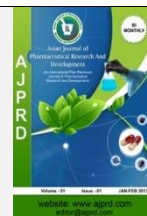


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Research Article

Formulation and Evaluation of Hair Tonic Gel Preparations Resistance Water Fraction N-Hexan Fruit Curm (*Phoenix Dactylifera* L.)

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ABSTRACT

Objective: This study aims to formulate and evaluate of hair tonic gel preparations resistance water fraction n-hexan fruit curm (*Phoenix dactylifera* L.)

Method: Dates are macerated with 80% ethanol, the extract is concentrated with a rotary evaporator dried with a freeze dryer, the extract is then fractionated with n-hexane. The concentrations used in the preparation of waterproof Hair tonic gel are 5, 7.5, 10 and 12.5% fraction of n-hexane then compared to Hair Tonic from the market. Evaluation of gel preparations includes checking homogeneity, pH, viscosity, irritation, and stability. The animals used are male white rats.

Results: The evaluation results of the waterproof gel evaluation on the fraction of n-hexane meet the SNI requirements. Hair tonic waterproof gel preparations yellow to dark brown, homogeneous for 12 weeks of storage at room temperature. The pH and viscosity are stable during 12 weeks of storage and do not irritate the skin. The best hair tonic waterproof hair growth gel growth activity at a concentration of 10%, n-hexane fraction (1.41 ± 0.07).

Conclusion: The preparation of waterproof hair tonic gel n-hexane fraction (*Phoenix dactylifera* L.) has hair growth activity.

Keywords: Dates (*Phoenix dactylifera* L.), formulations, waterproof gels, hair growth.

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INTRODUCTION

Hair is a crown for everyone because hair functions in addition to providing warmth, protection, hair also for beauty, supporting appearance¹. In general, hair loss every day ranges from 50-100 strands, but almost all hair loss will grow back and replace with new hair. However, if hair loss is more than 100 strands per day and occurs continuously, showing unhealthy hair characteristics². An easy way to deal with hair loss is to provide nutrition to the hair by using hair tonic as an ingredient to add nutrients to the hair³.

One of the plants which has efficacy as hair growth is Dates (*Phoenix dactylifera* L.), dates and seeds are considered to have special properties as hair growth stimulants [4]. The contents of dates include riboflavin, vitamin A, niacin, pyridoxine, thiamine, protein, folic acid, pantothenic acid, linoleic and oleic⁵.

The preparations commonly used to help hair growth are usually in gel form. Gel is a semi-solid system consisting of a suspension made of small inorganic particles or large organic molecules, penetrated by a liquid⁶. The advantages of gel preparations⁷ include: good ability to spread to the skin; no physiological inhibition of hair function; ease of washing; the release of the medicine is good.

Gel preparations made for hair tonic are waterproof gels, where the gel formula is added with a waterproof material which can provide a longer duration of effect. One material that is waterproof is dimethicone which has the advantage of being easy to spread and providing good softness and smoothness⁸.

MATERIALS AND METHODS

Materials

The materials used in this research are dates (*Phoenix dactylifera* L.), n-hexane, mercury (II) chloride, potassium iodide, sodium hydroxide, iodine, bismuth (III) nitrate, nitric acid, acetic acid, iron (III) chloride, concentrated hydrochloric acid, lead acetate, alpha naphthol, magnesium powder (Merck), 2 N hydrochloric acid, 96% ethanol, 2 N sulfuric acid, isopropanol, chloroform, amyl alcohol, concentrated sulfuric acid, carbopol 940, glycerin, methyl paraben, propyl paraben, sodium metabisulfite, dimethicone and minoxidil 5%.

Research Methods

Making Extracts of Dates (*Phoenix dactylifera* L.)

Using the maceration method with 80% ethanol as a solvent, carried out as follows: put 10 parts of simplicia with a suitable degree of fineness into a vessel, pour 75 parts of the search fluid, covered, left for 5 days protected from light while frequently stirring, stirring, squeezing, squeezing, washed pulp with enough liquid to find 100 parts. Moved into a closed vessel, left in a cool place, protected from light, for 2 days, filtered⁹.

Manufacture of n-hexane Fraction

As much as 90 grams of thick ethanol extract was dissolved in 96% ethanol until dissolved then 40 ml of distilled water were added, put into a separating funnel, then added 100 ml of n-hexane, then shaken, and allowed to stand until there were 2 separate layers (+ 30 minutes). The n-hexane layer (upper layer) is taken by flowing, and fractionation is carried out until the n-hexane layer gives negative results with LB reagents. The n-hexane layer collected was concentrated with a Rotary evaporator¹⁰.

A Waterproof Hair Tonic Gel Formula

Table 1: Waterproof hair tonic gel formula

Material	Formula I (%b/b)	Formula II (%b/b)	Formula III (%b/b)	Formula IV (%b/b)
FNHK	5	7.5	10	12.5
Dimetikon	3	3	3	3
Carbopol	0,5	0,5	0,5	0,5
Na. metabisulfite	0,1	0,1	0,1	0,1
Metilparaben	0,14	0,14	0,14	0,14
Propilparaben	0,02	0,02	0,02	0,02
PG	15	15	15	15
TEA	0,2	0,2	0,2	0,2
Aqua	Ad 100	Ad 100	Ad 100	Ad 100

Material is weighed entirely, then 940 carbopol sprinkled on distilled water, then left for one night, stirring using a magnetic stirrer with a speed of 800 rpm for 1 hour. Previously, methyl paraben, propyl paraben and Sodium metabisulfite were dissolved with ethanol and PG was dissolved with aquadest. After carbopol forming gel mass, methyl paraben, propyl paraben, sodium metabisulphite and PEG are mixed and stirred again, and gradually the TEA drops gradually to neutralize the gel base¹¹.

Gel Evaluation Check

It includes a waterproof effectiveness test and then dips the gel-coated hand on the back of the hand into a container

filled with water at a temperature of 23-32°C and is viewed for 40 minutes¹². Organoleptic see colors, smell and texture from the preparation of waterproof hair tonic gel for 12 weeks, homogeneity test using glass slide and glass cover with a homogeneous view of a test preparation, pH checking using pH meter with observations every week for 12 weeks¹³. The examination of mouse hair growth activity using calipers was performed every 7 days for 21 days¹⁴.

RESULTS AND DISCUSSION

Waterproof Effectiveness Test

Waterproof effectiveness test is carried out to find out the gel produced can last more contact with water. From the 6 panelists tested the results showed that the resulting gel can survive with water. This is because dimethicone (Silicone oil) is a non-polar component that can be used as an emollient because of its ability to protect the skin. Chemically the material is not able to lift sebum from the skin as in mineral oil. Silicone oil can be an effective barrier against chemical compounds that irritate the skin¹⁵.

Organoleptic Testing

The color of the waterproof gel formula in each n-hexane fraction formula; in formula IV produces a brownish color compared to Formula I, II, III which has a yellowish clear color. The color of the resulting waterproof gel preparation did not change after 90 days of storage. The resulting color difference is influenced by differences in the concentration of extract used.

The odor produced is in the form of a distinctive odor of dates in the formula IV of the n-hexane fraction while in formula III it has a slightly smelly date palm and in formulas I, II have a characteristic odor of carbopol.

PH Check

The pH value in the preparation of Hair tonic gel is waterproof n-hexane fraction, is still in the pH range that does not irritate the skin and in accordance with the established SNI. The pH value obtained is between 5.0-5.2. PH measurement is done every week. The pH of hair tonic preparations should range between 3.0-7.0 in accordance with SNI standard number 16-4955-1998 pH for hair tonic lotion preparations used on the scalp¹⁶. It can be concluded that each formula has a good pH value.

Viscosity Testing

Viscosity testing aims to determine the viscosity value of a substance, the higher the viscosity value, the higher the viscosity level of the substance¹⁷. A good viscosity value of gel preparations is 2000-4000 cps¹⁸. The viscosity value obtained shows that all formulas meet the viscosity value of the gel preparation for 90 days of storage.

Irritation Test

The results of irritation tests on volunteers carried out on 12.5% hair tonic gel preparations did not show any irritant reactions such as redness, itching, and tearing on the skin, it can be concluded that the formula of waterproof hair tonic

gel does not cause irritation to the skin and can be said that overall waterproof hair tonic gel is safe to use.

Test Activity of Dates Fruit Waterproof Gel Preparation for Mice Hair Growth

Table 2: Length of mouse hair

	Average Rat Hair Length (mm) \pm SD			
	Day of 0	Day of 7	Day of 14	Day of 21
Blanko	0	0,32 \pm 0,01	0,65 \pm 0,01	0,94 \pm 0,02
Positive Control	0	0,84 \pm 0,01	1,69 \pm 0,01	2,02 \pm 0,04
FNHK 5%	0	0,34 \pm 0,02	0,66 \pm 0,02	1,01 \pm 0,02
FNHK 7,5%	0	0,48 \pm 0,01	0,75 \pm 0,03	1,10 \pm 0,03
FNHK 10 %	0	0,66 \pm 0,04	0,89 \pm 0,02	1,41 \pm 0,07
FNHK 12,5%	0	0,74 \pm 0,01	1,26 \pm 0,06	1,32 \pm 0,04

The data shows that there are differences in the average hair length between each group. ANAVA test results showed a significant difference in the average hair length in all test groups. The test results showed a significant difference between the groups of n-hexane fraction of 10% concentration, 7.5% concentration and positive control compared to the fraction of n-hexane concentration of 12.5%, 5% concentration and blank (negative control) which had no difference meaningful on the 7th day.

Day 14 data on the average length of blank hair (0.65 \pm 0.01mm), n-hexane fraction concentration of 5% (0.66 \pm 0.02mm) did not have a significant difference ($p > 0.05$), whereas a concentration of 7.5% (0.75 \pm 0.03mm), a concentration of 10% (0.89 \pm 0.02mm), a concentration of 12.5% (1.26 \pm 0.06 mm) has a long hair growth activity. This shows that all waterproof hair tonic gel formulas have hair growth activity. All waterproof hair tonic gel formulas have significant differences with positive controls.

On day 21, the average length of blank hair, 5% n-hexane fraction, 7.5% n-hexane fraction, 10% n-hexane fraction, 12.5% n-hexane fraction were successively 1.01 \pm 0.02; 1.10 \pm 0.03; 1.41 \pm 0.07; 1.32 \pm 0.04 mm. Statistical data test results show that all groups and blanks have significant differences. This shows that all waterproof hair tonic gel formulas have less hair growth activity compared to ethanol extract.

Table 3: Rat hair weights

	Average Rat Hair Weight (mg) \pm SD
	Day of 21
Blanko	0,0116 \pm 0,001
Positive Control	0,0959 \pm 0,001
FNHK 5%	0,0329 \pm 0,001
FNHK 7,5%	0,0364 \pm 0,001
FNHK 10 %	0,0422 \pm 0,001
FNHK 12,5%	0,0317 \pm 0,001

This hair weight parameter was used to see the effect of the preparation of date palm waterproof hair tonic gel on the growth of white rat hair, carried out on hair weight on day 21.

Statistical test results showed that the hair weight data were normally distributed, so that the ANAVA test continued,

the results showed that there were significant differences in hair weight in each group of white rats. Of the three groups tested had significant differences ($p < 0.05$) with positive controls.

CONCLUSION

Hair tonic gel preparation waterproof n-hexane fraction Dates (*Phoenix dactylifera* L.) has hair growth activity.

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