

## The Effect of Immersing Basil Leaves Infusion (*Ocimum Sanctum L*) on The Surface Roughness of Heat Cured Acrylic Resin Plates

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### ABSTRACT

**Background:** The aging population in the world is a challenge for dentists in providing oral care for the elderly, especially for denture users. Acrylic resin heat cured type is currently a material commonly used as a denture base material. Basil leaves (*Linnaeus*) is widely used by the community and has an acid content. Basil leaves are proven to be a denture cleaning agent but can cause erosion on the acrylic resin plate.

**Materials and Methods:** The type of research used in this research is a laboratory experimental design using Pre-test and Post-test Group Design. In this study there were 4 working groups with each group consisting of 6 samples per treatment to be examined, so that the total sample to be used was 24 samples. Then, before and after immersion, the surface roughness measurement was carried out on the sample. Then the data analysis was carried out using the normality test Shapiro-Wilk, homogeneity test Levene Test, and statistical tests Paired T-Test.

**Results:** There were significant differences in the acrylic resin plates before and after immersion in basil leaf infusion.

**Conclusion:** There is an effect of immersing basil leaf infusion on the surface roughness of the acrylic resin plate heat cured type.

**KEYWORDS:** Surface Roughness, Acrylic Resin, Basil Infusion

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### INTRODUCTION

The aging population in the world is a challenge for dentists in providing oral care for the elderly, especially for denture users. Lost teeth, partial or complete, should be replaced with dentures. Loss of teeth that are not replaced with dentures will disrupt the harmony of function in the oral cavity because dentures are a substitute for natural teeth and their supporting tissues that have been lost.

Dentures consist of 2 types, namely fixed dentures and removable dentures. Removable denture bases can be made of acrylic or metal. Poly methyl methacrylate resin (PMMA) or commonly known as acrylic resin is the most widely used material as a denture base. The most commonly used denture base material is hot polymerized acrylic resin or heat cured.

resin acrylic heat cured is currently a material commonly used as a denture base material. Heat cured acrylic resin has several advantages such as aesthetic color, biocompatible, relatively cheap price, easy to repair and manipulate. Heat cured acrylic resin qualifies as an ideal denture base material, because it is acrylic resin heat cured non-toxic, non-irritating to tissues, good physical and aesthetic properties, relatively inexpensive, repairable, easy to manipulate, and manufacture. But heat cured acrylic resins also have the disadvantage of microporosity. The existence of this microporosity can affect the physical properties, aesthetics, and cleanliness.

Basil leave (*Linn.*) is a traditional medicinal plant that is easy to obtain because it grows wild and is widely cultivated. In addition, this plant is widely used by the community. This

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plant is widely used as a medicine for infections, stomach aches, snake and insect bites, and fever medicine. According to Viona (2017) 50% basil leaf infusion was effective in reducing the number of *Candida albicans* colonies on heat cured acrylic resin and can be used as an alternative material for cleaning dentures.

The components or ingredients contained in basil leaves include essential oils, eugenol, methyl eugenol, ocimene, alpha pinene, eucalyptol, linalool, geraniol, methyl chavicol, methyl cinnamate, anetole and camphor. According to Ramadhani (2022) The acid content in basil leaves can cause the surface tension of the acrylic resin to increase so that it makes it easier for the acrylic resin to absorb the basil leaves which can cause erosion or chemical damage to the surface of the acrylic resin.

### METHODOLOGY

This type of research is in the form of laboratory experimental research using heat cured acrylic resin plate samples. There were 24 samples which were divided into 4 groups with each group consisting of 6 samples. The division of sample groups was carried out based on variations in immersion time in basil leaf infusion, namely for 1 day, 3 days, 5 days, and 7 days. After immersion, the samples were measured using a surface roughness measuring device.

Prior to conducting the research, samples were made in advance by the process of making acrylic resin from making wax models to polishing. Polishing is done only on the part to be studied. The marinade is made by preparing basil leaves and distilled water with a ratio of 2 ml: 1 gram of basil leaves. After measuring it, continue with the smoothing process with a blender and the results are boiled for 30 minutes and cooled, then the pH is measured and it is found to be 5.76. This research was conducted at the Laboratory of the Department of Materials Science and Dentistry Technology, University of Prof. Dr. Moestopo (Beragama) in May 2023 to see the difference in surface roughness of acrylic resin before and after immersion.

### RESULTS AND DISCUSSION

Content testing was carried out using a sample in the form of heat cured acrylic resin plate with the measuring tool used is Surface Roughness Tester. The test results are shown in Table 1.

In the four test groups, the largest change in roughness value was found in the 7-day immersion group (+0.075) and the smallest change in roughness value was shown in the 1-day immersion group (+0.002) wherein the 1-day immersion second sample had no significant effect on the roughness of the resin plate. heat cured acrylic soaked in basil infusion at this time.

The samples were subjected to paired t-test after it was found that the data were normally distributed and were homogeneous. The calculation results using the paired t test

obtained all values  $p < 0.05$ , this means that  $H_0$  rejected and  $H_1$  accepted which means that there is a significant difference in the study samples before and after immersing the solution for a period of 1, 3, 5, and 7 days and indicates that there is an effect of immersing basil leaf infusion on the surface roughness of the acrylic resin plate heat cured type.

**Table 1. Average sample results**

| Time   | Rerata           | Surface Roughness Average Value |
|--------|------------------|---------------------------------|
| 1 Day  | Before immersing | 0.041                           |
|        | After immersing  | 0.043                           |
| 3 Days | Before immersing | 0.069                           |
|        | After immersing  | 0.076                           |
| 5 Days | Before immersing | 0.081                           |
|        | After immersing  | 0.116                           |
| 7 Days | Before immersing | 0.085                           |
|        | After immersing  | 0.130                           |

This research was conducted with the aim to determine the effect of immersing basil leaf infusion on the surface roughness of acrylic resin plate heat cured. In this study, laboratory experiments were carried out using 24 samples with a rectangular shape measuring 10x10x2 mm which was an acrylic resin plate.heat cured. The basil leaves used in this study were in the form of infusion preparations which were processed by pulverizing them using a blender and boiling them mixed with distilled water in a ratio of 1gr :2 ml of distilled water.

In a study conducted by Viona (2016) immersion of acrylic resin plates was carried out heat cured into cinnamon extract with concentrations of 40%, 50%, and 60% which contain eugenol, flavonoids, and other phenol derivatives the same as basil leaves, it was found that there was an increase in the surface roughness of the acrylic resin plate heat cured caused by the content of eugenol, flavonoids and other phenolic derivatives.

Researchers immersing acrylic resin plate heat cured for 1,3,5, and 7 days using basil leaf infusion. In a study conducted by Viona (2017), research was conducted on immersing acrylic resin plates in 50% basil leaf infusion on dimensional changes for 1, 3, 5, and 7 days. In this study, it was found that there was a change in dimensions in each group of immersion duration, and no further research had been carried out on changes in surface roughness in immersion of 50% basil leaf infusion.

In a study conducted by Clarissa (2019) who carried out immersion on a type heat cured acrylic resin plate using citronella leaf extract with a concentration of 30% and 60% The concentration of the material also affects the increase in surface roughness of the type of heat cured acrylic resin plate. The greater the concentration of the immersion solution, will

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cause an increase in surface roughness on the type of heat cured acrylic resin plate.

The results of this study are in accordance with research conducted by research conducted by Kalasworajati (2020) in his research which carried out immersion of acrylic resin plates in a decoction of red betel leaf essential oil to observe changes in surface roughness and color changes on type acrylic resin plates heat cured type. The essential oil in red betel leaves, like basil leaves, contains chavicol, phenol, and eugenol compounds. According to Sari (2016) the surface of the acrylic resin plate is heat cured type. Exposure to phenolic compounds and their derivatives which are acidic and have a high degree of polarity will cause surface erosion of the acrylic resin plate. The phenol content can diffuse into the acrylic plate which will cause damage to the surface of the heat cured acrylic resin plate. When the ester group reacts with phenol, then H ions<sup>+</sup> on phenol will be released and bind to CH<sub>3</sub>O<sup>-</sup> from the ester group, and the benzene group on the phenol will bind to RCO on the ester group. This chemical reaction will cause the chemical bonding of the acrylic resin to become unstable so that the surface of the heat cured acrylic resin plate hollow

The type of acrylic resin used in this research is heat cured acrylic resin which still takes precedence in its use because of its prevalence in its use. McCabe (2015) in his book entitled *Dentistry Materials* states that acrylic resin has the property of absorbing water which causes water loss in the surface layer to occur quite quickly. This will cause surface abnormalities. Annusavice (2021) in his book entitled *Phillip's Science of Dental Materials* mention that one of the drawbacks of this type of heat cured acrylic resin is the presence of permeability which will cause acrylic resin to easily absorb water. The process that usually occurs is diffusion, which is the movement of substances through cavities. According to Craig (2022) in his book entitled *Craig's Restorative Dental Material* stated that the influence factor of the change in roughness was due to the hydrolysis process which caused the release of the OH group<sup>-</sup> and affected the surface roughness. In the hygroscopic expansion process, taking liquid can reduce the polymerization stress. An insufficiently polymerized resin will absorb large amounts of liquid and solubility thereby affecting the surface of the resin.

In this study, changes in surface roughness on heat cured acrylic resin plate immersion in the basil leaf infusion is probably caused by the absorption of liquid, the presence of acids in the essential oil in the basil leaves which contain eugenol, flavonoids, chavicol, and other phenol derivatives, the concentration of the immersing solution, and chemical reactions that cause the chemical bonds of the acrylic resin to become unstable. stable.

**Table 2. Test Paired T-Test on Sample**

| Time   | Mean ± Standard Deviation | p-value | Data Interpretation   |
|--------|---------------------------|---------|-----------------------|
| 1 Day  | 0.003±0.002               | *0.010  | There is a difference |
| 3 Days | 0.006 ± 0.002             | *0.001  | There is a difference |
| 5 Days | 0.022 ± 0.005             | *0.000  | There are differences |
| 7 Days | 0.046 ± 0.013             | *0.000  | There are differences |

\*Paired T Test: p<0.05: significant

### CONCLUSION

In this study, it was concluded that immersion of basil leaf infusion could affect the surface roughness of the heat cured acrylic resin plate. The length of immersion time of the heat cured acrylic resin plate in the infusion of basil leaves within 1 day, 3 days, 5 days, and 7 days had an effect on increasing the surface roughness of the heat cured acrylic resin plate. The surface roughness of the acrylic resin plate is affected by the presence of essential oils which contain eugenol, flavonoids, chavicol, and other phenol derivatives which are acidic and cause chemical reactions, the absorption of fluids in the form of diffusion, and the concentration of the immersing solution.

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