ABSTRACT

Burn wounds pose significant challenges due to their susceptibility to microbial invasion and limited effective dressing options. This study aimed to evaluate the wound healing potential of a sericin-based self-healing and stretchable hydrogel loaded with *Psidium guajava*L. extract against full-thickness burn wounds in mice. The hydrogel was characterized by physicochemical analyses including SEM, FTIR, XRD, viscosity, pH, swelling degree, weight loss, and mechanical strength. In vivo experiments used a Swiss albino mice burn model, where 6 mm full-thickness wounds were induced with a hot metal rod. Hydrogels were applied topically at regular intervals, and wound healing was assessed through wound contraction measurements, healing time, and histological analysis. Hematological parameters and serum biomarkers i.e. pro-and anti-inflammatory cytokines, matrixmetalloproteinases (MMPs), tissue inhibitors of metalloproteinases (TIMPs), antioxidants (GSH, GPx, CAT, SOD), angiogenic factors (VEGF), and oxidative stress markers (MDA) were also evaluated. Results demonstrated that the hydrogels exhibited high swelling capacity and notable weight loss, suggesting effective absorption of wound exudates and reduced infection risk. Notably, Hydrogel 4 (3% sericin + 3% P. guajava L.) achieved significantly improved wound healing (89.66%) compared to controls (37.16%) by day 15. Histological examination confirmed collagen deposition and hair follicle regeneration, indicative of complete healing. Hematological findings showed increased red blood cell counts and reduced white blood cells, reflecting resolution of inflammation. Serum analyses revealed elevated anti-inflammatory markers (IL-10), TIMPs, and antioxidants (GSH, GPx, CAT, SOD), alongside decreased pro-inflammatory cytokines (IL-6, IL-8, IL-1β, TNF-α), MMPs, angiogenic factor VEGF, and oxidative stress marker MDA. Hydrogel 4 showed a 3.47-fold increase in SOD and a 68% reduction in MDA, underscoring its efficacy in mitigating oxidative stress. In conclusion, the sericin-based hydrogel infused with *P. guajava*L. exhibited excellent physicochemical and biological properties, promoting effective burn wound healing. Hydrogel 4 demonstrated the most pronounced therapeutic benefits, making it a promising candidate for advanced wound dressing applications.

Key words: Burn wound healing, Self-healing and stretchable hydrogel, *Psidium guajava*L., Silk sericin, Inflammation, Angiogenesis.