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MELASTOMA MALABACHTRICUM EXTRACT AS A DENTAL PLAQUE DETECTION AGENT

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ABSTRACT

Background: Using chemical colors in disclosing solutions is still controversial, so looking for alternative materials that are readily available and made from nature is necessary. Senduduk fruit (*Melastoma Malabachtricum*) is produced from wild plants that are easily obtained in Jambi and the Sumatera region and have high anthocyanin levels. Senduduk fruit is commonly consumed and does not cause problems with the body. It is hoped that this fruit can be used as an alternative disclosing solution made from natural ingredients that can be utilized.
Method: This type of research is quasi-experimental with pre and post-test control group design.
Melastoma Malabachtricum extract was carried out by maceration, evaporation, and distillation until the alcohol was used. Concentrations are made into 100%. Respondents numbered 14 elementary school children. The extract was applied to the teeth of respondents who met the inclusion criteria, and control was no intervention.
Result: The results of the Mann-Whitney test between the staining of Melastoma Malabachtricum extract at concentrations of 100% and control showed p≤0,01
Conclusion: There is no significant difference in plaque staining with Melastoma Malabachtricum extract concentrations of 100% and control. So, the fruit can be used as a plaque-detection material.

Keywords: plaque; disclosing solution; Melastoma Malabcahtricum; senduduk

INTRODUCTION

Based on the 2017 article review results, the number of gingivitis and periodontitis patients increased by 7.9 million, twice that of 2010. Dental caries patients increased from 5.34 to 5.84 million (Patthi et al., 2017). The prevalence of dental caries in Indonesia reached 88.8%, and periodontitis disease was 73%. (Kementerian Kesehatan RI, 2018) If left untreated, dental disease can interfere with learning and work activities. In certain conditions, it can cause systemic diseases because the bacteria in the mouth are the same as those in the kidneys and heart.

Dental caries or cavities are caused by acid products from microorganisms in plaque, while the inflammatory immune response by bacteria in dental plaque can cause periodontal tissue damage (Dommisch H & Kebschull M.Takei HH, 2015). Therefore, plaque can be removed to reduce gingival inflammation and demineralize tooth enamel. (Gomes et al., 2015) Plaque is invisible and is a thin, transparent layer. Disclosing solution is a plaque-disclosing material used to evaluate the cleaning of dental plaque when brushing teeth (Godoy & ., 2014). The red disclosing solution is applied to the teeth before brushing them. The red color will be visible if there is plaque, and then the teeth are brushed until the red color disappears, which means no more plaque.

Disclosing Solutions must be purchased at a dental supply store, which makes it difficult for people to get them. The use of chemical dyes in disclosing solutions is still controversial. Research by (Jung et al.,

2020)found that dental disclosing solution has potent cytotoxicity against pig skin epithelium. Therefore, searching for alternative materials that are easily obtained and made from natural ingredients is necessary. Senduduk fruit is produced from wild plants and is easily obtained in Jambi and the Sumatra region with high anthocyanin content. This fruit is expected to be an alternative material for disclosing solutions from natural ingredients that the community can utilize. The study aims to test the difference in the effectiveness of disclosing the solution of liquid extract of Senduduk fruit with concentrations of 100% compared to the control of dental plaque.

Dental plaque is the predominant etiology of gingivitis, periodontal disease, and causes caries (Fedi, P.F., Vernino, A.R., Gray, J.L., 2005). Dental plaque easily forms 3 minutes after brushing (Kayo et al., 2013). Thorough plaque can be seen with the help of a disclosing solution, but visually, it can only be seen after 1-2 days on teeth that are not cleaned with a white, grayish, or yellow image with a globular image.(Fedi, P.F, Vernino, A.R., Gray, J.L., 2005)

Plaque is transparent in color so that it is the same as the color of the teeth, so in order to be visible, the plaque must be colored first. This plaque coloring agent is called a Disclosing solution. Plaque coloring agents can indicate plaque's presence in patients and are helpful as a good counseling and motivational tool. According to Fedi et al., iodine, food coloring, Bismarck brown, mercurochrome, and basic fuscin were used as plaque coloring agents in the past.(Fedi, P.F, Vernino, A.R., Gray, J.L., 2005)

Natural ingredients are currently being encouraged with a food diversification program. Senduduk/Karamunting is a type of plant used as food and medicine.(Wiryono; Japriyanto; Erniwati, 2017)8 Senduduk fruit is also called (Melastoma Malabahtricum) Larahmah's research shows that the natural dyes found in Senduduk fruit (Melastoma Malabahtricum) are flavonoids and tannins (Jerni Larahmah, Hotni Arista Harahap, Ledy Yolanda Pasaribu & Batubara., 2019) Meiliati's research found that 50 grams of Senduduk fruit made into an extract by maceration using 95% ethanol produced the highest anthocyanin concentration of 204.9847 mg/L and was the highest value of ethanol concentrations of 50%, 80%, 85%, 90% (Meilianti, 2018)

The method commonly used to isolate anthocyanins is to extract fresh tissue by maceration in alcohol that has a low boiling point and contains acid. The organic solvent commonly used is methanol. Because methanol is a polar compound, anthocyanin pigments can quickly dissolve. In addition, its boiling point is relatively low at 65 ° C, making it easier to concentrate the extract. Anthocyanins are unstable compounds in neutral or basic solutions, so extraction occurs in acidic conditions. So, adding acid to methanol is intended to maintain the acidic media conditions.

Figure 1. Senduduk fruit (Melastoma Malabahtricum) which grows abundantly in the researcher's yard

In acidic pH conditions and low temperatures, anthocyanins are stable and will provide bright colors. At low pH, anthocyanin pigments are red, changing to violet and blue. Low concentrations of anthocyanins will be blue, high concentrations will be red, and average concentrations will be purple.

METHODS

The research will be conducted in the Pharmacy and Dental Health Department Laboratory of Poltekkes Kemenkes Jambi. The respondents are elementary school children, willing to be respondents without coercion, have a minimum pulp caries of 1 (acidic pH), and teeth are not crowded. The exclusion criteria of respondents are free caries or having enamel/dentin caries only and wearing brackets.

The study was conducted on 16 respondents of children in grades 5 and 6 consisting of 6 boys and 6 10 girls aged 11-12 years. These children were very cooperative, so the study could be carried out smoothly.

Data was collected after the child's teeth were smeared with the experimental material on each tooth, and then three observers with healthy vision were observed to determine whether plaque was visible, indicated by the presence of a reddish color or red/dark purple. Each child was smeared with one tooth for each experimental material, and the comparison was a tooth that was not smeared with disclosing or plaque material. After that, the teeth were wiped once with the respondent's tongue, and the plaque was observed again to determine whether it was still visible.

RESULTS AND DISCUSSION

After smearing it with Senduduk fruit extract, the respondent's teeth containing plaque appeared purplish.

Figure 2. Picture of the application of disclosing solution on tooth 11 (incisivus) smeared with Senduduk fruit extract

In the picture, it can be seen that tooth 11, which was smeared with Senduduk fruit extract, left a purplish red color that did not disappear when wiped with the respondent's tongue. This means that the presence of plaque on tooth 11(first incicivus) can be clearly detected compared to tooth 21 (second Incicivus) and all of the teeth that were not smeared with dye.

The results of observations on 16 children showed that there were two children whose teeth did not show any coloring after being smeared with disclosing solution or with Senduduk fruit extract. In addition, the two children's teeth were smeared with Senduduk extract and each smeared tooth. If, after being smeared with senduduk extract, a red color is visible, and the color is still there after being wiped with the tongue, a score of 2 is given. If the red color disappears after being wiped with the tongue, a score of 1 is given, and if no red color is visible when smeared with the experimental material, the tooth is not included in the analysis.

Table 1. Value Result

	Melastoma Malabachtricum 100%	Kontrol negative
Amount	26	0
Mean	1,86	0
Modus	2	0
Median	2	0

Table 1 shows that the most frequently appearing value is score 2, meaning that more teeth have visible plaque than teeth that are not categorized. The value that often appears is 2, meaning that the Senduduk fruit extract can detect plaque and does not disappear with tongue wiping.

The normality test with Saphiro Wijk was carried out on the research data, and the sig result was obtained. Sig ≤0.000 means there was no normal distribution, so statistical tests are then carried out with Mann-Whitney test results obtained sig ≤0.001, meaning there is a significant difference between the treatment and control teeth. Thus, the extract of Senduduk fruit is the same as the disclosing solution used to detect plaque.

The normality test with Saphiro Wijk was carried out on the research data, and the sig result was obtained. = 0.000, meaning there was no normal distribution. The difference between disclosing with extract of Senduduk fruit and the control was tested using the Mann-Whitney test. This test yielded a p-value of 0.001, meaning that the color visible on teeth smeared with closing solution from the Senduduk fruit extract significantly differed from teeth that had not been smeared with anything.

Based on the research results, the Senduduk fruit extract from nature is relatively safer. According to research conducted on the phytochemical content, antioxidant activity, and cytotoxicity of Senduduk fruit extract (Senduduk akar), it is known that Senduduk fruit extract does not have toxic properties against Artemia Salina Leach. (Meilianti, 2018) Humans and animals have long consumed this anthocyanin pigment in their fruits or vegetables. So far, there has never been a disease or poisoning caused by anthocyanin pigments. According to many studies, anthocyanin pigments and other flavonoid compounds have been proven to have positive effects on health(Priska et al., 2018).

CONCLUSION

There is no difference in plaque detection with Melatoma extract Melastoma Malabachtricum with factory disclosing solution.

CONFLICT OF INTEREST

There is no conflict of interest.

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