

FORMULATION AND PHYSICAL EVALUATION TEST OF *HAIR TONIC PREPARATION* ETHANOL EXTRACT OF MORINGA LEAVES (*MORINGA OLEIFERA*)

Fildhawati ¹, Muhammad Tasjiddin Teheni* ² Ratih Nurwanti ³

^{1, 2,, 3} Baubau Polytechnic, Baubau City, Indonesia

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CORRESPONDING AUTHOR

Name : Muhammad Tasjiddin Teheni
Address: Baubau
Email: muh.tasjiddin.teheni@gmail.com

ABSTRACT

Moringa leaves (*Moringa oleifera*) are used to stimulate hair growth due to their content of flavonoids, saponins, and tannins that act as antioxidants and keratolytics, increase the blood flow of hair follicles, increase their growth rate, and prevent hair loss. Objective: research on the manufacture of ethanol from moringa leaf extract (*Moringa oleifera*) as a tonic medicine for hair. Method: This study is qualitative with an extraction method that uses 96% ethanol solvent. Research Results: The results of the physical evaluation test that meet the requirements of the *hair tonic test* standard, namely the F1 organoleptic test, have a cloudy yellow color, a menthol-like smell and a liquid shape. F2 cloudy yellow color is slightly dark, the bauk has bulbs, liquid shape. F3 is a cloudy yellow rather dark, has a bulbous smell, liquid form. According to the homogeneity test, the hair tonic preparation is evenly mixed, free from deposits and insoluble particles of the three formulations. The pH test showed that F0 pH 4.0 was qualified, F1 pH 6.0 qualified, F2 6.07 qualified, and F3 pH 4.57 qualified, but the viscosity test for all formulas did not meet good viscosity standards. Conclusion: Moringa leaf (*Moringa oleifera*) extract can be used to improve hair health. The physical test results meet the standards of tonic hair tests, including organoleptic, homogeneity, and pH, but all formulas do not meet good viscosity standards.

Moringan oleifara leaves are used to stimulate hair growth. These leaves contain flavonoids, saponins and tannins, which function as antioxidants and preventing hair loss. The purpose of this study was to formulate an ethanol extract of Moringa oleifera leaves as a hair tonic and to conduct a physical evaluation of the hair tonic preparation. Method: This research is qualitative with extraction method using 96% ethanol solvent. Result of the research: This shows that Moringa leaf extract can be formulated as hair tonic preparation with concentration for formulation 1 which is 2%, formula 2 which is 3%, and formula 3 which is 4% in hair tonic preparation. The results of physical evaluation test that meet the standard requirements of hair tonic test are organoleptic test F1 has a cloudy yellow color, has menthol odor and liquid form. F2 is a slightly dark cloudy yellow color, has menthol odor, liquid form. F3 is a slightly dark cloudy yellow, has menthol odor, liquid form. Homogeneity test shows that the hair tonic preparation is mixed evenly, there are no insoluble particles and no sediment from the three formulations. The pH test showed that the results of F0 pH 4.0 met the requirements, F1 pH 6.0 met the requirements, F2 6.07 met the requirements and F3 pH 4.57 met the requirements of good pH, but the viscosity test for all formulas did not meet the good viscosity standards. Conclusion: Moringa oleifera leaf extract can be formulated into a hair tonic. The physical evaluation results met the standard requirements for hair tonic testing, including organoleptic testing, homogeneity testing, and pH testing. However, the viscosity test for all formulas did not meet the standard.

INTRODUCTION

One of the most important parts of the human body for human physiological and aesthetic needs is hair. Physiologically, hair protects the scalp from direct sun exposure, high temperatures, and mechanical damage (Mota-rojas et al., 2021). Moringa leaves have a pinnate arrangement and a smooth surface both at the top and the leaf. Its uniqueness lies in its thin and pliable leaf structure, allowing this plant to adapt to a variety of environments (Jandov et al., 2021). Benefits of moringa leaves (*Moringa oleifera*) has been proven in various studies, there are still significant gaps in the study of optimal topical

preparation formulations based on moringa leaf extract. Most of the previous research focused on evaluating its biological activities, such as antioxidant, anti-inflammatory and hair growth stimulation, without considering the physical stability aspects of the product produced. For example, research by (Kanlayavattanakul & Lourith, 2022).

This product moisturizes the hair, strengthens its roots, and stimulates its growth by increasing blood flow to the scalp. *Hair tonic* often contain natural active ingredients such as plant extracts that have a high nutritional content, such as moringa leaves (*Moringa oleifera*), aloe vera and hazelnut oil, which are known to improve hair structure and prevent hair loss (Hadi et al., 2023). Study by (Padule et al., 2022). It shows that moringa leaf extract can increase hair growth by increasing the proliferation of virgin papilla cells in hair follicles. In addition, the combination of tannins and flavonoids in this extract has also been proven to be able to strengthen hair roots and reduce hair loss. Hair length measurement after routine application *Hair tonic* A four-week dive recorded an increase of up to 30% proving the potential of moringa leaf extract as an effective natural alternative in hair growth.

The development of medicinal plant potential is very important because traditional medicine is very important for public health, and Indonesian people are increasingly aware of the importance of returning to nature by using traditional medicine to treat various diseases because it is considered to have lower side effects than chemical drugs. Thus, traditional medicine can be a safer and more effective option for the community (Teheni et al., 2023). Antioxidants, which can protect the body from free radicals, are very important for people. Moringa leaves—also known as *Moringa oleifera* have the ability to act as antioxidants. Vitamin E levels and antioxidant activity of moringa leaves (*Moringa oleifera*) were measured in this study. Moringa leaf extraction (*Moringa oleifera*) is carried out by maceration method using 96% ethanol (Areas et al., 2023).

Moringa plants are one of the plants of *Family Moringaceae* which has a lot of nutrients. There are a large number of free radical inhibitor molecules found in moringa plants. These include alkaloids, tannins, phenolic acid betalain, flavonoids, quinones, coumarin, lingnan, stilbenes, tannins, terpenoids (carotenoids), vitamins, and several other endogenous metabolites. Moringa plants also have many vitamins that have high antioxidant activity (Wahid et al., 2017). For example, research by (Kanlayavattanakul & Lourith, 2022) demonstrated significant antioxidant activity from moringa leaf extract, but did not test the compatibility of the active ingredient with the topical preparation base. Meanwhile, a study by (Kessler et al., 2024) suggests that although moringa leaves have biological potential, their effectiveness in cosmetic formulations is not always significant due to the degradation of active ingredients during storage. Therefore, in-depth research needs to be done on the effect of variations in moringa leaf extract concentrations on the efficiency and stability of preparations. This study should include a thorough evaluation of all aspects of hair growth.

The physical and chemical stability of hair tonic preparations is highly dependent on the right formulation, as well as the pH that should be within the safe range for the scalp, between 3.0 to 7.0 (Hanis Sumakno et al., 2021). The main ingredients in the hair tonic formulation greatly affect the quality and effectiveness of the product. One of the important ingredients is ethanol, which serves as the main solvent for moringa leaf extract. Ethanol also has antiseptic properties that help keep the scalp and hair clean (Hasanah et al., 2022).

METHOD

Types of research

This research includes quantitative research by making a formulation of *hair tonic* preparations of ethanol extract of moringa leaves (*Moringa oleifera*) whose extracts are taken as *hair tonic preparations* and go through several stages of testing, namely organoleptic tests, homogeneity tests, pH tests and viscosity tests.

Time and place of research

This research was conducted on May 3 -July 16, 2025, and was conducted at the Pharmacy Laboratory of Baubau Polytechnic.

Tools and Materials

A set of maceration tools (macerators), rotary evaporators, filter paper, cup cups, extract container bottles, test tubes, drip pipettes, containing rods, funnels, watch glass, pH meters, Brookfield viscometers, picnometers, and etiquette are all equipment used.

The ingredients used include moringa leaf extract (*Moringa oleifera*), 96% ethanol, propylene glycol, propyl paraben, menthol, sodium metabisulfite, and aquadest.

Sampling

In this study, a sample of moringa leaf plants (*Moringa oleifera*) taken from Kalia-lia village was used.

Working procedure

namely the preparation of simplicia, the manufacture of extracts (at the Bina Husada Kendari Pharmaceutical Laboratory). Moringa leaf simplicia (*Moringa oleifera*) used for extraction. 500 grams of moringa leaf powder are weighed, then put in a glass jar and soaked with 2000 milliliters of 96% ethanol. The jar is then covered with aluminum foil. The extraction was carried out for 6 hours at room temperature and away from light, and then repeated for 24 hours. Filtered moringa leaf extract and separated from the pulp. Filtered using filter paper. Cut the dregs using a flannel cloth. Steam the condensed extract over a water bath (Susanty & Bachmid, 2016). Next, ethanol extract of moringa leaves (*Moringa oleifera*) to make tonic preparations for hair and physical preparation tests were carried out at the Baubau Polytechnic Pharmaceutical Laboratory.

The physical preparation test of the *preparation of hair tonic* formulation of ethanol extract of moringa leaves consists of 4 tests, namely organoleptic testing, pH, homogeneity and viscosity.

Table 1 Formulation of *moringa leaf extract* (*Moringa oleifera*) hair tonic preparation.

Yes	Material	Formulation				Information
		F0	F1	F2	F3	
1.	Moringa leaf extract	0	2%	3%	4%	Active substances
2.	Propylene glycol	15%	15%	15%	15%	Hufixan
3.	Sodium Metabisulfite	0,001%	0,001%	0,001%	0,001%	Antioxidant
4.	Propyl parabens	0,1%	0,1%	0,1%	0,1%	Condoms
5.	Menthol	0,3%	0,3%	0,3%	0,3%	Cold Flavor Purifier
6.	Aquadest ad	100mL	100mL	100mL	100mL	Solvent

Source: Primary Data, 2025

Information

F0 : No active substance

F1 :Use 2% active ingredient

F2: Use 3% active substances

F3 :Uses 4% active substance

Preparation of Hair Tonic

All ingredients are weighed according to the formulation and mixed little by little. For example, 0.001 grams of Na Metabisulfite was mixed with aquadest, and the other ingredients were 15 grams of propyl paraben, 0.3 grams of menthol, 0.1 grams of propylene glycol, and 2 grams of F1, 3 grams of F3, and 4 grams of F4 extracts. Then the two mixtures are mixed little by little while stirring. Then the mixture is put into a container and the preparation is evaluated (Sona, 2018)

Physical characteristics

Organoleptic Test

The appearance of color, taste, texture, and aroma of tonic preparations are part of the organoleptic test.

Homogeneity Test

The results of the homogeneity check showed that the hair tonic preparation was evenly mixed (homogeneous), there were no insoluble particles, and the three formulations did not contain any deposits.

pH Test

The pH value of the hair tonic preparation is measured using an electrode pH meter, which is rinsed with aquadest. The pH value of hair tonic preparations is measured evenly on the scalp, so that the pH according to SNI is between 3.0 and 7.0. The purpose of pH testing is to determine the pH of the preparation as well as to evaluate the safety of the preparation *Hair tonic* so that it does not irritate the skin. (Damayanti et al., 2017).

Viscosity Test

The viscosity test was performed with a Brookfield viscometer device. The tonic preparation for hair is tested with spindle 1 at a speed of 30.0 rpm. Viscosity tests on moringa leaf extract hair tonic preparations (*Moringa oleifera*) showed an increase and decrease in viscosity as a result of temperature factors in storage. The results show that the preparation does not qualify as a good hair tonic. Storage conditions can also affect viscosity. The purpose of the viscosity test is to determine the level of viscosity of the hair tonic preparation; A good hair tonic preparation, according to SNI, has a viscosity below 5 Cp.

RESULTS & DISCUSSION

This study is an experimental research aimed at finding out that moringa leaf extract can be used as a hair tonic preparation to prevent hair loss and to find out that the hair tonic preparation has met the standard in the physical preparation test by using the maceration extraction method, the sample used is moringa leaf simplicia powder (*Moringa oleifera*). The solvent used is 96% ethanol. Its semipolar properties help to perfectly dissolve vitamin C compounds. The sample was concentrated using a *rotary evaporator* to obtain a thick extract of 14 g and a weight of 500 g of wet scabbard.

The initial stage of sampling moringa leaves (*Moringa oleifera*) is carried out in Kalia-lia village, After that, washing is carried out to remove dirt that sticks to the sample, then the stem and leaves are separated, After that, pruning is carried out to speed up the process of drying the sample, After that, the sample is dried in the sun and then aerated. This process is carried out with the aim of reducing the amount of water in the sample. Dried leaves are simply ground into a powder.

After that, moringa leaf simplicia powder is used as a thick extract in the wet maceration method. Then the thick extract of moringa leaves is converted into a hair tonic preparation made in 3 concentrates, namely formulation 1 has 2% active substances, formulation 2 has 3% active substances and formulation 3 has 4% active zak and uses additional substances, namely aquades as a carrier, propylene glycol as a moisturizer, sodium metbisulfite as an antioxidant, propyl paraben as a preservative, menthol as a cold sensation for each preparation.

Table 2 Organoleptic Test Results Hair tonic preparations.

Formula	Color	Smell	Shape	Picture
F0	Clear white	Typical menthol	Liquid	
F1	Cloudy yellow	Typical menthol	Liquid	
F2	A bit of a dark cloudy yellow	Typical menthol	Liquid	
F3	A bit of a dark cloudy yellow	Typical menthol	Liquid	

Source: Primary Data, 2025

The results of organoleptic observations in Table 4 show the results of the physical preparation test on each preparation, namely organoleptic test, pH test, homogeneity test, viscosity test. Organoleptic tests of *hair tonic preparations* were carried out by observing the shape, color and smell of the preparation. In each preparation that has been made, F0 has a clear white color, a typical smell of menthol and a liquid form, F1 has a cloudy yellow color, a typical smell of menthol and a liquid form, F2 has a cloudy yellow color and a somewhat dark cloudy color, a typical smell of menthol and a liquid form and F3 has a cloudy yellow color that is slightly dark, a typical smell of menthol and a liquid form.

Table 3 pH Test Results of *hair tonic* preparation.

Formula	Testing	Information	Picture
F0	4,00	Qualification	
F1	6,07	Qualification	
F2	6,07	Qualification	
F3	4,57	Qualification	

Source: Primary Data, 2025

The observation results in Table 5 show the pH value of formulation 1, formulation 2, and formulation 3. A very important parameter to know is the pH measurement, which can indicate that the active ingredient has spread in the preparation. The pH test uses a device in the form of a pH meter, which is with electrodes rinsed using aquadest, then dried to remove tissues. The electrodes are dipped in the preparation until it shows a constant pH. The recommended pH range with the Indonesian National Standard (SNI) for the scalp ranges from 3.0-7.0. pH Test *Hair tonic* which has been made in formulation 0, namely 4.00, formulation 1 6.07, formulation 2 6.07, and formulation 3 4.57. Each preparation has a normal pH and according to the standards that have been set. The purpose of the pH test is to determine the pH of the preparation as well as from the evaluation of the safety of the preparation *Hair tonic* so that it does not irritate the skin (Damayanti et al., 2017).

Table 4 homogeneity test results of hair tonic preparations.

Formula	Testing	Information
F0	Homogeneous	Qualification
F1	Homogeneous	Qualification
F2	Homogeneous	Qualification
F3	Homogeneous	Qualification

Source: Primary Data, 2025

Table 6 shows the results of the homogeneity test. The results showed that the *hair tonic* preparation was mixed evenly (homogeneously) and did not contain particles or deposits from the four formulations.

Table 5 viscosity test results of *hair tonic preparations*

Formula	Viscosity (Cp)	Requirements (Cp)	Information	Picture
F0	165,19	5	Not eligible	
F1	167,38	5	Not eligible	
F2	168,92	5	Not eligible	
F3	169,50	5	Not eligible	

Source: Primary Data, 2025

The results of the viscosity test observations in Table 7. The viscosity test is a test that measures how difficult a liquid is to flow, how much force needs to be exerted to make the liquid flow. The tool used in the study was a viscometer. The test of tonic ingredients for hair is carried out with spindle 1 at a speed of 30.0 rpm. Viscosity tests on moringa leaf extract (*Moringa oleifera*) hair tonic preparations showed an increase and decrease in viscosity as a result of temperature factors during storage. The results show that the preparation does not qualify as a good hair tonic. Storage conditions can also affect viscosity. The viscosity test is carried out to determine the level of viscosity of the hair tonic preparation, which must meet the Indonesian national standard (SNI), which is carried 5 Cp.

Preparation storage container *Hair tonic* in a sealed original container or dark glass bottle to protect from sunlight. Storage temperature conditions and temperature (25-2) °C, away from direct exposure to sunlight and anas. Do not store at extreme temperatures (too cold or hot), as this may affect viscosity. Avoid evaporation of karaena *Hair tonic* Usually containing alcohol, the bottle must be tightly closed so that it cannot evaporate which can change the viscosity (Joseph, 2025).

This research has similarities with a journal entitled The Use of Moringa (*Moringa oleifera*) as a preparation *Hair tonic* by (Damayanti et al., 2017) Where both use ethanol extract of moringa leaves as the main active ingredient and maceration method in the extraction process. This study emphasizes more on effective biological hair growth researchers, using rabbits as test animals with hair length and weight parameters as indicators of success. Unlike this study, which focuses more on physical testing of preparations, such as irritation, viscosity, stability, homogeneity, and pH tests. The focus of this research is on the safety aspects of physical preparations that are more relevant for human cosmetic applications, as well as the use of low concentrations of reality (2%, 3%, and 4%) that can be applied directly without risk of irritation. In addition, the data presented in this study is more systematic.

COVER

The results show that moringa leaf extract (*Moringa oleifera*) can be used to make soothing hair care products, but there is no optimal formulation in *hair tonic preparations* because all formulas do not meet the requirements of good viscosity tests. The results of physical evaluation tests that meet the requirements of *the standard hair tonic* test are organoleptic tests, pH tests, homogeneity tests, but the viscosity test for all formulas does not meet good viscosity standards.

This study has limitations in the viscosity test that does not meet the requirements because during the evaluation test there is an increase in viscosity due to the temperature factor in the storage condition can also affect viscosity.

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