Abstract

Diabetes, a serious chronic disorder, is usually associated with elevated blood sugar levels in the blood. Diabetes involved various complications specifically in delayed wound healing. Natural products have an amazing effect on the healing of 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 checked the healing of the wound. The wound-healing effect of 15% garlic, 10% turmeric, and 5% fibroin, individually along with their combinations 15% garlic + 5% fibroin, 10% turmeric + 5% fibroin, 15% garlic + 10% turmeric, and 15% garlic + 10% turmeric + 5% fibroin 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 combination of 15% garlic, 10% turmeric, and 5% fibroin in which case wounds healed in 12 days with wound contraction upto 97.3±2.2%. In contrast, the wound of the positive control group (polyfax) and the diabetic control (saline) healed in 17- and 19-days respectively, and had correspondence contraction upto 96.7±1.4% and 96.3±1.1%, respectively. Histological analysis showed that the combination of three biomaterials (15% garlic, 10% turmeric, and 5% fibroin) 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 disturbing serum level of biochemical parameters. The combination the three biomaterials (15% garlic, 10% turmeric and 5% fibroin) significantly alleviated the serum level of pro-inflammatory cytokine i.e., TNF-α (14.2±0.7pg/ml), IL-6 (10.0±1.0pg/ml), and IL-8 (16.0±1.5pg/ml) as compared to the diabetic control (TNF-α=40.9±4.9pg/ml, IL-6=28.0±1.8pg/ml, IL-8=60.2±2.4pg/ml) ($P<0.001$). The serum level of MMP2 (228.0±18.1pg/ml), MMP7 (271.0±9.9pg/ml), and MMP9 (141.0±5.3pg/ml) in the same group was also observed 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 (193.0±9.1pg/ml) in this group was increased maximally with respect to diabetic control (51.8.0±7.7pg/ml) (P<0.001). It can be concluded that combination of these biomaterials possessed 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.

Key words: Diabetic Wound, Biomaterials, Wound Contraction, Biochemical Parameters