INTISARI

Gigi tiruan cekat (GTC) berbasis *fiber reinforced composite* (FRC) menjadi solusi inovatif dalam kedokteran gigi modern karena sifatnya yang estetis, invasif minimal, dan biokompatibel. Pemanfaatan serat alami, seperti sutra *Bombyx mori*, menjadi alternatif bahan penguat yang ramah lingkungan dan ekonomis. Pola orientasi serat dalam FRC di antaranya, yaitu *unidircetional* dan *bidirectional (braided)*. Tujuan penelitian ini adalah mengetahui perbedaan modulus elastisitas *fiber reinforced composite* antara orientasi pita sutra *Bombyx mori unidirectional* dan *bidirectional.*

Penelitian ini menggunakan desain eksperimental laboratoris dengan bahan resin komposit *flowable* (Denfil Flow, Vericom, Korea) dan serat sutra *Bombyx mori*. Dua kelompok sampel FRC dibuat dengan pola orientasi serat, *unidirectional* dan *bidirectional* (*braided*). Masing-masing kelompok terdiri dari 6 sampel (n=6) berukuran (25 x 2 x 2) mm dan disinar menggunakan *light cure* selama 20 detik. Pengujian modulus elastisitas dilakukan menggunakan *universal testing machine* dengan metode *three-point bending*. Data dianalisis secara statistik menggunakan uji *independent t-test* ($p < 0,05$).

Hasil penelitian menunjukkan bahwa rerata modulus elastisitas (MPa) kelompok FRC dengan orientasi serat *unidirectional* lebih tinggi, yaitu 1.497,63 ± 180,00 MPa dibandingkan pola *bidirectional (braided)*, yaitu1.044,65 ± 39,68 MPa. Hasil uji statistik *independent t-test* menunjukkan bahwa terdapat perbedaan yang signifikan antara kelompok *unidirectional* dan *bidirectional (braided)* terhadap modulus elastisitas *fiber reinforced composite* ($p < 0,001$). Kesimpulan dari penelitian ini adalah pola orientasi pita serat sutra *Bombyx mori* memberikan perbedaan yang bermakna terhadap modulus elastisitas FRC.

Kata kunci: Orientasi serat, modulus elastisitas, serat sutra *Bombyx mori*, FRC

ABSTRACT

Fixed dental prostheses (GTC) based on fiber-reinforced composite (FRC) are regarded as an innovative solution in modern dentistry due to their aesthetic properties, minimal invasiveness, and biocompatibility. The utilization of natural fibers, such as Bombyx mori silk, has been considered as an environmentally friendly and economical alternative reinforcement material. Fiber orientation patterns in FRC, including unidirectional and bidirectional (braided), are investigated. The purpose of this study was to examine the differences in the elastic modulus of fiber-reinforced composite between unidirectional and bidirectional Bombyx mori silk ribbon orientations.

An experimental laboratory design was utilized using flowable resin composite (Denfil Flow, Vericom, Korea) and Bombyx mori silk fibers. Two groups of FRC samples were prepared with fiber orientations of unidirectional and bidirectional (braided). Each group consisted of 6 samples (n=6) measuring (25 × 2 × 2) mm, which were cured using a light cure for 20 seconds. Elastic modulus testing was conducted using a universal testing machine with the three-point bending method. Data were statistically analyzed using an independent t-test ($p < 0,05$).

The results indicated that the mean elastic modulus (MPa) of FRC samples with unidirectional fiber orientation was higher, at 1497.63 ± 180.00 MPa, compared to the bidirectional (braided) pattern at 1044.65 ± 39.68 MPa. It was shown that there was a significant difference between the unidirectional and bidirectional (braided) groups in terms of the elastic modulus of the fiber-reinforced composite ($p < 0.001$). The conclusion of this study is that the orientation of Bombyx mori silk ribbons significantly affects the elastic modulus of FRC.

Keywords: Fiber orientation, elastic modulus, Bombyx mori silk fibers, FRC