

INTISARI

Karies merupakan penyakit rongga mulut berupa kerusakan pada jaringan keras gigi akibat asam yang dihasilkan oleh bakteri kariogenik, salah satunya adalah bakteri *Streptococcus mutans*. Glukosiltransferase (GTF) adalah enzim ekstraseluler yang diproduksi oleh bakteri *S. mutans*. Enzim GTF berfungsi mengkatalisasi substrat berupa sukrosa menjadi glukukan. Glukan memfasilitasi adhesi bakteri yang mendukung pembentukan biofilm. Kitosan memiliki struktur gugus hidroksil yang berpotensi untuk berikatan dengan sisi aktif enzim dan menghambat aktivitas enzim. Penelitian ini bertujuan untuk mengetahui kemampuan kitosan ekstrak ekstrak kulit udang galah (*Macrobrachium rosenbergii*) dalam menghambat aktivitas glukosiltransferase bakteri *S. mutans* ATCC 25175.

Pengujian penghambatan aktivitas GTF *S. mutans* ATCC 25175 dilakukan dengan metode turbidimetri. Setiap tabung diisi dengan enzim GTF dan larutan substrat (1,25% sukrosa, larutan penyangga kalium fosfat (6,35 mM pH 6,5), dan 0,01% natrium azida) kemudian ditambahkan kitosan konsentrasi 0,5%, 0,25%, dan 0,125% serta klorheksidin glukonat 0,1% (kontrol positif) dan akuades (kontrol negatif). Tabung reaksi diinkubasi selama 18 jam pada suhu 37°C dengan kemiringan 45°. Supernatan dibuang, diisi dengan akuades lalu larutan diultrasonikasi selama 30 menit. Nilai OD diperoleh dari pembacaan dalam kuvet menggunakan spektrofotometer UV-Vis 1800 $\lambda=550$ nm.

Hasil uji *One Way ANOVA* memperlihatkan perbedaan signifikan ($p<0,05$) antara kelompok uji terhadap penghambatan aktivitas glukosiltransferase *S. mutans*. Hasil *Least Significant Difference* (LSD) menunjukkan perbedaan signifikan antara kitosan ekstrak kulit udang galah konsentrasi 0,125%, 0,25%, dan 0,5% dengan klorheksidin glukonat 0,1% ($p<0,05$). Kesimpulan dari penelitian ini, kitosan ekstrak kulit udang galah konsentrasi 0,5%, 0,25%, dan 0,125% mampu menghambat aktivitas GTF *S. mutans* ATCC 25175 walaupun efektivitasnya lebih rendah dibandingkan klorheksidin glukonat 0,1%.

Kata kunci: *Streptococcus mutans*, kitosan, ekstrak kulit udang galah, aktivitas glukosiltransferase

ABSTRACT

Caries is an oral cavity disease characterized by damage of the hard tissues of the tooth due to acid produced by cariogenic bacteria, such as *Streptococcus mutans*. Glucosyltransferase (GTF) is an extracellular enzyme produced by *S. mutans*. The enzyme catalyzes sucrose into glucan. Glucan facilitates bacterial adhesion, which supports biofilm formation. Chitosan, with its hydroxyl group structure, has the potential ability to bind to the active site of the enzyme, inhibiting its activity. This study aimed to determine the ability of chitosan extracted from the shell of the giant freshwater prawn (*Macrobrachium rosenbergii*) in inhibiting the glucosyltransferase activity of *S. mutans* ATCC 25175.

The inhibition of GTF activity of *S. mutans* ATCC 25175 was tested using the turbidimetric method. Each tube was filled with GTF enzyme and substrate solution (1.25% sucrose, potassium phosphate buffer solution (6.35 mM pH 6.5), and 0.01% sodium azide), followed by the addition of chitosan at concentrations of 0.5%, 0.25%, and 0.125%, as well as 0.1% chlorhexidine gluconate (positive control) and distilled water (negative control). The test tubes were incubated for 18 hours at 37°C with a 45° incline. The supernatant was discarded, distilled water was added, and then the solution was ultrasonicated for 30 minutes. OD values were obtained from readings in a cuvette with a spectrophotometer at $\lambda=550$ nm.

One Way ANOVA test showed a significant difference ($p<0.05$) among the test groups regarding the inhibition of *S. mutans* glucosyltransferase activity. The Least Significant Difference (LSD) test results showed significant differences between chitosan extracted from the shell of the giant freshwater prawn at concentrations of 0.125%, 0.25%, and 0.5% with 0.1% chlorhexidine gluconate ($p<0.05$). In conclusion, chitosan extracted from the shell of the giant freshwater prawn at concentrations of 0.5%, 0.25%, and 0.125% can inhibit the activity of GTF in *S. mutans* ATCC 25175, although its effectiveness is lower compared to 0.1% chlorhexidine gluconate.

Keywords: *Streptococcus mutans*, chitosan, giant freshwater prawn shells, glucosyltransferase activity