

Preparation of Biomedical Hydrogels Using Phenolic Compounds and Electron Beam Irradiation

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Abstract : In this study, an attempt has been made to prepare a physically cross-linked gel by cooling of tannic acid (TA)-polyvinyl alcohol (PVA) solution that subsequently convert to antibacterial chemically cross-linked hydrogel by using electron beam irradiation. PVA is known for its biocompatibility and hydrophilicity, and TA is known for being a natural compound which can serve as a cross-linking agent and a therapeutic agent. Swelling behavior, gel content, pore size, and mechanical properties of hydrogels which prepared at 14, 28, and 56 (kGy) with different ratios of polymers were investigated. PVA-TA hydrogel showed sustained release of tannic acid as approximately 20% and 50% of loaded TA released from the hydrogel after 4 and 72 h release time. We found that gel content decreased and the moisture retention capability increased by an increase in TA composition. In addition, PVA-TA hydrogels showed a good antibacterial activity against S.aureus. MTT analysis indicated that close to 83% of fibroblast cells remained viable after 48 h exposure to hydrogel extract. Moreover, the cooling of 10% PVA solution containing 0.5 and 0.75% w/v tannic acid to room and refrigerator, respectively, led to formation of physical gel that did not present any flow index after inversion of hydrogel cast. According to the results, the hydrogel prepared by electron beam irradiation of blended PVA-TA solution could be further investigated as a promising candidate for wound healing.

Keywords : poly vinyl alcohol, tannic acid, electron beam irradiation, hydrogel wound dressing

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