

Literature Study of Three Plant Formulations with Anti-Candida Albicans Activity in Feminine Liquid Soap Preparations

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Abstract—Candida albicans is a fungus that causes vaginal discharge in women. Leucorrhoea is a discharge from the vagina with a relatively small frequency, odorless, and clear. In Indonesia, there are many plants that have medicinal properties that are used in traditional medicine and are believed to have antifungal activities. Feminine hygiene soap is a liquid cleansing preparation for femininity which is made from basic ingredients and is used to clean the feminine area without causing irritation to the skin. This study aims to provide information about plants that have anti-fungal activity and their formulation as a good female liquid soap preparation with their activity as an anti-candida albicans. The method in this research is by searching literature studies from various journals. The results showed that each female liquid soap preparation with plants as the active substance gave different inhibition diameters. The difference between the active substance and the additive in the formulation affects the resulting inhibition diameter. Based on the results of a literature review, basil, cabbage (*Brassica oleracea* var. capitata alba) and waru (*Hibiscus tiliaceus*), has activity as an antifungal against *Candida albicans*.

Keywords—Leucorrhoea, antifungal, *Candida albicans*, liquid soap

I. INTRODUCTION

Since ancient times, treatment with traditional ingredients has been carried out in Indonesia. One of the alternative ways to find antifungal agents is through the use of traditional medicines. The guava plant as part of the family medicinal plant (toga) has been used by the community for traditional medicine (Latief, 2014). Leucorrhoea or fluorine albus is a symptom of a genital disorder experienced by many women, which is characterized by a yellowish-white or grayish-white discharge from the nasal passages. Normally, every woman can experience vaginal discharge. Women are prone to reproductive disorders because the female reproductive organs are in direct contact with the outside world through the intercourse, the uterine cavity, fallopian tubes or fallopian tubes that start in the mother's stomach. This direct relationship results in ongoing external infection that can travel to the abdominal space in the form of peritonitis [1]. The female sex organs, such as the vagina, are very sensitive to environmental conditions. Because it is hidden and closed, Humid conditions will invite the breeding of fungi and pathogens. This is one of the causes of vaginal discharge (Widyastuti, 2009). However, you need to be aware that vaginal discharge can also occur due to infections caused by bacteria, viruses, fungi or parasites. Handling of vaginal discharge caused by *Candida albicans* can be in the form of healthy behavior in maintaining genital hygiene, maintaining

clean underwear, and washing hands before washing the genitals and the use of chemical drugs [2].

Leucorrhoea medications include Flucytosin, Ketocanazole, Fluconazole, Posakonazole, and Ekinocandin fluconazole which are some of the antifungal treatment options for *Candida albicans* (Katzung, 2013). The use of antifungal agents that are not in accordance with the rules is often the cause of fungal resistance (Elin et al., 2008), so this is what triggers the search for new treatment agents that are more effective in inhibiting fungal activity and have lower side effects. This is done is by using traditional ingredients because it is considered to have smaller side effects compared to those from chemicals and the price is relatively affordable [3]. Besides that, antibiotic treatment is one of the efforts made to cure the disease. Even though the continuous use of antibiotics can result in a reduction in the normal flora found in the vagina. As a result, the fungus replaces the normal beneficial flora position.

Feminine hygiene soap is a liquid cleansing preparation for femininity which is made from basic ingredients and is used to clean the feminine area without causing irritation to the skin. Indonesia has a lot of plants that are used as herbal remedies and as spices in cooking, for example basil, cabbage (*Brassica oleracea* var. capitata alba), and waru (*Hibiscus tiliaceus*) . These three plants are believed to have anti-*Candida albicans* activity. Fresh cabbage contains water, protein, fat, carbohydrates, fiber, calcium, phosphorus, iron, sodium, potassium, vitamins (A, C, E, thiamine, riboflavin, nicotinamide), calcium, and beta carotene. It also contains cyanohydroxybutene (CHB) compounds, sulforafan, and iberine which stimulate the formation of glutathione (Dalimartha, 2000). It is reported that cabbage is effective for treating gout (gout, joint swelling), diarrhea, deafness, and headaches; crushed cabbage is a herb commonly used to treat mushroom poisoning (Vincent, 1998). In addition, cabbage is also traditionally used as an itching medicine due to *Candida* fungus (candidiasis), fungi on the scalp, hands and feet, high blood cholesterol levels, arthritis (arthritis), antidotes for hangovers, liver toxins, difficult defecating, preventing the tumor from enlarging, Basil leaves contain flavonoids, alkaloids, saponins, tannins and triterpenoids which have the potential to be anti-fungal, therefore the aim of this study was to determine the anti-fungal activity of EEK against *Candida albicans* and formulate it into liquid soap preparations for women. The leaves of waru (*Hibiscus tiliaceus* L.) where the leaves contain saponins, flavonoids, polyphenols and triterpenoids which can act as anti-fungi [4] and based on research conducted by Kusuma (2009), waru plants that have

antifungal properties are in part of the stem where at a concentration of 15.8% has an anti-fungal effect and the content in the stems of the warui plant is alkaloids, triterpenoids, flavonoids and carbohydrates and in the leaves of the waru plant at a concentration of 5% to 20% shows an increasing antibacterial effect, the content contained in plant leaves waru are saponins, steroids, tannins, polyphenols, and flavonoids [5]. This study aims to determine which plants have antifungal activity and their formulation as a good female liquid soap preparation with their activity as an anti-fungal. Through this research, it is hoped that it can provide benefits, namely information on anti-fungal activity, especially *Candida albicans* from various plants and its formulation as a preparation for feminine liquid soap (feminine hygiene).

II. METHOD

The method used is library search. The literature used is in the form of scientific journals, national and international journals. Literature studies were carried out using the help of the Pubmed online journal search site with the keyword "femine hygiene". The articles used for this literature study are articles with a publication range from 2010-2020, published online from various web journals and google. The criteria for the inclusion of articles that will be used as research materials, namely those containing search keywords, are experimental research, including the feminine hygiene formulation method. . Based on the search, 25 journals were obtained and journal screening was carried out, so that a total of 12 journals were obtained. Obtained 5 main journals and 3 supporting journals as libraries that display the formulation and evaluation of gel preparations so.

III. RESULT

Formula I (Ami Tjitraresmi, 2010)

Substance name	Formula		
	A0	A1	A2
Cabbage ethanol extract (gram)	-	7	8.75
PEG 400 (gram)	0.5	0.5	0.5
Viskolam SMC-20 (gram)	0.3	0.3	0.3
0.1 M (ml) citric acid solution	21.67	21.67	21.67
0.2 M (ml) Na ₂ HPO ₄ solution	65	65	65
Acnibio AC (%)	0.0125	0.0125	0.0125
Ol. Rosae (drops)	5	5	5
Distilled water up to (100 ml)	100	100	100
Organoleptic Observation Results			
Formula	Form	Color	Smell
A1	Solution	Dark brown	-
A2	Solution	Dark brown	Typical cabbages
A3	Solution	Dark brown	Typical cabbages
Result of Change in pH			
Days to	A0	A1	A2
1	6.6	6.4	6.3
3	6.6	6.4	6.3
7	6.5	6.3	6.2
14	6,, 6	6.4	6.4
21	6.5	6.3	6.2
28	6.5	6.3	6.3

35	6.6	6.4	6.3	
42	6.6	6.4	6.3	
49	6.6	6.4	6.3	
56	6.6	6.4	6.3	
Results of the Antifungal Activity Test of Cabbage Ethanol Extract Liquid Soap Preparation against <i>Candida albicans</i>				
Formula	Day 0		Day 56	
A0	-	-	-	-
A1	1.01	1.02	1.02	1.02
A2	1.65	1.65	1.65	1.65

Formula II [6]

Substance name	Formula			
	A (%)	B (%)	C (%)	K (-)
Extract Leaf Waru	5	10	15	-
Na Lauril Sulfate	10	10	10	10
Propylene glycol	4	4	4	4
Setil alcohol	2	2	2	2
Adeps lanae	2	2	2	2
Cera flava	2	2	2	2
Acid citric	0.25	0.25	0.25	0.25
Ol. Rosae (drops)	1 ml	1 ml	1 ml	1 ml
Distilled water up to (100 ml)	50	50	50	50
Organoleptic Observation Results				
Formula	Form	Color	Smell	
A	liquid	Deep Green	Typical smell rose	
B	liquid	Deep Green	Typical smell rose	
C	liquid	Deep Green	Typical smell rose	
K (-)	liquid	Deep Green	Typical smell rose	
Result of Change in pH				
Week	A	B	C	D
I	3	3	3	3
II	4	4	4	4
III	4	4	5	5
IV	3	3	3	3
The average diameter of the inhibition zone of Waru leaf's feminine cleansing liquid soap using disc disk method				
Formula	The average yield for the inhibition zone diameter			
A (5%)	21.10 mm			
B (10%)	21.77 mm			
C (15%)	20.55 mm			
D (LACTACYD)	15.32 mm			
E (BLANKO)	18.66 mm			

Formula III [7]

Substance name	Formula		
	A (%)	B (%)	C (%)
Extract Leaf basil	1	5	10
Na Lauril Sulfate	10	10	10
Propylene glycol	4	4	4
Setil alcohol	2	2	2
Adeps lanac	2	2	2
Cera flava	2	2	2
Acid citric	0.25	0.25	0.25
Distilled water up to (100 ml)	100	100	100
Organoleptic Observation Results			
Formula	Form	Color	Smell
A	liquid	Deep Green	Typical smell
B	liquid	Deep Green	Typical smell
C	liquid	Deep Green	Typical smell
K (-)	liquid	Deep Green	Typical smell
The average diameter of the inhibition zone for the feminine cleansing liquid soap of basil leaves using the disc disc method			
Formula	The average yield for the inhibition zone diameter		
A (1%)	21.26 mm		
B (5%)	22.27 mm		
C (10%)	23.67 mm		
CONTROL +	22.36 mm		
CONTROLS -	18.50 mm		

A review was carried out on the formulation and evaluation of the femine hygiene preparation. The evaluation used was organoleptic observation, and anti-Candida albicans activity. The results of the liquid soap formulation of cabbage ethanol extract had organoleptic characteristics: a solution form, dark brown color, and a characteristic cabbage odor. The results of the evaluation, which included observations of organoleptic, pH, specific gravity and antifungal activity during the storage period (56 days), showed that both the test formula and the blank formula had good stability. The antifungal activity produced by the two test formulas also showed that the greater the ethanol extract concentration, the greater the diameter of the inhibition formed. Based on this research, the A2 formula with a cabbage ethanol extract concentration of 8.75% was the best formula and met the requirements of anti-whiteness liquid soap. The results of the comparative antifungal activity test showed that the ethanol extract liquid soap preparation had smaller activity than the commercial liquid soap containing Povidone iodine as the active substance. The appeal value is 1: 0.2576. The results of the irritation test showed that the A2 formula and the cabbage ethanol extract did not cause irritation, compared to normal controls.

Evaluation of the physical stability of feminine cleansing liquid soap preparations includes organoleptic observation, pH measurement, and anti-Candida albicans activity test. Evaluation of its activity was observed using the activity test

method for feminine cleansing liquid soap preparation against *Candida albicans* fungi. Organoleptic test was carried out to determine the physical characteristics of the liquid cleansing soap for femininity of hibiscus leaf extract whether it met the desired criteria or not. This test is done visually based on the characteristics of the shape, color and smell of the liquid cleansing liquid soap for women, organoleptic examination is carried out for 4 weeks. Based on the results of organoleptic observations, it shows that the liquid cleansing soap for femininity of waru leaf extract with various concentrations such as 5%, 10% and 15% from the first to the fourth week remain dark green, have a distinctive smell of roses, liquid and there is no growth of bacteria or fungi, this indicates that the liquid feminine cleansing liquid soap preparation is stable during storage at room temperature (25°C). one of the requirements for the quality of female liquid soap. This aims to determine the safety of the preparation when used so that it does not irritate the skin of the female area and can cause problems and damage the normal flora in the vagina if the pH is not in accordance with the pH in the female area. Based on the pH test carried out from the first week to the fourth week of liquid cleansing soap for femininity, the extract of waru leaves with an extract concentration of 5% has a pH of 3, 10% concentration has a pH of 4 and a concentration of 15% in the first to second week has a pH of 4 and in the third and fourth weeks it has a pH of 5 even though there is a change in pH at a concentration of 15% in the third and fourth weeks but the pH is still included in the pH range of liquid soap preparations femininity, where according to Chusniasih (2018) the pH requirements for feminine cleansing liquid soap are in accordance with the normal pH of the female area, namely pH 3.5-4.5 and the pH requirements for feminine cleansing liquid soap according to Mutmainah (2016) ranges from pH 5.5 -8, These 5 values will not interfere with the normal flora of bacteria in the vagina. The antifungal activity test aims to determine the ability of hibiscus leaf extract (*Hibiscus tiliaceus*) to inhibit fungal growth. Performed using the disc disk method, the use of this method because the technique is simple and straightforward. The fungus used in this test is *Candida albicans* because this fungus is the most common cause of vaginal discharge in women. PDA (Potato Dextrose) media was used in this test because the media is commonly used for fungal growth media. The diameter of the inhibition zone against the fungus *Candida albicans* was influenced by the concentration of hibiscus leaf extract. The results of the antifungal test were the feminine cleansing soap preparation of waru leaf extract which had the highest activity in inhibiting the growth of *Candida albicans* fungus at a concentration of 10% with an inhibition zone of 21.77 mm. When compared with negative control (blank without extract) and positive control (lactacyd®) inhibition of feminine cleansing soap preparations with a concentration of 5%.

Based on the test results, the concentration of basil extract which has the highest activity in inhibiting the growth of the fungus *Candida albicans* is at a concentration of 60%. However, when compared with positive control (nystatin 100 IU) basil extract with 60% concentration of activity in inhibiting the growth of *Candida albicans* was still lower where the diameter of the inhibition zone in the positive control group was 18.63 mm. This is because in EEK there are various kinds of compounds that can affect or cause reduced activity in inhibiting the growth of *Candida albicans*. Positive control (nystatin 100 IU) had the highest zone of inhibition compared to the other test groups. This is because nystatin is

a proven drug for infection with *Candida albicans*. Nystatin will only be bound by mildew or sensitive yeast. The antifungal activity depends on the presence of binding with sterols on the cell membrane of fungi or yeast, especially ergosterol. Because the mechanism of action of nystatin is by binding to fungal cell membrane sterols, especially ergosterol. As a result, there is a disruption in the permeability of the fungal cell membrane and its transport mechanism, as a result, the fungal cells lose a lot of cations and macromolecules (Ganiswara, 1995). Based on the general standards issued by the Indonesian Ministry of Health (1988), it is stated that microbes are said to be sensitive / sensitive to antimicrobials if they have a diameter of the inhibition zone of 12-24 mm. The average inhibition zone of basil extract concentrations of 10%, 20%, 40% and 60% in this study ranged from 12–16 mm, this proves that basil extract is sensitive to *Candida* and can be used as an anti-fungal against *Candida albicans*.

IV. CONCLUSION

Based on the review, the liquid soap of female hygiene basil extract has the best anti-*Candida albicans* inhibitory power compared to liquid soap preparations from waru and kobis leaf extracts.

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