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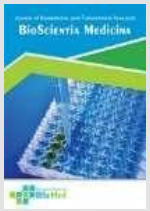

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# Comparison of Dimensional Stability of Alginate Impressions by Spraying 0.5% Sodium Hypochlorite Against Kepok Banana Peel Extract (*Musa paradisiaca Linn.*)

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**A B S T R A C T**

**Background:** The process of impressions of hard and soft tissues in the oral cavity is a fairly routine activity in dentistry. Alginate is an irreversible elastic impression material that is often used. Alginate can be disinfected using soaking or spraying techniques. This disinfection solution itself has side effects that are quite serious for patient health. This study aimed to find out Comparison of the dimensional stability of alginate impressions by spraying 0.5% sodium hypochlorite against kepok banana peel extract (*Musa paradisiaca Linn.*). **Methods:** This study was experimental research. The research object used was dimension of alginate impressions which were grouped into control and treatment groups. Assessment of the projection value of the antero-posterior (AP) and cross arch (CA) lines was carried out with digital calipers. Data analysis was carried out with the help of SPSS version 25 in univariate and bivariate. **Results:** The results of this study showed that the mean value of the AP and CA lines in the kepok banana peel extract treatment group did not show a significant difference with the control treatment (sodium hypochlorite 0.5%), p-value> 0.05. **Conclusion:** Spraying kepok banana peel extract with various concentrations did not cause changes in the dimensions of the alginate impressions.

## 1. Introduction

The process of impressions of hard and soft tissues in the oral cavity is a fairly routine activity in dentistry. The formed impressions will then be filled with gypsum to obtain replicas of the hard and soft tissues of the oral cavity. Alginate is an irreversible elastic impression material that is often used on the grounds that this material is easy to manipulate, practical, affordable, and comfortable for patients because it has a refreshing aroma. However, alginate has a drawback. Namely, it is susceptible to dimensional changes. The process of syneresis or evaporation of water causes the alginate impressions to shrink when it is in the open air, while expands and distorts due to the imbibition process or absorb water when in contact with water. The impression process causes saliva, debris, pus, and blood to stick to the surface of the impression material and become a source of infection. On the impression surface, microorganisms from the oral cavity can persist and transfer to the model. As for the process of

rinsing alginate impressions using water is not effective in removing microorganisms. Therefore it is necessary to do disinfection.[1-5]

Alginate can be disinfected using immersion or spraying for 10 minutes. Disinfection by immersion technique is not recommended because it can cause imbibition due to more alginate impressions coming into contact with the disinfectant solution. A study states that various disinfectant solutions cause dimensional changes in impression models. The spraying technique has smaller dimensional changes than immersion of alginate impressions because less liquid is absorbed. The most commonly used disinfectants are sodium hypochlorite and chlorhexidine. However, this disinfection solution itself has side effects that are quite serious for patient health. Several studies state that the disinfection solution is caustic, has an unpleasant odor, and has a burning sensation when it comes into contact with the skin. Moreover, the disinfection solution can affect the stability of the impressions dimensional model.[6-9]

Exploratory efforts to develop disinfection solutions need to be developed in order to obtain solutions with maximum efficacy and safety. Kepok banana peel extract can be an alternative to an antimicrobial disinfectant. Previously, various concentrations of kepok banana fruit extract 25%, 50%, 75%, and 100% had been carried out, which were found to be effective for cleaning acrylic dentures on growth of *Streptococcus mutans* and the greatest bacterial inhibition was found in the highest concentration extract.[10,11] This study aimed to find out comparison of the dimensional stability of alginate impressions by spraying 0.5% sodium hypochlorite against kepok banana peel extract (*Musa paradisiaca Linn.*).

## 2. Methods

This study was experimental research and used a research object in the form of a study model made of type III gypsum obtained from the alginate impression filling of the maxillary master model. This research was conducted at the chemistry laboratory of the Faculty of Medicine, Dentistry and Health Sciences, Universitas Prima Indonesia. A total of 24 research objects were used in this study, where the research objects were divided into four test groups: group 1 (K1): research objects were sprayed with 0.5% sodium hypochlorite, groups 2-4 (K2-4): research objects were sprayed with extract banana kepok concentration of 25%, 50% and 75% for 10 minutes. This study was approved by the medical and health research ethics committee of the Faculty of Medicine, Dentistry and Health Sciences, Universitas Prima Indonesia, Medan, Indonesia.

Kepok banana peels are cleaned and dried to obtain simplicia powder. Furthermore, the extraction process was carried out by maceration method using 70% ethanol solvent for 2x24 hours. Furthermore, the macerate was evaporated using a rotary evaporator to obtain a thick extract. Process for impressions of the maxillary master model: preparation of alginate, which has been measured according to the manufacturer's instructions with a ratio of the amount of alginate powder to water, namely 2 tablespoons of alginate powder (20gr) and 2/3 measuring cup (46mL). Manipulation of impressions materials using a rubber bowl which is filled with water, then the alginate powder is stirred using a spatula with a stamped motion and pressed against the wall rubber bowl to form a figure eight quickly until homogeneous. After the homogeneous results of the stirring are placed in the appropriate impressions spoon, then impressions are made on the master model.

Measurement of dimensional stability was carried out by measuring the distance from the incisor papilla to the central pit of the maxillary right first molar or called the antero-posterior (AP) line, and measuring the distance between the central pit of the right first molar to the central pit of the maxillary left first molar or called the cross arch (CA) line using a digital caliper. Data analysis was carried out with the help of SPSS version 25. Then univariate analysis was carried out to present the distribution of data frequencies for each test variable. Bivariate analysis was carried out to find out the difference in the mean AP values and CA values between the test groups, with a p-value <0.05.

## 3. Results

Table 1 presents a comparison of AP values between groups. The results of this study showed that the mean value of the AP line in the kepok banana peel extract treatment group did not show a significant difference with the control treatment (sodium hypochlorite 0.5%), with a p-value> 0.05.

Table 1. Comparison of AP values between groups.

| Group | Mean (mm) ± SD | p-value* |
|---|---|---|
| K1 | 33,18 ± 0,07 | - |
| K2 | 33,26 ± 0,07 | 0,094 |
| K3 | 33,25 ± 0,08 | 0,134 |
| K4 | 33,23 ± 0,07 | 0,340 |

*Post hoc LSD VS K1, p>0,05.

Table 2 presents a comparison of CA values between groups. The results of this study showed that the average value of the CA line in the kepok banana peel extract treatment group did not show a significant difference with the control treatment (sodium hypochlorite 0.5%), p-value> 0.05.

Table 2. Comparison of CA values between groups.

| Group | Mean (mm) ± SD | p-value* |
|---|---|---|
| K1 | 44,79 ± 0,07 | - |
| K2 | 44,86 ± 0,08 | 0,159 |
| K3 | 44,25 ± 0,08 | 0,286 |
| K4 | 44,82 ± 0,08 | 0,589 |

*Post hoc LSD VS K1, p>0,05.

## 4. Discussion

The results showed that there was no significant difference in the distance between the AP and CA between the two groups ($p > 0.05$), although there was a greater dimensional change in the kepok banana peel treatment group than in the 0.5% sodium hypochlorite group. This may be due to the solvent used in the kepok banana peel extract being distilled water which has a water content that is favored by hydrophilic alginate. This is in line with studies that state that when disinfection is carried out, the solution comes into contact with the alginate impression material, in which the alginate has the property of absorbing water, and the presence of pressure on the absorbed solution causes the alginate impression to expand, and the dimensional stability of the study model can change.[12-14]

Another study showed that kepok banana peels contain tannins which are a group of polyphenols. The polyphenols will then bind to the polymer chains in the form of carboxylic acids in alginate resulting in an esterification reaction to form esters and $H_2O$. The content in $H_2O$ causes alginate to be easily absorbed and has an impact on changes in alginate dimensions. This is in line with other research which explain that when the phenol content in castor oil comes in contact with alginate to produce $H_2O$ and esters will cause the absorption of the solution and results in increasing dimensional changes.[15-17] Another study showed that there were OH ions in the polyphenol content of tannins in kepok banana peel extract, and alginate also had OH ions. Therefore, the OH ions in the extract bind to the OH ions of the alginate and produce $H_2O$, which can have an impact on dimensional changes. However, the changes occur because the tannin content is not proportional to the water content in the distilled water solvent.[18-20]

## 5. Conclusion

Spraying kepok banana peel extract with various concentrations did not cause changes in the dimensions of the alginate impressions.

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