Clerodendrum glandulosum Lindl. extract reduced *in situ* silver nanoparticles in a chitosan-PEG polymeric matrix for the management of diabetic wound

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Abstract:

Chronic wounds related to diabetes mellitus are a result of a series of complications due to hyperglycemia, including impaired growth factor production, decreased keratinocyte proliferation and migration, reduced angiogenesis, reduced cytokine synthesis, lowered matrix metalloproteinase (MMP) production, neuropathy, reduced nitric oxide synthase production, decreased fibroblast synthesis and migration, and impaired inflammatory cell functions. This multifaceted mechanism of diabetic wounds needs a suitable novel topical formulation that can deliver the active constituent at a controlled means, target the various stages of wound healing, absorb the wound exudates, and prevent secondary infections. To meet the above requirements, the *Clerodendrum glandulosum* (CG) extract reduced silver nanoparticles (AgNPs) impregnated Chitosan-Polyethlene glycol (PEG) hydrogel was synthesized. The formulated hydrogel was then characterized for its physicochemical properties, such as absorbance, particle size, zeta potential, surface morphology, porosity, swelling capacity, viscosity, and release of AgNPs. The findings suggested that the hydrogel exhibited excellent formulation characteristics and showed a controlled release for seven days, making it suitable for chronic wound healing studies. In subsequent studies, these formulations showed good antioxidant and antimicrobial properties. The results of the diabetic wound healing studies showed a faster wound closure rate and improved extracellular matrix formation. These antioxidant, antimicrobial, and wound-healing properties suggest that the CG-AgNPs loaded Chitosan-PEG hydrogel is a promising material for novel topical formulation of diabetic wounds.

Keywords: chronic wounds; diabetes mellitus; *Clerodendrum glandulosum*; silver nanoparticles; hydrogel