

## RESEARCH ARTICLES

# Administration Of Aloe Vera Extract (Aloe Vera L.) Effectively Inhibits The Growth Of The Fungus *Malassezia Furfur* Causing The Occurrence Of Pythriaasis Versicolor In Vitro

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Jln.Gedung Arca No.53, Medan-Sumatera Utara, 2019

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**Abstract:** Pytiriasis versichloror, or better known as panu, is a skin infection caused by a superficial fungus, *Malassezia furfur*. This disease causes skin discolouration, accompanied by itching in the infected area. Although not contagious, pityriasis versichloror occurs in adolescents or young adults, with risk factors including tropical climate, individual hygiene, environmental factors, age, sex, and genetic factors. Herbal plants, such as aloe vera (*Aloe vera L.*), have potential as an alternative treatment. Aloe vera has a wide variety of ingredients such as quinones, saponins, aminoglycosides, caffeine, tannins, salicylic acid, flavonoids, synaptic acid, essential oils, and sulfur, some of which have antifungal properties. Previous research has shown that aloe vera extract has an inhibitory effect on the growth of *Malassezia furfur fungus*. This study aims to determine the effectiveness of giving aloe vera extract (Aloe vera l.) on the growth of the fungus *Malassezia furfur*, which causes versichloror pityriasis in vitro. This study is an experimental research with a posttest-only control group design. Research shows that the administration of aloe vera extract has a positive impact on inhibiting the growth of *Malassezia furfur fungus*. Statistical analysis using *the Mann-Whitney* test confirmed that aloe vera extract effectively inhibited the growth of the fungus. The 90% concentration of aloe vera extract showed the best inhibition effect compared to the concentrations of 80% and 85%. This study shows that aloe vera extract has the potential as an antifungal agent to treat versicolor pityriasis. The 90% concentration of aloe vera extract showed the best inhibition effect, and these findings could be the basis for the development of new therapies in the treatment of versicolor pityriasis using aloe vera extract.

**Keywords:** Pytiriasis versichlor, *Malassezia furfur*, aloe vera, extracts, fungal growth inhibition

## INTRODUCTION

Pythriaasis versichlor, commonly known as panu, is an infection of the skin caused by a superficial fungus, *Malassezia furfur*. The disease causes skin discolouration and itchy sensations in the infected area. These discolourations can be in the form of hyperpigmentation, hypopigmentation, or erythema on the skin, accompanied by a smooth squama. It is important to note that pythriaasis versichlor is not a fungal infection of a contagious nature. Usually, this condition tends to appear on the back and chest, although it can also affect other areas such as the face, neck, abdomen, and upper arms.<sup>1</sup>

According to the *World Health Organisation* (WHO), the incidence of pythriaasis versichlor in warm countries reaches about 16% at the age of 13, 8–18% at the age of 14–15 years, and only 1% at the age of less than 10 years. In Indonesia, the prevalence of this disease is quite high. For example, in Semarang City, the prevalence is around 2.93%, while in Padang City it reaches 27.6%. Research in Bandar Lampung City by Dwi Marlina shows that the incidence rate of pityriasis versicolor reaches 58.8% and increases during the summer.<sup>2,3</sup>

Herbal plants such as aloe vera (*Aloe vera* L.) have potential as an alternative treatment. Aloe vera, also known as "true aloe", is a plant rich in health benefits with therapeutic effects. Aloe vera has several ingredients such as *quinone*, *saponins*, *aminoglycosides*, *phenols*, *tannins*, *salicylic*

*acid*, *flavonoids*, *cinnamic acid*, essential oils, and *sulfur*, which are useful as antifungal agents<sup>4,5</sup>

Some compounds, such as anthraquinone and quinone, have pain-relieving effects, while saponins can act as antifungal, antibacterial, and antiviral. The content of lignin and polysaccharides helps to carry nutrients into the skin, and other active substances work in denaturing the cell walls, inhibiting fungal growth, as well as facilitating the absorption of aloe vera mucus into the mucosa.<sup>6</sup>

This study aims to determine the effectiveness of aloe vera extract (*Aloe vera* L.) on the growth of *Malassezia furfur* fungus that causes versichloror pityriasis in vitro.

## METHOD

This study used a *true experimental* approach with a *posttest-only control group* design, which focused on the results of giving aloe vera extract (*Aloe vera* L.) with four treatments. The study population was a colony of *Malassezia furfur* mushrooms bred on *Sabouraud Dextrose agar medium*. The study sample consisted of 20 total samples with different groups.

1. Group 1: Aloe vera extract (*Aloe vera* L.) with a concentration of 80%
2. Group 2: Aloe vera extract (*Aloe vera* L.) with a concentration of 85%
3. Group 3: Aloe vera extract (*Aloe vera* L.) with a concentration of 90%
4. Group 4: *Miconazole* as a post-positive control

5. Group 5: Aquabidest as a negative control

The hypothesis of this study was tested using Statistical Packages for Social Science (SPSS). The hypothesis test assessed the effect of giving aloe vera extract (*Aloe vera L.*) on the growth of *Malassezia furfur* fungus. Data analysis consists of two stages, namely univariate analysis and bivariate analysis. Univariate analysis was performed to elucidate the characteristics and assess the distribution of variables using the Shapiro-Wilk test due to the sample size <50. Bivariate analysis involves testing normality and homogeneity to ensure normal distribution and homogeneity of data. If the data are not eligible, a Kruskal-Wallis test is performed to see the difference between groups. Furthermore, the Mann-Whitney test is used to see the difference between the two groups and determine their significance.

**RESULT**

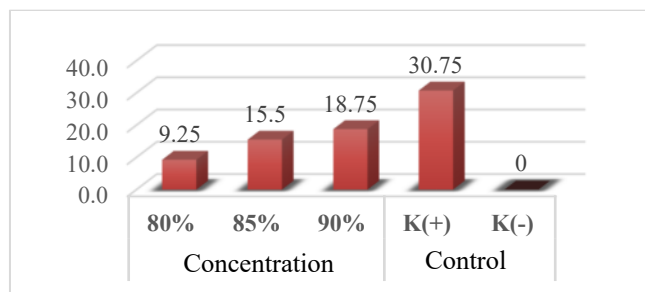
The following is the average growth of fungi in each control group and treatment group after the administration of aloe vera extract.

Table 1 shows the growth of the *Malassezia furfur* fungus to understand the growth differences in each treatment group. The mean growth rate of fungi at 80% concentration was 9.25, indicating a lower growth rate compared to the 85% (mean = 15.5) and 90% (mean = 18.75) concentration groups. In the positive control group (K+), the mean fungal growth was 30.75,

indicating the highest growth among all treatment groups.

**Table 1: Average Growth of Fungi**

Treatment	Concentration			Control	
	80%	85%	90%	K(+)	K(-)
1	8	15	18	28	0
2	9	15	19	30	0
3	10	16	19	30	0
4	10	16	19	35	0
<b>Average Growth of Fungi</b>	<b>9.25</b>	<b>15.5</b>	<b>18.75</b>	<b>30.75</b>	<b>0</b>



**Figure 1: Average Growth of Fungi**

Meanwhile, the negative control group (K-) showed no fungal growth (mean = 0) because they did not receive the treatment.

**Table 2. Normality Testing**

Group	P-Value	Description
Control (-)	-	Not normally distributed
Control (+)	0.279	Normally Distributed
K 80%	0.272	Normally Distributed
K 85%	0.024	Not normally distributed
K 90%	0.001	Not normally distributed

The above normality test is used to see whether the data distribution comes from a

normal distribution or not. The table above is the result of testing the normality of data in each group.

Based on the results of the normality test calculation in each treatment group, there were 3 treatment groups with a p-value less than 0.05 (<0.05).

**Effectiveness of Aloe Vera Extract (*Aloe vera* L.) on the Growth of *Malassezia furfur* Fungus**

In this section, an effectiveness test will be carried out on the application of aloe vera extract (*Aloe vera* L.) on the growth of the *Malassezia furfur* fungus using *Kruskal-Wallis*.

The decision-making criteria based on probability value (p-value) or significance (Asymp. Sig.) are:

- If the significance value of  $> \alpha = 0.05$ , then  $H_0$  is accepted
- If the significance value of  $\leq \alpha = 0.05$ , then  $H_0$  is rejected".

The following are the results of the *Kruskal-Wallis* test processed using SPSS 26 software:

**Table 3 Effectiveness of Aloe Vera Extract (*Aloe vera* L.)**

Variabel	Group	Kruskal-Wallis		
		Mean Rank	p-value	Conclusion
Fungal	Control (-)	2.5	0.001	Significant
	Control (+)	18.5		

Variabel	Group	Kruskal-Wallis		
		Mean Rank	p-value	Conclusion
Growth	Concentration 80%	6.5	Impact (Efektif)	
	Concentration 85%	10.5		
	Concentration 90%	14.5		

The table above shows a significance value smaller than  $\alpha$  (0.05). Thus, the results of the research hypothesis test ( $H_1$ ) are acceptable, meaning that there is an effect of giving aloe vera extract (*Aloe vera* L.) on the growth of the fungus *Malassezia furfur*, the cause of pityriasis versicolor.

Based on the results of *Kruskal-Wallis*, which showed that the administration of aloe vera extract (*Aloe vera* L.) had an effect on the growth of *Malassezia furfur* fungus, a follow-up test (*post-hoc*) was carried out to see the difference in effectiveness between the 2 treatment groups.

**Table 4 Post Hoc Test Results**

	Mann-Whitney (P-Value)				
	K(-)	K(+)	80%	85%	90%
K(-)	-				
K(+)	0.013*	-			
80%	0.013*	0.019*	-		

Mann-Whitney (P-Value)					
	K(-)	K(+)	80%	85%	90%
85%	0.013*	0.019*	0.019*	-	
90%	0.011*	0.017*	0.017*	0.017*	-

\*Significant

Based on the table above, it shows that in every 2 treatment groups compared, significant results were obtained, meaning that each treatment group consisting of 5 groups had a significant difference in the growth of *Malassezia furfur* fungus. Thus, it can be stated that the administration of aloe vera extract (*Aloe vera* L.) has significant effectiveness starting from the highest concentration.

## DISCUSSION

Research shows that there is a positive effect of giving aloe vera extract on the growth of the fungus. These results reveal the potential for inhibition of the growth of *the Malassezia furfur fungus* by the administration of aloe vera extract, and the higher the concentration of the extract, the more effective it is in inhibiting the growth of the fungus.

Previous research that discussed the effectiveness of aloe vera (*Aloe vera* L.) on the growth of the *Malassezia furfur* fungus obtained the results of aloe vera extract with an inhibition zone of 5.82 mm and 9.02 mm. Aloe vera extract has an effect on inhibiting the growth of fungi. It is explained that the saponin content in aloe vera is able to inhibit

the growth of fungi. Other ingredients in aloe vera are also influential in inhibiting the growth of fungi.<sup>8,10</sup>

Several types of active substances will work in the process of denaturing the cell wall, which will later result in cell lysis and inhibit fungal growth. Active substances such as lignin will help absorption and make it easier for aloe vera to be absorbed into the mucosa. Furthermore, the active substances in *saponins*, *Anthraquinone Complex* and *Antifungal Ancemannan* work.<sup>7</sup>

The study also found that a concentration of 80% aloe vera extract was most effective in inhibiting the growth of *Malassezia furfur fungus*. The average growth of fungi at a concentration of 80% is lower compared to concentrations of 85% and 90%. The decrease in effectiveness is seen with an increase in concentration, where a concentration of 90% indicates higher fungal growth compared to a concentration of 85%.

Comparisons with control groups reinforce the findings. The positive control group showed the highest fungal growth, as expected, because it did not receive an inhibitory treatment. On the other hand, the negative control group showed no fungal growth at all, validating that experimental conditions and media were appropriate for evaluating the effects of aloe vera extract on fungal growth. These findings have clinical implications in the development of skin care products, with an 80% concentration of aloe vera extract being the optimal choice for skin care product formulations aimed at

addressing skin problems related to fungal growth.

## CONCLUSION

Based on the results of this study, it can be concluded that:

1. The administration of aloe vera extract has a positive impact on inhibiting the growth of *the fungus Malassezia furfur*, the cause of pityriasis versicolor.
2. The concentration of 90% aloe vera extract showed the best inhibition effect compared to the concentrations of 80% and 85%.
3. The higher the concentration of aloe vera extract (*Aloe vera* L.), the larger the inhibition zone.

Based on these conclusions, some of the suggestions submitted include:

1. Conducting further research to identify the active compounds in aloe vera that are responsible for inhibiting fungal growth. This could open up opportunities for the development of more effective antifungal drugs.
2. Conducting clinical trials in humans to assess the effectiveness of aloe vera in the treatment of pityriasis versicolor. These studies can measure patients' responses to aloe vera use and assess possible side effects.
3. Researching better formulations for aloe vera applications, including the use of nanotechnology or

combinations with other natural ingredients. This aims to increase the stability and effectiveness of antifungal products.

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