

ABSTRACT

Menopause is a physiological phase in women characterized by a decrease in estrogen levels, which can lead to decreased salivary secretion and an increased risk of oral diseases, particularly dental caries caused by *Streptococcus mutans* bacteria. Propolis is known to have antibacterial activity, while lime extract (*Citrus aurantifolia*) can stimulate salivary secretion and enhance product acceptability. This study aimed to determine the antibacterial effectiveness of propolis- and lime extract-based *hard candy* against *Streptococcus mutans* and to evaluate its organoleptic properties as an oral health product for menopausal women. This study was a laboratory experimental study using a posttest-only control group design. The study groups consisted of F1 (*hard candy* containing 2% propolis and 25% lime extract), F2 (*hard candy* containing 4% propolis and 25% lime extract), K+ (0.2% chlorhexidine gluconate), and K- (*hard candy* without active ingredients). Antibacterial activity was tested using the disk diffusion (Kirby–Bauer) method and analyzed using One-Way ANOVA followed by Duncan's post hoc test. Organoleptic tests, including aroma, color, taste, and texture, were conducted using a hedonic scale method by 30 non-standard panelists and analyzed using the Mann–Whitney test. The results showed statistically significant differences among treatment groups ($p < 0.05$). The analysis indicated that *hard candy* containing 4% propolis and 25% lime extract (mean inhibition zone diameter of 13.91 mm) produced a higher inhibition zone compared to the formulation containing 2% propolis and 25% lime extract (mean of 11.35 mm), indicating that both formulations exhibited strong antibacterial activity against *Streptococcus mutans*. Statistical analysis of the organoleptic test showed a significant difference in taste parameters, with the formulation containing 2% propolis and 25% lime extract receiving higher acceptance than the formulation containing 4% propolis and 25% lime extract. Propolis and lime extract-based *hard candy* were effective in inhibiting the growth of *Streptococcus mutans* and demonstrates good organoleptic acceptance, indicating its potential to be developed as a functional product to support oral and dental health in menopausal women.

Keywords : propolis, *hard candy*, lime extract, *Streptococcus mutans*, menopause, antibacterial activity

ABSTRAK

Menopause merupakan fase fisiologis pada wanita yang ditandai dengan penurunan kadar hormon estrogen, yang dapat menyebabkan penurunan sekresi saliva dan meningkatkan risiko penyakit rongga mulut, khususnya karies gigi akibat bakteri *Streptococcus mutans*. Propolis diketahui memiliki aktivitas antibakteri, sedangkan ekstrak jeruk nipis (*Citrus aurantifolia*) dapat menstimulasi sekresi saliva serta meningkatkan daya terima produk. Penelitian ini bertujuan untuk mengetahui efektivitas antibakteri permen *hard candy* berbasis propolis dan ekstrak jeruk nipis terhadap *Streptococcus mutans* serta menilai sifat organoleptiknya sebagai produk kesehatan gigi dan mulut bagi wanita menopause. Penelitian ini merupakan penelitian eksperimental laboratorium dengan rancangan posttest-only control group design. Kelompok penelitian yaitu F1 (Permen *hard candy* propolis konsentrasi 2% ekstrak jeruk nipis 25%), F2 (Permen *hard candy* propolis konsentrasi 4% ekstrak jeruk nipis 25%), K+ (Chlorhexidine gluconate 0,2%), dan K- (Permen tanpa bahan aktif). Uji aktivitas antibakteri menggunakan metode difusi cakram (Kirby–Bauer) yang dianalisis menggunakan uji One-Way ANOVA dan uji lanjut Duncan. Uji organoleptik meliputi aroma, warna, rasa, dan tekstur dengan metode skala hedonik oleh 30 panelis non-standar dan dianalisis menggunakan uji Mann–Whitney. Hasil penelitian menunjukkan adanya perbedaan yang bermakna antar kelompok perlakuan ($p < 0,05$) secara statistik. Analisis menunjukkan permen *hard candy* dengan propolis 4% dan ekstrak jeruk nipis 25% (rerata 13,91 mm) menghasilkan diameter zona hambat lebih tinggi dibandingkan formulasi propolis 2% dan ekstrak jeruk nipis 25% (rerata 11,35 mm) yang menunjukkan kedua formulasi memiliki aktivitas antibakteri kuat terhadap *Streptococcus mutans*. Analisis statistik menunjukkan terdapat perbedaan bermakna parameter rasa pada uji organoleptik, dengan formulasi propolis 2% dan ekstrak jeruk nipis 25% lebih tinggi dibandingkan formulasi propolis 4% dan ekstrak jeruk nipis 25%. Permen *hard candy* berbasis propolis dan ekstrak jeruk nipis efektif menghambat pertumbuhan *Streptococcus mutans* serta memiliki tingkat penerimaan organoleptik yang baik, sehingga berpotensi dikembangkan sebagai produk fungsional untuk mendukung kesehatan gigi dan mulut pada wanita menopause.

Kata Kunci :propolis, permen *hard candy*, ekstrak jeruk nipis, *Streptococcus mutans*, menopause, aktivitas antibakteri