

The Serum Formulation of Hati Tanah Tuber Ethanol Extract from Central Kalimantan

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ABSTRACT

Introduction: Lately, the use of natural cosmetics can have a good effect on the skin. One of them is traditional beauty treatments. The Serum is a preparation with low viscosity, because of its low viscosity serum is categorized as an emulsion preparation. From the results of research that has been carried out, ethanol extract of Hati Tanah tuber has great potential as an anti-acne because it can inhibit the growth of acne-causing bacteria such as *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Propionibacterium acnes*. With the innovation of serum ethanol extract of Hati Tanah tuber, it can be an option for the community later in the treatment of acne. **Methods:** The formulation is made in 4 (four) formulas with different concentrations of the main ingredients used. Next is to weigh all the ingredients needed according to each formula. Then physical properties test performed. a) Organoleptic test; b) Homogeneity Test; c) pH test; d) Spreadability Test and e) Adhesion Test. **Results:** The organoleptic test was carried out directly by looking at the shape and color and smelling the serum preparation of the ethanol extract of Tanah Hari tubers. The test results show that at F0 (0%) the color is clear, for F1 (0,5%) it is quite pale pink, F2 (1%) is bright pink and F3 (5%) is dark red. For scent organoleptic, F0 indicates no scent, for F1 and F2 there is a distinctive scent from the Hati Tanah tuber which is slightly pungent, while F3 shows a pungent aroma typical of the Hati Tanah tuber. The resulting serum has a thick texture at F0 and F1, a watery texture at F2 and a thinner texture at F3. All of the formulas have met the physical test requirement of organoleptic properties, homogeneity, pH, and adhesion test. **Conclusion:** The simplicia of Hati Tanah tuber can be made into an innovative cosmetic preparation in the form of serum with a concentration of 0,5%, 1% and 5%. From the results of testing the physical properties of the formulations, all of the formulas have met the physical test requirement of organoleptic properties, homogeneity, pH, and adhesion test. **Key words:** Serum, Formulation, Hati Tanah Tuber Ethanol Extract.

INTRODUCTION

The use of plants that have health benefits has long been carried out by the community because empirically plants have minimal side effects and are more economical because they are easy to obtain.¹ The Hati Tanah plant is one of the medicinal forest plants from Central Kalimantan which has been used by the community as traditional medicine. Empirically the tubers of this plant are used by the community in treating mild to moderate wound infections, diarrhea, and malaria. In a study the simplicia of Hati Tanah tubers was positive for secondary metabolites of flavonoids, tannins, saponins and catechols.² And in a study the ethanol extract of the Hati Tanah tuber contained secondary metabolites of flavonoids, tannins, saponins and steroids.³ The presence of secondary metabolites in the Hati Tanah tuber indicates the presence of pharmacological activity that can be used as an ingredient in traditional medicine. One of the pharmacological activities that can be used is as an antibacterial. Flavonoid compounds can damage cell walls, causing cell death. Flavonoids can also inhibit the formation of proteins to inhibit the growth of bacteria. The mechanism of action of flavonoids as an antibacterial is to denature bacterial cell proteins and can damage the cytoplasmic membrane.⁴ The mechanism of action of tannins as an antibacterial is to inhibit the enzyme reverse transcriptase and DNA topoisomerase so that bacterial cells cannot be

formed.⁵ The mechanism of action of saponins as an antibacterial is to reduce surface tension, resulting in increased permeability or cell leakage and resulting in the release of intracellular compounds.⁵

Previous research has been carried out to see the activity or potential of the ethanol extract of Hati Tanah tuber on bacterial growth. Previous research in 2015, which was to test the inhibitory power of the ethanol extract of the Hati Tanah tuber soil on *Staphylococcus aureus* bacteria. The results showed that the ethanol extract of the Hati Tanah tuber was able to inhibit the growth of *Staphylococcus aureus* bacteria at concentrations of 1%, 5%, 10%, and 15%.⁶ Further research has also been carried out using the N-Butanol fraction from the ethanolic extract of the Hati Tanah tuber and gave the same result that the N-Butanol fraction of the Hati Tanah tuber was able to inhibit the growth of *Staphylococcus aureus* bacteria at concentrations of 1%, 5%, 10%, and 15%.⁷

Then in 2019, another research was conducted to test the inhibitory power of the ethanolic extract of the liver of the Hati Tanah tuber on *Staphylococcus epidermidis* bacteria with concentrations of 1%, 5%, 10%, and 15% and the results showed that there was a potential inhibition of the ethanol extract of the Hati Tanah tuber on the bacteria *Staphylococcus epidermidis*. In 2021, a study was conducted to test the inhibitory power of the ethanol extract of the Hati Tanah tuber on *Streptococcus pyogenes* bacteria, and the results obtained at concentrations of 5%, 10% and 15% of the ethanolic extract of the Hati Tanah

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tuber were able to inhibit the growth of *Streptococcus pyogenes* bacteria. And the results of research in 2022 showed that the ethanol extract of ground liver tubers could inhibit the growth of *Propionibacterium acnes* bacteria at concentrations of 0.5%, 1%, 5% and 10%. From the results of the inhibitory tests that have been carried out, it becomes the basis for researching the development of Hati Tanah tubers, especially development of pharmaceutical preparations. This study aims to create an innovative preparation from the ethanol extract of the Hati Tanah tuber that can be used by the community. The innovation of pharmaceutical preparations made is serum.

Lately, the use of natural cosmetics can have a good effect on the skin. One of them is traditional beauty treatments. Natural treatments are relatively safer than using synthetic chemicals. The Serum is one of a series of skincare that is widely used by the public. The Serum is a preparation with low viscosity, because of its low viscosity serum is categorized as an emulsion preparation. The Serum has the advantage of having a high concentration of active ingredients so that the effect is more quickly absorbed by the skin, so it can provide a more comfortable effect and spread more easily on the surface of the skin because its viscosity is not too high.⁸ This preparation will deliver a thin film layer of active ingredients on the skin surface with a high concentration of active substances.⁹ Types of serum include antiacne, brightening, antiaging, eyelash serum, and others. Currently also developing serum derived from natural ingredients. One of the benefits of serum that is often used is as an anti-acne. From the results of research that has been carried out, ethanol extract of Hati Tanah tuber has great potential as an anti-acne because it can inhibit the growth of acne-causing bacteria such as *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Propionibacterium acnes*. With the innovation of serum ethanol extract of Hati Tanah tuber, it can be an option for the community later in the treatment of acne.

MATERIAL AND METHODS

Material and tools

The materials used in this study were ethanol extract of Hati Tanah tuber, 96% ethanol, aquadest, glycerin, methyl paraben, carbomer, propylene glycol, sodium metabisulfite, triethanolamine (TEA).

The tools used in this study were beakers, measuring cups, test tubes, erlenmeyer, measuring flasks, measuring pipettes, stirring rods, porcelain dishes, ball pipettes, mortar and stamper, percolator, water bath, digital balance, blender, rotary evaporator, aluminum foil, and serum bottle

Research stage

Selection and sampling

The Hati Tanah plant used in this study was the ground liver plant obtained from a seller of medicinal plants at Kahayan Market, Palangka Raya City.

Collection of *Propionibacterium acnes* bacteria: The bacteria used were from the Microbiology Laboratory, Faculty of Health Sciences, University of Muhammadiyah Palangkaraya

Simplicity making: The process of making Hati Tanah tubers simplicia begins with collecting the raw material for Hati Tanah tubers, then wet sorting and washing using clean running water, after which the tubers are thinly sliced to expand the surface of the raw material. The next stage is the drying process which is carried out by drying and then after drying the simplicia is re-sorted and mashed into powder.¹⁰

Extract making: Making the ethanol extract of the Hati Tanah tubers using the percolation method by weighing the simplicia of the Hati Tanah tubers as much as 453 grams and put into the percolator. Next,

Table 1: Serum formulation of hati tanah tuber ethanol extract.

Material	Concentration (%)			
	F0	F1	F2	F3
Ethanol Extract of Hati Tanah Tubers	0%	0,5%	1%	5%
Carbomer	0,5%	0,5%	0,5%	0,5%
Gliserin	10%	10%	10%	10%
Propanediol	10%	10%	10%	10%
Natrium metasilfit	0,5%	0,5%	0,5%	0,5%
Metil paraben	0,5%	0,5%	0,5%	0,5%
Propilenglikol	5%	5%	5%	5%
TEA	0,5%	0,5%	0,5%	0,5%
Aquadest	Ad 50ml	Ad 50ml	Ad 50ml	Ad 50ml

Table 2: The organoleptic test result of serum formulation of hati tanah tuber ethanol extract.

Formulation	The Results of Organoleptic Test		
	Colour	Scent	Texture
F0	clear	No Scent	thick texture
F1	pale pink	distinctive scent	thick texture
F2	bright pink	distinctive scent	watery texture
F3	dark red	distinctive scent	thinner texture

Table 3: The homogeneity test result of serum formulation of hati tanah tuber ethanol extract.

Formulation	The Results of Homogeneity Test
F0	Homogenous
F1	Homogenous
F2	Homogenous
F3	Homogenous

Table 4: The dispersion test result of serum formulation of hati tanah tuber ethanol extract.

Formulation	The Result of Dispersion Test			
	Weight			
	0 gram	50 gram	100 gram	150 gram
F0	6,33 cm	6,43 cm	6,56 cm	6,71 cm
F1	8,68 cm	9,00 cm	9,18 cm	9,34 cm
F2	9,74 cm	10,18 cm	10,98 cm	11,99 cm
F3	9,41 cm	10,55 cm	11,88 cm	12,81 cm

Table 5: The adhesion test result of serum formulation of hati tanah tuber ethanol extract.

Formulation	The Result of Adhesion test
F0	95 second
F1	62 second
F2	53 second
F3	121 second

Table 6: The result ph test of serum formulation of hati tanah tuber ethanol extract.

Formulation	The Results of pH Test
F0	5
F1	5
F2	6
F3	5

add 96% ethanol solvent until all the simplicia powder is submerged and let the solution stand for 1 x 24 hours. After 24 hours, the existing filtrate was accommodated and the immersion and addition of a new



solvent were carried out again until the filtrate obtained was clear in colour. Evaporating the obtained filtrate until it becomes a thick extract, then the extract yield is calculated

Serum formulation: The first step is to make a serum formulation with the main ingredient composition, namely the ethanol extract of the Hati Tanah tuber along with the required additional ingredients. The formulation is made in 4 (four) formulas with different concentrations of the main ingredients used. Next is to weigh all the ingredients needed according to each formula. Mix all dry ingredients gradually starting from carbomer, Sodium Meta Bisulfite and methyl into a mortar and then ground until homogeneous. Then add Propylene glycol and grind until thickened. Adding Glycerin and TEA are gradually ground again until homogeneous. Add propanediol and stir again until homogeneous, then the last ingredient to be added is the ethanol extract of the Hati tanah tuber. All ingredients are ground until the desired serum mass is formed. The following is the formulation of the serum ethanol extract of Hati Tanah tuber.

Physical properties test

Organoleptic test: Observations of the preparations included the aroma, colour and texture of each formulation of Hati Tanah ethanol extract serum which was observed 3 times for 1 month.

Homogeneity Test: The preparation was tested using two slides, where the sample was placed on one slide and placed evenly. Good preparation must be homogeneous and free from particles that are still agglomerated.

pH test: pH testing is carried out using universal pH paper dipped in a diluted gel sample. The colour changes that occur are matched with universal pH standards. Gel preparations generally have a pH value between 4-6.

Spreadability test: This test is carried out by weighing as much as 0.5 grams of serum and then placed in a round glass, the other glass is placed on it and left for 1 minute. After that, added 150 grams of load, was allowed to stand for 1 minute, and measured constant diameter.

Adhesion test: A sample of 0.25 grams is placed between 2 glasses of objects on the adhesion test equipment, then a load of 1 kg is pressed for 5 minutes, the load is lifted 4 and is given a load of 80 grams on the tool and the gel release time is recorded.

RESULTS AND DISCUSSION

The Hati Tanah plant is one of the plants that have been used by the Dayak people as traditional medicine. It's just that the processing of Hati Tanah tubers as the main raw material in traditional medicine is still simple. Therefore, it is necessary to innovate pharmaceutical preparations for Hati Tanah tubers so that they can be easily used by the community and are safe and efficacious if used by the community. This study aims to create an innovative pharmaceutical preparation from the ethanol extract of Hati Tanah tuber. Based on previous research, the ethanolic extract of the Hati Tanah tuber was able to inhibit the growth of acne-causing bacteria, namely *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Propionibacterium acnes*. Therefore, a serum preparation with the main active ingredient was chosen, namely ethanol extract of Hati Tanah tuber. The Serum is one of the cosmetic preparations that are currently in great demand by the public, especially in the treatment of acne.

The ethanol extract of the Hati Tanah tubers was obtained using the percolation extraction method. Percolation is an extraction process that is commonly used in industry and is influenced by time and the ratio of solvents.¹¹ The time or length of the extraction process determines the content of the compound that comes out of the material, as well as the ratio of the solvent, the amount of extractant involved in the transfer determines the level of concentration difference which is very important in the diffusion process that affects the compound content.¹² Percolation is a cold extraction method that does not affect the temperature of the process. By using the percolation extraction method, it is hoped that the active compounds contained in the liver tubers are not damaged. From the results of the extraction, the yield of the ethanol extract of the Hati Tanah tubers was 25.8%.

The serum formulation of the ethanol extract of the Hati Tanah tuber used a variation of the formulation on the concentration of the ethanol extract of the Hati Tanah tuber used. The serum formula for the ethanol extract of Hati Tanah was F0 (0%), F1 (0.5%), F2 (1%) and F3 (5%). In making serum, in addition to using the main ingredient, namely ethanol extract of Hati Tanah tuber, additional ingredients are also used consisting of carbomer, glycerin, propanediol, sodium metabisulfite, methylparaben, propylene glycol, TEA and aqua dest. Pharmaceutical preparations have good quality if they are not toxic, effective, efficient, stable, and comfortable. To meet these criteria, it is necessary to optimize the formulation of the preparation so that

the preparation can reach the desired therapeutic site, has minimal toxicity, high stability and as much as possible does not interfere with daily activities. Optimization was carried out using carbomer as a gelling agent, propylene glycol as a humectant, and triethanolamine (TEA) as an alkalizing agent. Carbomer was chosen because it is easily dispersed in water with only a small concentration and propylene glycol serves to improve the properties of the carbomer if it binds to the drug too strongly by increasing the solubility of the drug substance.¹³ Triethanolamine was chosen because it can provide an alkaline atmosphere to the carbomer so that the resulting gel becomes thick and clear.¹⁴ In this formulation, propylene glycol is used as a humectant, humectants also play a role in maintaining water loss from the gel so that the gel will be more stable. The humectant to be used is propylene glycol. Propylene glycol is a clear liquid, the texture is chewy, colorless, odorless, and tastes like glycerin. Apart from being a humectant, propylene glycol can also be used as a solvent, extractant, preservative, disinfectant, and antimicrobial agent. Propylene glycol is stable at low temperatures and in closed containers because it is protected from oxidizing agents. The stability of propylene glycol can be increased by adding 95% ethanol and glycerin or water.¹⁵ With the combination of the main ingredients with additional ingredients, it is expected to produce a serum preparation of Hati Tanah ethanol extract that can meet the requirements of the physical properties of topical preparations.

Physical properties testing on topical preparations aims to determine whether the resulting preparations have met the specified requirements. The first physical property test conducted was the organoleptic test. Organoleptic test was carried out to see the physical appearance of the resulting serum preparation. Organoleptic is done macroscopically using the senses by describing the color, smell, and dosage form.¹⁶ The organoleptic test was carried out directly by looking at the shape and color and smelling the serum preparation of the ethanol extract of Hati Tanah tubers. The test results show that at F0 the resulting color is clear, for F1 it is quite pale pink, F2 is bright pink and F3 is dark red. These results indicate that the higher the concentration of the ethanol extract used, the lighter and darker the color of the serum preparation. For scent organoleptic, F0 indicates no scent, for F1 and F2 there is a distinctive scent from the Hati Tanah tuber which is slightly pungent, while F3 shows a pungent aroma typical of the Hati Tanah tuber. The resulting serum has a thick texture at F0 and F1, a watery texture at F2 and a thinner texture at F3.

The second physical property test that was carried out was the homogeneity test. The homogeneity test aims to observe the presence or absence of coarse particles in the preparation. According to Pharmacopoeia Indonesia edition III, good topical preparation is the absence of lumps and the resulting flat structure. The results of the homogeneity test showed that all serum formulas of the ethanol extract of the Hati Tanah produced did not show any coarse grains and it could be concluded that all formulas were homogeneous. Good preparation must be homogeneous and free from particles that are still clumping.⁹

The next test was the pH test on serum preparations of the ethanol extract of Hati Tanah tubers. The pH test was carried out to ensure that the pH of the resulting serum preparation was safe for use on facial skin. Topical preparations should have a pH that is by the pH of the skin, namely 4.5-6.5 because if the topical preparation has a pH that is too alkaline it can cause the skin to become dry, whereas if the pH is too acidic it will cause skin irritation.¹⁷ When viewed from the results of the tests carried out, all serum formulas for the ethanol extract of Hati Tanah tubers gave pH test results by the requirements.

The fourth test of physical properties is the dispersion test. Testing the dispersion of serum ethanol extract of Hati Tanah tuber aims to see the ability to spread the serum over the skin surface when used.

Testing the spread ability of the gel using weight from 0-150 grams. A good dispersion diameter is 5-7 cm.¹⁸ The test results show that F0 has a dispersion power by the requirements, while F1, F2 and F3 have a dispersion value of >7 cm which is concluded not to meet the requirements. This could be due to the concentration of the ethanol extract of Hati Tanah tuber in serum preparations affecting the dispersion ability.

The final physical property test is adhesion. Adhesion test was carried out to determine the ability of the cream to adhere to the skin surface. Adhesive ability is one of the conditions for the cream to be applied to the skin. The greater the adhesion, the longer the contact time between the cream and the skin, so that the absorption of the drug through the skin is greater. The requirements for a good adhesion test are if the resulting adhesion time is more than 1 second.¹⁸ The results of the adhesion test showed that F0, F1, F2 and F3 gave the adhesion time that met the requirements. The difference in concentration affects the adhesion of serum preparations, F3 with 1% ethanol extract concentration has a longer adhesion time.

CONCLUSION

The simplicia of Hati Tanah tuber can be made into an innovative cosmetic preparation in the form of serum with a concentration of 0.5%, 1% and 5%. From the results of testing the physical properties of the formulations, all of the formulas have met the physical test of organoleptic properties, homogeneity, pH, and adhesion test.

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AUTHOR CONTRIBUTIONS

Nurul Qamariah as conceived, designed the analysis, performed the analysis and wrote the manuscript.

Rezqi Handayani as analyzer, wrote the manuscript and collector of the data.

CONFLICTS OF INTERESTS

Declared none.

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