0.17 cm, and P6 averaged 0.43 ± 0.30 cm. Data analysis using SPSS obtained normality test results with a significance value of 0.001 and homogeneity test results with a significance value of 0.672. This means that the data is normally distributed but not homogeneous. The follow-up test using Kruskal-Wallis obtained a significance value of 0.068, which means there is a significant difference. Data analysis to find out whether there were significant differences between each treatment was carried out using Mann-Withney, and the result was that there were significant differences between treatments on hair growth. P3 (Formula 5) resulted in a rabbit hair growth of 0.32 ± 0.23 cm. The results of P3 hair growth were smaller when compared to P1 (normal control), P2 (Formula 4/negative control), P4 (Formula 1), and P6 (Formula 3), which resulted in successive hair growth of 0.43 0.26 cm; 0.73 ± 0.19cm; 0.48 ± 0.31cm; and 0.43 ± 0.30 cm.



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Avemor (Aloe vera and Moringa oleifera), a natural hair growth tonic, combines active components in the form of aloe vera gel and a dry extract of Moringa leaves. It is believed that the phytochemical ingredients present in Natural Hair Growth Tonic: Avemor (Aloe vera and Moringa oleifera) are what cause the hair growth activity it produces. The growth of hair may be influenced by flavonoid molecules and vitamins A, B1, and C. While vitamins A, B1, and C are nutrients that influence hair growth, flavonoid molecules have antioxidant, antibacterial, and antiviral properties [14]. In the experiment, a product with 2% minoxidil was employed as the positive control. It is used off-label to treat a variety of hair issues and has the potential to stimulate hair growth. Minoxidil is a strong arteriolar vasodilator [15]. The results of hair growth tests on days 7, 14, and 21 showed significant differences between treatments. Based on the results of previous studies, aloe vera contains a number of chemicals that can help hair growth, so it is necessary to do a phytochemical screening first to know if the ingredients described as positive active substances contain these substances. The difference in the length of rabbit hair measured is influenced by several factors. The stripped rabbit hair is considered to be the longest hair, and the different stripping locations on each treatment and on different rabbits affect the results of the measurement. Different health conditions in rabbits were also thought to affect rabbit hair growth. There were significant differences in rabbit hair growth on the 7th, 14th, and 21st days.

IV. CONCLUSION

Natural Hair Growth Tonic: Avemor (Aloe vera and Moringa oleifera) is made with variations in the concentration of dried leaf extracts 2% (Formula 1), 4% (Formula 2), and 6% (Formula 3) have a liquid shape, a gold-yellow and brown color (dried leaves extract 6%), a distinctive aroma, a pH of 6, and are homogeneous. Formula 4 (negative control) has a liquid shape, a bright white color, and a distinctive aroma. Formula 5 (Positive Control) has a liquid shape, a bright yellowish color, and a distinctive aroma. The viscosity of the preparation qualifies for the viscosity test with an average of formula 1 size 2,961 cPs ± 0,140, formula 2 size 2,991 cPS ± 0.096, and formula 3 size 4,051 cP ± 0.067. Formula 4 (the negative control) has a viscosity of 2,962 cPs. There are significant differences in terms of viscosity between Formula 1 and Formula 3; Formula 1 and Formula 5; Formula 2 and Formula 3; Formula 2 and Formula 5; Formula 3 and Formula 4; and Formula 3 and Formula 5. There are significant differences in rabbit hair growth on the 7th, 14th, and 21st days. The difference in hair growth in rabbits is influenced by the variation in the concentration of the dried leaf extract.

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