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Research Article

THE UTILIZATION OF BINAHONG (*ANREDERA CORDIFOLIA* (TEN.) STEENIS) LEAF AS AN ANTI-AGING

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ABSTRACT

Objective: To formulate binahong leaf extract in the microemulsion dosage form and to evaluate the anti-aging effect on the human skin.

Methods: Binahong leaf extract was prepared by maceration then formulated into microemulsion dosage form with various concentrations of 0.1%, 0.3%, and 0.5%. The microemulsion preparation was prepared by adding the oil phase to the water phasehen mixed until a clear and transparent microemulsion was formed. Characterization of the dried powder included the determination of water content, water-soluble content, ethanol-soluble content, total ash content, and unsaturated acid ash content. Evaluation of microemulsion preparation included a stability test, determination of homogeneity, density, viscosity, pH, centrifugation, microemulsion type, surface tension, particle size, irritation test, and anti-aging effect test using skin analyzer. Anti-aging parameters measured included moisture, number of spots and wrinkles number.

Results: Characterization results showed the water content of 7.48%, water-soluble content of 19.2%, ethanol soluble content of 9.46%, total ash content of 4.65%, and acid content of 0.58%. Microemulsion preparation of the binahong leaf extract was homogen, had low viscosity, pH 6.0–7.0, density of 1.049–1.0753 g/ml, surface tension of 35.24–38.00 dyne/cm, particle size of 364.68–632.72 nm, stable for 12 weeks storage and did not irritate the skin. The results of anti-aging effect measurements showed that the 0.5% binahong leaf extract microemulsion gave the best results.

Conclusion: The dried powder of binahong leaf is qualified to be formulated. Microemulsion preparation of 0.5% binahong leaf extract showed the best anti-aging effect.

Keywords: Binahong, Microemulsion, Anti-aging.

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INTRODUCTION

Skin aging is a complex biological process influenced by a combination of endogenous and exogenous factors, which leads to structural and physiological alterations in the skin layer as well as changes in skin appearance, especially on the sun-exposed skin areas [1].

Aging can be inhibited by using anti-aging. Anti-aging is a cosmetic that has bioactivity that can prevent or improve signs of aging such as wrinkles, sagging skin, hyperpigmentation, and others so that the better skin appearance [2].

Bioactive phenols, especially bioflavonoids, are very interesting antioxidants because of their natural origin and the ability to act as efficient free radical scavengers [3]. The leaves of binahong can be used as anti-aging agents due to the secondary metabolites content such as saponins, flavonoids, quinones, steroids, monoterpenoids, as well as the rhizomes also contain flavonoids, polyphenols, tannins and steroids [4].

Binahong is used traditionally to cure various diseases, including for skin diseases, hypertension, inflammation and rheumatism. The leaves of binahong are also effective as a burning medicine, antibacterial, acne and smoothing the skin [4]. In an effort to achieve the optimum effect of using the binahong leaf extract as anti-aging, a good delivery system is required such as a microemulsion dosage form.

Microemulsions are a dispersion system developed from emulsion preparations. Many characteristics of microemulsions that make these preparations attractive for use as one of the drug delivery systems [5].

Microemulsion technology is applied in the cosmetic and pharmaceutical industry in the formulation of transdermal drug delivery systems and some topical preparations because of their potential to increase the permeation of drug across diffusion layers, good appearance, and drug solubilization [6].

Based on the things above, we conducted the study of binahong leaf extract formulated into microemulsion as an anti-aging dosage form.

MATERIALS AND METHODS

Materials

The plant material used in this research was binahong (*Anredera cordifolia* (Ten.) Steenis) leaf. The chemicals used were: 96% ethanol, hydrochloric acid, sulfuric acid, acetic acid anhydride, iron (III) chloride, bismuth (II) nitrate, magnesium, butanol, n-hexane, toluene, chloroform, distilled water, soybean oil, tween 80, PEG 400, methyl paraben, acid buffer solution (4.0), buffer solution of neutral pH (7.01).

Methods

Characterization of the dried powder of binahong leaf

Characterization of dried powder included macroscopic examination, microscopic examination, determination of water-soluble extract, determination of ethanol soluble content, determination of total ash content and the determination of acid soluble ash content as stated in Materia Medica of Indonesia [7], while the determination of water was performed as indicated in quality control methods for medicinal plants materials [8].

Extraction process

The method of extraction was maceration. Binahong leaves were extracted using ethanol 96%.

Table 1: The basic formula of microemulsion

Component	Concentration (%)
Sweet almond oil	5
Tween 80	30
PEG 400	25
Water	100

Table 2: The modified formula of microemulsion

Component	Formula			
	F0	F1	F2	F3
Ethanol extract of binahong leaf	-	0.1	0.3	0.5
Soy oil	5	5	5	5
Tween 80	30	30	30	30
PEG 400	25	25	25	25
Methyl paraben	0.1	0.1	0.1	0.1
Water	100	100	100	100

F0: Without extract, F1: The concentration of extract 0.1%, F2: The concentration of extract 0.3%, F3: The concentration of extract 0.5%

Preparation of binahong leaf extract microemulsion

The microemulsion formula used in this study was modified based on a formula used in a previous study [9] which can be seen in the Tables 1 and 2.

Methyl paraben was dissolved in distilled water, heated on the water bath, then left to be cool. The solution was used to dissolve the leaf extract of binahong, then the surfactant (tween 80) and cosurfactant (PEG 400) were added. The solution was strirred until homogen. Then soybean oil was added and stirred until homogen which was up to eight hours with speed of 4000 rpm.

Examination of the physical properties of microemulsion

Examination of stability

A total of 100 g of each formula was put into the plastic containers. Furthermore, the observations were conducted in the form of changes in consistency, colour and scent at the time of the preparation was prepared as well as in storage for 12 weeks at room temperature.

Determination of homogeneity

A certain amount of preparations were applied on a piece of glass or other suitable transparent material, preparations should show a homogeneous composition and no visible coarse grains [10].

Determination of emulsion type

Determination of the type of emulsion preparation was done by adding a drop of methylene blue into the preparation, if homogen in the external phase while stirring, then such emulsions are the type of oil in water (o/w), but when only blue spots appeared means emulsions are the water in oil (w/o) type.

Determination of viscosity

Determination of preparation viscosity was done by using the Brookfield viscometer. Procedure: Spindle 63 was attached to the viscometer and put into the preparation until the limit line. The motor was switched on at speed 3 so the spindle could rotate. The measurement was considered finished if the needle indicated a constant number. The viscosity was obtained by multiplying the readable numbers with a factor of 100.

Determination of pH

Determination of pH of the preparation was done by using a pH meter. The instrument must be calibrated using pH neutral buffer solution (pH 7.01) and acidic pH buffer solution (pH 4.01) until the instrument showed the pH values. Then, the electrode was washed with distilled water then dried with paper towels. The sample was prepared by dissolving 1 g of microemulsion into distilled water until 100 ml. The electrode was placed in the solution, pH of the solution appeared in the display screen [11].

Centrifugation test

The centrifugation test was performed at the beginning after the preparation was made. The microemulsion preparations were put into centrifugation tubes and then centrifuged at 3750 rpm for 5 h [12].

Determination of microemulsion density

Determination of microemulsion density was done at the beginning after the preparation was prepared. The density was measured using a pycnometer at room temperature. A clean and dry pycnometer was weighed (A g), then filled with water until full and weighed (A1 g). The water was removed from the pycnometer and the pycnometer was cleaned. The microemulsion preparation was loaded in the pycnometer until full and weighed (A2 g). The density was measured by the following calculation:

$$\text{Density} = \frac{A2 - A}{A1 - A}$$

Determination of surface tension

Determination of surface tension of microemulsion was done at the beginning after the preparation was prepared. The surface tension was measured using a Du Nuoy Tensiometer at room temperature. The sample was filled into a glass cup approximately 50%. The Tensiometer apparatus was calibrated using distilled water. If the Tensiometer was ready, the Du Nouy ring was cleaned by heating the ring on a Bunsen flame for 10–15 s. The ring was hung on the hook, then set the needle position at zero. The Du Nouy ring was put into the sample to a depth of 2–3 mm from the liquid surface. Then the ring was slowly lifted out of the sample liquid. Figures indicated when the ring detached was recorded as the surface tension value of the sample [13].

Determination of particle size

The particle size determination was performed at the Physical Integrated Laboratory in USU Medan using Vascoγ CORDOUAN Technologies Particle Size Analyzer at room temperature.

Irritation test

Irritation test conducted on 24 volunteers with patch test technique by attaching the preparation on the back of the ear.

Determination of anti-aging effect

The determination of anti-aging effect was done using Aramo SG® skin diagnosis system. Treatment was conducted for 4 weeks by applying the microemulsion twice a day for 4 weeks. Parameters measured including moisture, spot and wrinkles.

RESULTS

Examination of characterization of the binahong dried powder

The results of the characterization of binahong leaf dried powder showed the water content was 7.48%, water-soluble concentration was 19.2%, ethanol soluble concentration was 9.46%, total ash content was 4.65%, and unsaturated acid ash content was 0.58 %.

Examination of physical properties of binahong leaf extract microemulsion

The result of physical properties of binahong leaf extract microemulsion is shown in Table 3.

Anti-aging test

The result of the anti-aging effect using binahong leaf extract microemulsion on volunteer's facial skin was shown in Figs.1-3. From Figs. 1-3, it can be seen that binahong leaf extract could improve skin condition after 4 weeks treatment.

DISCUSSION

Based on the data in Table 3, it shows that each formula was homogeneous. The pH value was 6.00–7.00 which was within the range of permitted

Table 3: Physical properties of binahong leaf extract microemulsion

Parameter	Formula			
	F0	F1	F2	F3
Homogeneity	✓	✓	✓	✓
Emulsion type	o/w	o/w	o/w	o/w
Viscosity (after preparation)	500 cp	250 cp	250 cp	375 cp
Viscosity (after 12 weeks)	750 cp	250 cp	300 cp	400 cp
pH (after preparation)	7.0	6.4	6.4	6.2
pH (after 12 weeks)	6.7	6.0	6.0	6.0
Centrifugation	Do not change	Do not change	Do not change	Do not change
Type weights	1.0492 g/ml	1.0603 g/ml	1.0733 g/ml	1.0753 g/ml
Surface tension	35.24 dyne/cm	36.87 dyne/cm	37.00 dyne/cm	38.00 dyne/cm
Particle size	380.68 nm	364.68 nm	528.57 nm	632.72 nm
Stability	Stable	Stable	Stable	Stable
Irritation	-	-	-	-

✓: Homogeneous, -: No irritation, o/w: Oil in water

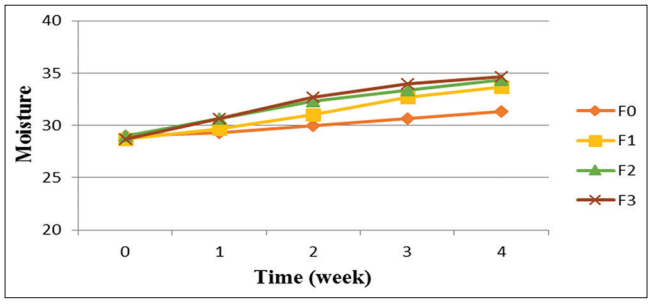

Fig. 1: Improvement of skin moisture in 4 weeks treatment

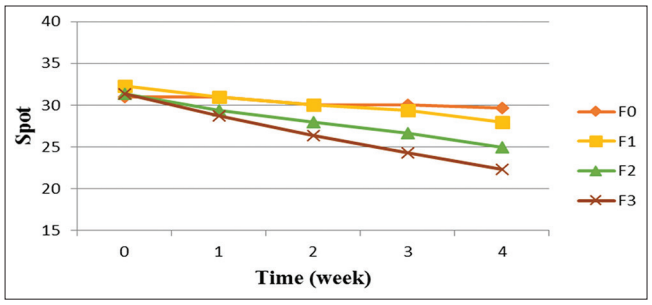

Fig. 2: Improvement of skin spot in 4 weeks treatment

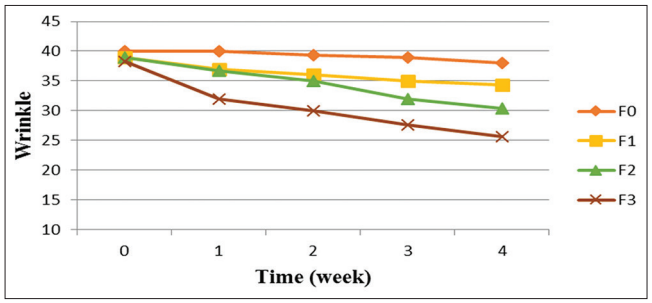

Fig. 3: Improvement of wrinkle level in 4 weeks treatment

pH requirements for cosmetics (5-8). Each formula was stable during storage and non-irritating to the skin and it can be assumed that the overall preparations of microemulsion were safe to be used.

Based on the figures, the microemulsion of binahong leaf extract 0.5% showed the best effectiveness of anti-aging compared to other preparations.

CONCLUSION

The dried powder of the characterized binahong leaves shows the appropriate result to be formulated. The binahong leaf extract can be formulated in microemulsion preparations as an anti-aging and microemulsion of 0.5% binahong leaf extract shows the best anti-aging effect.

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CONFLICT OF INTEREST

There is no conflict of interest.

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