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Physicochemical Analysis and Antibacterial Activity of Sea Grapes (Caulerpa racemosa) Toothpaste: A Novel Solution for Eco-Friendly Oral Hygiene

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Background/Objectives: Toothpaste basically contains triclosan compounds, parabens, and sodium pyrophosphate.[1] However, these compounds can pollute the ecosystem.[2] Therefore, it is necessary to explore active ingredients in natural products that are more environmentally friendly. The objective of this study is to evaluate the physicochemical properties of sea grapes (Caulerpa racemosa) with Thunnus fish bone flour toothpaste and its efficacy in antibacterial activity towards colonizations of cariogenic and periodontal bacterias.

Methods: There are 4 variations of toothpaste formulation, Sea Grape Extract: Calcium carbonate or tuna bone isolate, F1(1,5:45), F2(3:45, F3(4,5:45), F4(0:45), or control. The formulation of toothpaste content is based on Indonesian national standard as quality requirements. Furthermore, the toothpaste was analyzed for levels of antioxidant activity against DPPH, organoleptic or sensory test, homogeneity test, viscosity test, pH test, and foam formation (day 1, 7, 14 and 21). Antibacterial activity test against Staphylococcus aureus ATCC 6538, Streptococcus mutans ATCC 25175, and Porphyromonas gingivalis ATCC 33277. All tests were carried out in triples/three replications, then the data was analyzed using SPSS. Data obtained in the physical and chemical quality test were descriptively analyzed. The antioxidant and antibacterial activity data were statistically processed using the One-way ANOVA (95% CI) using the MacBook version of the Graphad Prism 9 program.

Results: There was a significant difference in antioxidant activity between F4/Control and F2, F3, and F4 $p = 0.0001$ ($p < 0.05$). F3 is the formulation that has the highest antioxidant activity, namely $27.46 \pm 3.09\%$. F3 also has good sensory test, has adequate homogeneity, has an optimal pH of 7.97 ± 0.24, increases viscosity 443.00 ± 14.62, has a foam formation of at least 19.33 ± 3.51, which is significantly different ($p < 0.05$) with other varies.

Discussion / Conclusion: Sea grape extract enriched with Thunnus fish bone flour can be a potential toothpaste without any risk of harm to not pollute water and injure aquatic biota. Several studies have stated that sea grapes have the bioactive compound caulerpin, which also acts as an antioxidant.[3] This variant of toothpaste contains natural ingredients that are easily biodegradable. Therefore, this eco-friendly toothpaste is the best alternative to save the environment.

References

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Disclosure of Interest

None Declared

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