



## Influence of Acrylic Resin Denture Base Soaking Length in Siwak Extract Solution (*Salvadora persica*) on the Growth of *Candida albicans*

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### Abstract

**Objective:** To know the influence of immersion length of denture base of acrylic resin in Siwak solution (*Salvadora persica*) on *Candida albicans* growth. **Material and Methods:** This type of research is laboratory experimental. The Siwak plant (*Salvadora persica*) was extracted and 1% solution was formed. The media used were Sabouraud Dextrose Broth (SDB) and Sabouraud Dextrose Agar (SDA). *Candida albicans* was cultured as 1 dose in 100 ml of SDB medium, and then incubated at shaker rotation for 1x24 hours. The concentration chosen to test the effectiveness of siwak extract solution was 1%, 10%, 15% and 25%. Data were presented as mean  $\pm$  SD. **Results:** Zone of 6 hours Siwak extract immersion inhibitor by  $43.47 \pm 0.35$ , 8 hours to know the influence of immersion length of denture base of acrylic resin in Siwak solution (*Salvadora persica*) on candida albicans growth  $44.42 \pm 0.02$ , 10 hours of  $52.79 \pm 0.03$ . **Conclusion:** There is a difference of immersion length of denture base of acrylic resin on *Candida albicans* growth in Siwak extract solution (*Salvadora persica*).

**Keywords:** Herbal Medicine; Phytotherapy; Microbiology; *Candida albicans*.

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## Introduction

Denture is one treatment used to replace missing teeth in a patient. Denture has several types such as removable denture, fixed denture, and implanted denture. The purpose of the use of denture, either partially removable partial dentures, fixed denture, and complete denture is essentially to improve function: mastication, pronunciation, esthetics, maintaining tissue health, and preventing further damage of organ structures in the mouth [1].

Currently the most common type of denture is used for denture-based acrylic resin-based teeth, as it meets the physical, functional and esthetic requirements [2]. Another advantage of using acrylic-based denture is the relatively cheap price, the gingival-like color, manipulation and easy way of making, insoluble in saliva, can be done reparation and small dimension changes [1].

In addition to having favorable properties, this material also has a deficiency that is easy to fracture, easy to form pores and high elasticity. Fracture and elasticity are related to the mechanical properties of the material, which include the press's strength, Vickers strength, tensile strength, and Young's modulus [3]. The fracture of the denture base may occur outside the mouth that falls in a hard place, whereas a fracture occurring in the mouth can be caused by both fatigue and occlusal forces. The broken base of the artificial tooth can be caused by the fitting of the denture is not good, the absence of balance of occlusion, fatigue and fall. While porosity is related to the physical properties of the material formed in the process of mixing the material [4].

The microorganisms commonly found in the oral cavity are *Candida albicans* about 40% as a normal part of the mouth flora. *Candida albicans* can perform a rapid breeding process on an acrylic resin thus it can infect soft tissues in the oral cavity and cause denture stomatitis therefore disinfection of denture is an important thing to do [1]. Some species of *Candida* are commensal organisms that can colonize the skin and the surface of the human mucosa. Critically, a low fever or immune condition of the patient tends to develop both candida infections on the mucosal surface and can be life-threatening. Candida infection is an infection caused by the most common fungus in AIDS patients. These patients are dominated by oropharyngeal candidiasis, which leads to malnutrition and impairs absorption from the treatment process [3].

Unfavorable and poorly maintained hygiene can make the number of *Candida albicans* fungal colonies to continue to increase and result in candidiasis or inflammation in the oral mucosal area of the oral cavity directly in contact with denture, commonly called denture stomatitis [1]. Maintain a resin-based denture hygiene of acrylic and oral hygiene from contamination of *Candida albicans* fungi, denture wearers can soak denture in denture cleanser at night, because at night the denture is not used and should be released. However, denture cleanser materials on the market today are relatively expensive. Therefore, the need for an alternative material as a substitute for denture cleaning agent is relatively cheaper [3].

One alternative by increasing the use of nutritious herbs as a medicine. Herbal medicine in general uses materials that are relatively easier to obtain and easy to breed, thus people more easily get it. Many researchers began to explore the use of such materials as disinfecting agents. One of the

ingredients that can be used as an alternative ingredient of denture cleanser in Indonesia is Siwak solution (*Salvadora persica*) [5].

Siwak has been used centuries ago in the days of the Greek and Roman empires. Then the siwak growing is becoming known in the Middle East and South America region. Siwak solution is different from other mouthwashes because siwak solution contains no chemicals and does not contain alcohol. Siwak solution contains essential oils and has a bactericidal effect [5].

Based on the background, this paper aims to examine the influence of immersion length of denture base of acrylic resin in Siwak solution to the growth of *Candida albicans*.

## Material and Methods

### Study Design

This research is a laboratory experimental research with post-test design with control group design, conducted in May-June 2017 at Phytochemical Laboratory of Hasanuddin University Faculty of Pharmacy and Microbiology Laboratory of Hasanuddin University Faculty of Pharmacy.

### Experimental Procedure

The sample of acrylic resin base was formed in 1x1cm plate and 2 mm thickness of 12 pieces. The treated samples (soaked in Siwak extract solution) were 9 pieces and 3 other samples were used as control. The Siwak plant (*Salvadora persica*) was extracted and 1% solution was formed. The media used were Sabouraud Dextrose Broth (SDB) and Sabouraud Dextrose Agar (SDA). *Candida albicans* was cultured as 1 dose in 100 ml of SDB medium, and then incubated at shaker rotation for 1x24 hours. Prior to the effectiveness of long-acting immersion denture base test, first test the concentration of extracts of siwak solution that can inhibit the growth of *Candida albicans*. The concentration chosen to test the effectiveness of siwak extract solution was 1%, 10%, 15% and 25%.

### Data Analysis

Data were presented as mean and standard deviation (SD).

## Results

The result of concentration test of Siwak extract solution, which can inhibit *Candida albicans* growth was 25% (Table 1).

**Table 1. Distribution of effective concentration of Siwak dispersion on *Candida albicans* growth.**

Sample	Inhibition Diameter (mm)
	Mean $\pm$ SD
Siwak Dispersion 1%	9.10 $\pm$ 0.17
Siwak Dispersion 10%	16.19 $\pm$ 0.19
Siwak Dispersion 15%	16.68 $\pm$ 0.14
Siwak Dispersion 25%	17.04 $\pm$ 0.14
Control + (Paper Disc Ampicillin)	24.62 $\pm$ 0.34
Control - (Paper Disc Blank)	6.01 $\pm$ 0.01

Zone of 6 hours Siwak extract immersion inhibitor by  $43.47 \pm 0.35$ , 8 hours to know the influence of immersion length of denture base of acrylic resin in siwak solution (*Salvadora persica*) on *Candida albicans* growth  $44.42 \pm 0.02$  and 10 hours of  $52.79 \pm 0.03$  (Table 2).

**Table 2. Determination of circumference of inhibition of *Candida albicans* growth.**

Immersion Length	Roving Inhibition (mm)
	Mean $\pm$ SD
6 Hours	$43.47 \pm 0.35$
8 Hours	$44.42 \pm 0.02$
10 Hours	$52.79 \pm 0.03$
Control (Soaked in Water)	$40.29 \pm 0.02$

## Discussion

The microorganisms commonly found in the oral cavity are *Candida albicans* about 40% as a normal part of the mouth flora. *Candida albicans* can perform a rapid breeding process on an acrylic resin thus it can infect soft tissues in the oral cavity and cause denture stomatitis therefore disinfection of denture is an important thing to do [1].

In maintaining denture hygiene based on acrylic resins and oral hygiene from contamination of *Candida albicans* fungi, denture users can soak denture in denture cleanser at night, because at night the denture is not used and should be released. However, denture cleanser materials on the market today are relatively expensive. Therefore, the need for an alternative material as a substitute for denture cleaning agent is relatively cheaper [3].

One of the ingredients that can be utilized as an alternative to denture cleanser in Indonesia is Siwak solution (*Salvadora persica*). Siwak solution is different from other mouthwashes because siwak solution contains no chemicals and does not contain alcohol. Siwak solution contains essential oils and has a bactericidal effect. Compounds that have a bactericidal effect on siwak wood is the most dominant of flavonoids and tannins [5].

The purpose of this study is to know the duration of denture immersion of acrylic resin in siwak solution (*Salvadora persica*) on *Candida albicans* growth. The observed period of immersion time was 6 hours, 8 hours, and 10 hours. The selection of these three time periods was based on human break time parameters, which means that the patient's denture is not being used. This research was done with the initial stages of the sorting of samples or selection of siwak wood in accordance with the type of sample to be used. After obtained the appropriate samples with the type to be used then next is washing siwak wood using water flowing. After that the sample was dried using a simplicia drying cupboard. The drying process was done to reduce the water content of the sample so it can last long and durable.

After the sample is dry, then cutting is done to obtain the sample in a smaller form. After that the sample is inserted into the maceration for maceration. Maceration is the process of extracting simplicia by using solvent at room temperature (room). The principle of maceration is the diffusion of solvent fluid into plant cells containing active compounds. This diffusion then results in

differences in osmotic pressure inside and outside the cell so that the active compound is pushed out. The maceration method was chosen because it does not require complex equipment and can avoid damage to compounds that are not heat resistant and relatively cheap [6].

In the process of maceration, the choice of solvent to be used must pay attention to the content of the compound to be isolated. The important properties are the polarity and the polar group of a compound because a material will be easily soluble in the same solvent polarity [7]. In this study, the compound to be obtained from Siwak wood is tannin and flavonoids as the dominant antibacterial. Tannins and flavonoids are polar compounds so extraction can be extracted with polar solvents, such as ethanol and methanol. Ethanol and methanol solvents can contract tannin and flavonoid compounds as equally optimally. This is because the magnitude of the dielectric constant of ethanol and methanol is not much different [8,9].

In this study it used 96% alcohol solvent (ethanol) in the maceration process to extract tannins and flavonoids optimally. The maceration process lasts for three days. After that, the simplicia is filtered using filter paper to separate the solution and the residue. Furthermore, the filtrate results maceration of the evaporated simplisia to obtain a thick-colored viscous extract. The concentration chosen to test the effectiveness of Siwak extract solution was 1%, 10%, 15% and 25%. After the observation then obtained an effective concentration of 25%. Furthermore, test of the effectiveness of long immersion denture of acrylic resin in siwak extract solution and obtained significant results [10,11].

## Conclusion

Siwak extract (*Salvadora persica*) can inhibit the growth of *Candida albicans* on the bases of acrylic resin glyctry. Siwak extract (*Salvadora persica*) 25% is an effective concentration as an anti fungus that can be used to disinfect denture acrylic resin; and there is an effect of long immersion base denture of acrylic resin on siwak extract solution to *Candida albicans* growth.

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