



Abstract

Diabetes, a heterogeneous group of disorders, primarily characterized by elevated blood glucose levels. Because of its high incidence and prevalence, it becomes the main concern about human health in the 21st century. Diabetes involved various complications specifically in delayed wound healing. Natural products have an amazing effect in healing different diseases and are being used for centuries. In the current study, diabetes was induced in Swiss albino mice by using alloxan monohydrate. After the successful induction of diabetes in mice, excision wounds were created via a biopsy puncture (6mm). Various biomaterials were applied to the diabetic wounds and healing was checked using various parameters. Wound healing effects of 5% Fibroin, 5% Aloe vera Gel and 3% Ginger Extract, individually along with their combinations 5% Fibroin + 5% Aloe vera Gel, 5% Fibroin + 3% Ginger Extract, 5% Aloe vera Gel + 3% Ginger Extract, 5% Fibroin + 5% Aloe vera Gel + 3% Ginger Extract were 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 combination of 5% Fibroin, 5% Aloe vera Gel and 3% Ginger in which case wounds healed in 11 days with wound contraction upto 98.5 \pm 0.9%. In contrast, the wound of the positive control group (polyfax) and the diabetic control (saline) healed in 17- and 19-days respectively, and had corresponding contraction upto 96.7 \pm 1.4% and 96.3 \pm 1.1%. Histological analysis showed that the combination of three biomaterials (5%Fibroin, 5%Aloe vera and 3%Ginger) exhibited increase in growth of collagen fibers, number of fibroblasts and keratinocytes, and blood vessels with lessened inflammation. These extracts and their combination also regulated the disturbed serum level of biochemical parameters. The combination of the three biomaterials (5%Fibroin, 5%Aloe vera and 3%Ginger) significantly alleviated the serum level of pro-inflammatory cytokine i.e., TNF- α (12.7 \pm 0.9pg/ml), IL-6 (9.6 \pm 0.9pg/ml), and IL-8 (19.6 \pm 1.0pg/ml) as compared to the Diabetic Control (TNF- α =40.9 \pm 4.9pg/ml, IL-6=28.0 \pm 1.8pg/ml, IL-8=60.2 \pm 2.4pg/ml) (P<0.001). The serum level of MMP2 (217.0 \pm 9.2pg/ml), MMP7 (279.0 \pm 9.8pg/ml), and MMP9 (156.0 \pm 11.6pg/ml) in the same group was also observed

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much less than the Diabetic Control (MMP2=416.0±15.5pg/ml, MMP7=455.0±20.5pg/ml, MMP9=363.0±13.5pg/ml) ($P<0.001$). The serum level of TIMPs (202.0±6.9pg/ml) in this group increased maximally with respect to diabetic control (51.8.0±7.7pg/ml) ($P<0.001$). It can be concluded from the current research that when the reported biomaterials are used in their combinations induce high regenerative and healing capabilities and can be used as an effective remedy in the healing of chronic wounds in normal as well as diabetic patients.