ABSTRAK

Transplantasi tulang secara global telah diaplikasikan lebih dari 2,2 juta dalam prosedur bedah setiap tahun. Prosedur ini memiliki kelemahan, seperti infeksi, perdarahan, jumlah jaringan tulang donor yang terbatas, dan kebutuhan melakukan operasi kedua untuk pengambilan transplantasi tulang. Penelitian ini bertujuan untuk fabrikasi komposit *scaffold* yang dapat diaplikasikan dalam restorasi tulang dengan menggunakan *biopolymer* kitosan yang diekstraksi dari limbah cangkang kepiting bakau (*Scylla serrata*). Ekstraksi dilakukan melalui tiga tahapan, yaitu deproteinasi, demineralisasi, dan deasetilasi. Selanjutnya, komposit *scaffold* untuk restorasi tulang difabrikasi menggunakan kitosan, hidroksiapatit, dan kolagen serta dicetak, kemudian dikeringkan menggunakan *freeze-dryer*. Karakterisasi komposit *scaffold* meliputi analisis gugus fungsi menggunakan *Fourier Transform Infra Red Spectroscopy* (FTIR), pengujian morfologi, *compressive strength*, porositas, *degradation ratio*, serta *swelling ratio*. Rendemen serbuk kitosan yang didapatkan adalah 9,376 ± 0,261%. *Scaffold* hasil fabrikasi memiliki pori dengan ukuran diameter 109,880 ± 46,9804 µm dan porositas 51,436 ± 2,279%. Karakteristik lain berupa kekuatan mekanik sebesar 0,98 ± 0,011 MPa, *swelling ratio* 370,112 ± 3,723% selama 6 jam, dan *degradation ratio* 23,115 ± 6,282% selama 4 minggu.

Kata Kunci: *scaffold*, kepiting bakau, kitosan, komposit

ABSTRACT

Bone grafts were employed over 2.2 million in surgical procedures each year worldwide. This procedure has drawbacks such as infection, bleeding, a limited amount of donor bone tissue, and the need for a second surgery to remove the bone graft. The objective of this study is to use chitosan biopolymers from mangrove crab (*Scylla serrata*) shell waste to fabricate scaffold composites for bone restoration. Extraction was performed in three steps: deproteinization, demineralization, and deacetylation. Furthermore, a composite scaffold for bone restoration consisting of chitosan, hydroxyapatite, and collagen was fabricated and dried with a freeze dryer. Characterization of scaffold composites includes Fourier Transform Infrared Spectroscopy (FTIR) functional group analysis, morphological testing, compressive strength, porosity, degradation ratio, and swelling ratio. The yield of chitosan powder obtained was 9.376±0.261%. The fabricated scaffold has pores of diameter 109.880 ± 46.9804 µm with a porosity of 51.436 ± 2.279%. Other properties such as mechanical strength of 0.98 ± 0.011 MPa, swelling ratio of 370,112 ± 3,723% in 6 hours and degradation ratio of 23.115 ± 6.282% in 4 weeks were obtained.

Keywords: scaffold, mangrove crab, chitosan, composite