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Research Article

In vitro testing of emulgel with a combined extract of *Sansevieria trifasciata* Prain. and *Curcuma longa* Linn. against the Candida albicans

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ABSTRACT

Content of flavonoids in *Sansevieria trifasciata* Prain. and curcumonoids in *Curcuma Longa* Linn. can inhibit the growth of the fungi *Candida albicans* in the wound. An innovative formulation was made that form a combination of antifungal extracts *S. trifasciata* and *C. longa* in the form of emulgel, which is easy to absorb and can moisturize the skin. The purpose is to determine the effect of antifungal activity of emulgel preparations using *S. trifasciata* extract with a concentration of 0%; 5%; and 10%, and *C. longa* 10% against *C. albicans*. *S. trifasciata* and *C. longa* extracts are formulated into emulgel in three formulas, F1 (*C. longa* 10%); F2 (*S. trifasciata* 5%; *C. Longa* 10%); and F3 (*S. trifasciata* 10%; *C. Longa* 10%). Antifungal activity was tested using the diffusion well method. The results of antifungal activity research showed inhibition zone diameter, inhibitory activity, and effectiveness. There were no significant differences in formula 1, formula 2, formula 3, but there were significant differences with positive controls. Variation the concentration of *S. trifasciata* 5% and 10% has no significant effect on the inhibitory zone of the *C. albicans*, but the three emulgel of *S. trifasciata* and *C. Longa* extract had antifungal activity on the growth of *C. albicans*.

1. INTRODUCTION

Infection is a disease that is easily found in tropical regions like Indonesia. Among the most common types of infection are superficial candidiasis, which is an acute and sub-acute fungal disease caused by the Candida fungus, usually by Candida albicans. Superficial candidiasis in humans is usually found in the groin, between the toes and armpits.

In the market, there are many antifungal drug formulations formulated in the form of creams or ointments; therefore, researchers to innovate antifungal combination of turmeric extract and sansevieria extract in the form of emulgel. Emulgel is a type of oil-in-water (m/a) or water-in-oil (a/m) emulsion mixed with a gel base. Emulgel can be used as a hydrophobic carrier (Anwar, Ramadon & Harmita, 2014).

One of the secondary metabolites of turmeric (*Curcuma longa* Linn.) is curcumin, which can reduce inflammation and speed up the healing process in wounds (Lima, Pereira-Wilson & Rattan, 2011). Besides, curcuminoids in *C. longa* can also be used as an antifungal (Kim, Choi & Lee, 2003). While the content of secondary metabolites (*Sansevieria trifasciata* Prain) known to the public as the sansevieria plant has flavonoid activity that can be used as an antifungal (Komala, Yulia & Pebrianti, 2012; Lombogia, Budiarso & Bodhi, 2016)

Emulgel has beneficial properties such as right consistency, longer contact time, thixotropic, transparent, can moisturize, easy absorption, and smooth spread (Haneefa, Easo, Hafsa, Mohanta & Nayar, 2013). Therefore, in this study, emulgel preparations were made using turmeric extract and sansevieria active ingredients to make it easier in topical use. Moreover, the evaluation carried out testing the effectiveness of antifungals on *C. albicans* in vitro by the wells method.

2. MATERIALS AND METHODS

Ingredients used in this study include an extract from the sansevieria (*S. trifasciata*) and turmeric extract (*C. longa*) (Materia Medica), carbomer, tween 80, triethanolamine (TEA), propylene glycol, parafin liquid, methylparaben, propylparaben, BHT, aquadest (CV. Cipta Anugerah Bakti), span 20 (Ashali Chemical), Sabouraud Dextrose Agar, and *C. albicans* Mushroom (UMM Biomedical Laboratory). The tools used in this study consisted of a digital analytical balance (Metter Toledo), antifungal activity test equipment, ointment pots, aluminum foil, porcelain cup, stainless steel bowl, mortar and stamper, glassware including beaker, measuring cup, stem stirrers, dropper pipettes, slide glass and watch glasses. In this research, the formula of Emulgel with different levels of the active ingredient of the sansevieria extract is F1 (0%); F2(5%); and F3 (10%) combined with turmeric extract 10%. The complete formula can be seen in **Table 1**.

Carbomer is developed with some water in a cup and added TEA little by little and stirred, then checked with a pH indicator to match the pH of the skin. Then made the water phase (sansevieria extract, propylene glycol, methylparaben, and tween 80) stir the ad soluble in beaker glass, then the oil phase (turmeric extract, propylparaben, span 20, paraffin liquid, and BHT) stir the ad soluble in beaker glass. Furthermore, the oil phase is introduced little by little into the water phase, where an emulsion is formed, then it is mixed into a gel base, stirring ad homogeneously.

3. RESULTS AND DISCUSSIONS

Based on the results of the antifungal emulgel test, the diameter of the inhibition zone of emulgel preparation showed that the first replication of positive control (15.89 mm); F1 (11.10 mm); F2 (12.21 mm); and F3 (12.36 mm), the second replication of positive control (16.91 mm); F1 (11.72 mm); F2 (12.06 mm); and F3 (12.13 mm), and the third replication of positive control (18.58 mm); F1 (13.58 mm); F2 (13.60 mm); and F3 (14.60 mm).

Data analysis was then performed with the One-Way Anova method to determine the effect of variations in the concentration of the sansevieria obtained the results of the homogeneity test that is 0.086 and concluded that the data obtained were homogeneous ($p > 0.05$). The Anova obtained significant results of 0,000, which shows that there are significant differences because the *p-value* < 0.05 so that it is continued with the analysis using the Honestly Significant Difference test (Tukey HSD) in this test serves to determine the difference in significance in each formula.

The results obtained between F1 with F2 *p-value* (0.980) > *α value* (0.05); F1 with F3 *p-value* (0.852) > *α value* (0.05); and F2 with F3 *p-value* (0.990) > *α-value* (0.05), which means that there is no significant difference between each formula. Whereas in F1, F2, and F3 compared to positive control has *p-value* (0.002); (0.004);and (0.007) which shows that all of the formula has significant differences in inhibiting *C. albicans*. Likewise, negative

Table 1. Emulgel formula.

Material Name	Material Function	Concentration (%w/w)			
		Control	F1	F2	F3
Sanseviera trifasciata Prain	Active Ingredients	-	0	5	10
Curcuma Longa Linn	Active Ingredients	-	10	10	10
Carbomer	Gelling agent	2	2	2	2
Triethanolamine (TEA)	pH adjust	qs	qs	qs	qs
Sorbitan Monolaurat (Span 20)	Emulgator	2.345	2.345	2.345	2.345
Polysorbate (Tween 80)	Emulgator	2.655	2.655	2.655	2.655
Parrafin liquid	Emolient	5	5	5	5
Methyl Paraben (Nipagin)	Preservative	0.1	0.1	0.1	0.1
Propyl Paraben (Nipasol)	Preservative	0.1	0.1	0.1	0.1
Propylene glycol	Humectant	10	10	10	10
Butyl Hydroxyl Toluene (BHT)	Antioxidant	0.1	0.1	0.1	0.1
Aquadest	Solvent	ad 100	ad 100	ad 100	ad 100

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Table 2. Results of measurement of inhibition zone diameter of emulgel preparation of sansevieria and turmeric extracts against *C. albicans*.

Replication	Inhibitory Zone Diameter (mm)				
	Positive Control	Negative Control	F1	F2	F3
1	15.89	6.00	11.10	12.21	12.36
2	16.91	6.00	11.72	12.06	12,13
3	18.58	6.00	13.58	13.60	14,60
Average	17,13	6.00	12,13	12.62	13.03
SD	± 1.36	± 0.00	± 1.29	± 0.85	± 1.36

controls were compared with all of the formula and positive controls has *p-value* (0,000).

Curcumin is the main bioactive component of turmeric. Curcumin and essential oils which have a role as antioxidants, antitumor, anticancer, antifungal, antimicrobial, and anti-poison (Hartati, 2013). The mechanism of action of curcumin in inhibiting the growth of *C. albicans* is by inhibiting protein synthesis so that it can result in inhibition of microbial growth (Khan et al., 2012; Neelofar et al., 2011; Wientarsih, Widhyari & Aryanti, 2013). Saponins in the plant of the sansevieria of the tongue are useful for influencing collagen, which is in inhibiting excessive scar tissue production (Ulya & Rusman, 2012). Besides, saponin compounds have soap-like properties, which are potent surfactant agents so that they can reduce cell surface tension (Robison & Nestler, 2011). Saponin absorption on the cell surface will cause damage by increasing the permeability or leakage of the cell membrane, so that essential material needed by bacteria/fungi for their lives are lost and can cause bacterial/ fungal cell death (Robison & Nestler, 2011).

The presence of carbon groups strongly influences the content of steroids and triterpenoids in the sansevierias as an antifungal. Where this carbon group, when in contact with *C. albicans*, will react with acidic compounds that make up the bacterial/fungal cell wall. For flavonoid compounds against the fungus, *C. albicans* have a mechanism by damaging cell walls, and these compounds can enter the cell nucleus (Sa'diah, 2004).

Associated with data on minimum inhibitory concentration (MIC) of curcumin against *C. albicans* shows that curcumin concentrations higher than 80 µM (29.5 mg/l) or 0.02% can produce antifungal effects (Khan et al., 2012; Sharma, Aqil, Jeyabalan, Gupta & Singh, 2013). In this study the concentration of curcumin extract 10% was used, which with this concentration was able to provide antifungal effects on *C. albicans*.

4. CONCLUSIONS

Based on the results of the research that has been carried out, it can be concluded that there is no significant difference in the inhibition zone diameter between emulgel F1 (Turmeric 10%), F2 (Sansievera 5% and Turmeric 10%), and F3 (Sansievera 10% and Turmeric 10%).

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