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**“OPTIMIZATION OF THE COMBINATION OF PANDAN LEAVES EXTRACT
(*Pandanus amaryllifolius* Roxb.) AND EGGSHELL CALCIUM CARBONATE IN
TOOTHPASTE FORMULATION FOR ANTIBACTERIAL ACTIVITY AGAINST
Streptococcus mutans AND *Porphyromonas gingivalis*”**

ABSTRACT

Background: Oral and dental health problems are associated with the growth of *Streptococcus mutans* and *Porphyromonas gingivalis*. Pandan wangi leaves (*Pandanus amaryllifolius* Roxb.) contain secondary metabolites that have potential antibacterial activity, while calcium carbonate derived from eggshells can be utilized as a natural abrasive in toothpaste formulations. The combination of these ingredients has the potential to be developed as a natural-based toothpaste.

Objective: This study aimed to determine the effect of variations in pandan wangi leaf extract concentration on the physical characteristics, stability, and antibacterial activity of toothpaste formulations against *Streptococcus mutans* and *Porphyromonas gingivalis*.

Methods: This study employed a laboratory experimental method, including the extraction of pandan wangi leaves using the maceration method with 96% ethanol, formulation of toothpaste with extract concentrations of 15%, 20%, and 25%, evaluation of physical characteristics, stability testing using the *cycling test* method, and antibacterial activity testing using the well diffusion method against *Streptococcus mutans* and *Porphyromonas gingivalis*.

Results: The results showed that all formulations had good organoleptic characteristics and homogeneity. The pH values and spreadability met the requirements, while the viscosity of all formulations did not meet the requirements. The antibacterial activity test showed that increasing the extract concentration increased the diameter of the inhibition zone. Formula F3 containing 25% extract produced the highest inhibition zone diameter, measuring 14.6 ± 13.13 mm against *Streptococcus mutans* and 11.4 ± 10.20 mm against *Porphyromonas gingivalis*, which were classified as strong antibacterial activity.

Conclusion: Based on the results, the toothpaste formulation combining pandan wangi leaf extract and calcium carbonate derived from eggshells exhibited antibacterial activity against *Streptococcus mutans* and *Porphyromonas gingivalis*. Formula F2 containing 20% pandan wangi leaf extract was considered the optimal formulation based on the evaluation of physical characteristics, stability, and antibacterial activity, although F3 exhibited the highest antibacterial activity.

Keywords: Pandanus amaryllifolius Roxb., calcium carbonate, eggshell, toothpaste, antibacterial activity, Streptococcus mutans, Porphyromonas gingivalis.