

ABSTRACT

Management of diabetic foot ulcers is challenging and require intensive care as they heal slowly and greatly affects quality of life due to reduced mobility, infection and sepsis. The aim of current study was to develop novel hybrid hydrogels of silk fibroin enriched with extracts of *Catharanthus roseus* (i.e., 0.5%, 1.0% and 1.5%). Plant extract of *C. roseus* was subjected to GC-MS analysis to assess the component composition. Hydrogels were characterized using FT-IR and SEM. Swiss albino mice were injected with alloxan to develop diabetic models and foot ulcer was induced. Hydrogels were topically administered every other day on diabetic foot and their wound healing potential were observed. GC-MS analysis of *C. roseus* revealed the presence of 17 plant constituents including components with antidiabetic and antimicrobial properties. FT-IR results of hydrogels indicated intramolecular interactions between CMC, sodium alginate, fibroin and *C. roseus* extracts. Highest swelling ration (240%) was shown by T3 hydrogel along with uniform surface morphology depicted by SEM analysis. Wound healing was significantly faster (more than 80%) in the mice treated with formulated hydrogels than negative control group which showed just a 42% reduction in wound size by day 14. There was a marked increase in IL-10 and TIMPs levels in treatment groups, whereas pro-inflammatory cytokines and matrix metalloproteinases were decreased. Histological analysis showed clear distinctions between diabetic and non-diabetic pancreas supported by HbA1c and C-peptide levels. Hydrogels treated groups exhibited enhanced angiogenesis, collagen fiber restoration and granulation tissue formation, indicating wound healing. In conclusion, this study demonstrates that a 1.5% *C. roseus* extract infused into silk fibroin hydrogel significantly enhanced healing and promoted rapid wound contraction of diabetic foot ulcers in mice by day 14.