Abstract

Diabetes mellitus, also known as only diabetes, is a metabolic condition that raises blood sugar levels. The most commonly diagnosed wound is a diabetic wound. Diabetes-related blood vessel narrowing impairs wound healing because less oxygen can enter the wound and the tissues repair more slowly. In the current work, Swiss albino mice were given alloxan monohydrate to induce diabetes. After mice were successfully given diabetes, excision wounds were made using a biopsy puncture (6 mm). The diabetic wounds were treated with various biomaterials, and the healing of the wound was monitored. The wound-healing effect of 10% *Vachellia nilotica* extract, 10% *Nigella sativa* extract along with 10% *Vachellia nilotica* nanoparticles extract, 2% *Nigella sativa* nanoparticles extract was evaluated by determining the percent wound contraction, healing time, and histological analysis. The serum level of various biochemical parameters i.e., pro-inflammatory cytokines (TNF-α, IL-6, IL-8), MMPs (MMP 2, MMP7, MMP 9), and TIMPs were also determined. The best results showed by the *Vachellia nilotica* nanoparticles in which wounds healed in 12 days with wound contraction up to 99.0±1.9%. In contrast, the wound of the positive control group (polyfax) and the diabetic control (saline) healed in 18- and 16-days respectively, and had correspondence contraction up to 96.7±1.4% and 95.9±1.0%, respectively. Histological examination revealed that *Vachellia nilotica* nanoparticles promoted the growth of blood vessels, fibroblasts, and keratinocytes while lessening inflammation. The disturbing serum level of biochemical parameters was likewise controlled by these extracts and their nanoparticles. The *Vachellia nilotica* nanoparticles significantly alleviated the serum level of pro-inflammatory cytokine i.e., TNF-α (19.4±1.5 pg/ml), IL-6 (13.8±0.6 pg/ml), and IL-8 (24.8±1.2 pg/ml) as compared to the diabetic control (TNF-α=47.6±2.5 pg/ml, IL-6=32.0±2.1 pg/ml, IL-8=68.8±1.7 pg/ml). The serum level of MMP2 (248.2±7.9pg/ml), MMP7 (316±5.2 pg/ml), and MMP9 (167.8±12.1 pg/ml) in the same group was also observed much less than the diabetic control (MMP2=510.4±10.0 pg/ml, MMP7=527.2±11.8 pg/ml, MMP9=378.6±11.2 pg/ml). The serum level of TIMPs (176.8±2.9 pg/ml) in this group was increased maximally with respect to diabetic control (62.2±5.6 pg/ml). It is concluded that nanoparticles of these biomaterial can be inferred, possesses strong regeneration and healing properties and can be utilized as a successful treatment for the repair of chronic wounds in both healthy and diabetic patients.