

## Chemical composition of *Moringa oleifera* ethyl acetate fraction and its biological activity in diabetic human dermal fibroblasts

### ABSTRACT

Background: *Moringa oleifera* (MO), commonly known as the drumstick tree, is used in folklore medicine for the treatment of skin disease. Objective: The objective of this study is to evaluate the ethyl acetate (EtOAc) fraction of MO leaves for in vitro antibacterial, antioxidant, and wound healing activities and conduct gas chromatography-mass spectrometry (GC-MS) analysis. Materials and Methods: Antibacterial activity was evaluated against six Gram-positive bacteria and 10 Gram-negative bacteria by disc diffusion method. Free radical scavenging activity was assessed by 1, 1-diphenyl-2-picryl hydrazyl (DPPH) radical hydrogen peroxide scavenging and total phenolic content (TPC). Wound healing efficiency was studied using cell viability, proliferation, and scratch assays in diabetic human dermal fibroblast (HDF-D) cells. Results: The EtOAc fraction showed moderate activity against all bacterial strains tested, and the maximum inhibition zone was observed against *Streptococcus pyogenes* (30 mm in diameter). The fraction showed higher sensitivity to Gram-positive strains than Gram-negative strains. In the quantitative analysis of antioxidant content, the EtOAc fraction was found to have a TPC of  $65.81 \pm 0.01$ . The DPPH scavenging activity and the hydrogen peroxide assay were correlated with the TPC value, with IC<sub>50</sub> values of  $18.21 \pm 0.06$  and  $59.22 \pm 0.04$ , respectively. The wound healing experiment revealed a significant enhancement of cell proliferation and migration of HDF-D cells. GC-MS analysis confirmed the presence of 17 bioactive constituents that may be the principal factors in the significant antibacterial, antioxidant, and wound healing activity. Conclusion: The EtOAc fraction of MO leaves possesses remarkable wound healing properties, which can be attributed to the antibacterial and antioxidant activities of the fraction. Summary: *Moringa oleifera* (MO) leaf ethyl acetate (EtOAc) fraction possesses antibacterial activities toward Gram-positive bacteria such as *Streptococcus pyogenes*, *Streptococcus faecalis*, *Bacillus subtilis*, *Bacillus cereus* and *Staphylococcus aureus*, and Gram-negative bacteria such as *Proteus mirabilis* and *Salmonella typhimurium*. MO leaf EtOAc fraction contained the phenolic content of  $65.81 \pm 0.01$  and flavonoid content of  $37.1 \pm 0.03$ , respectively. In addition, the fraction contained 17 bioactive constituents associated with the antibacterial, antioxidant, and wound healing properties that were identified using gas chromatography-mass spectrometry analysis. MO leaf EtOAc fraction supports wound closure rate about 80% for treatments when compared with control group.

**Keyword:** Diabetic wound healing; Gas chromatography-mass spectrometry; Migration rate; Phenolic content; Scratch assay; Skin pathogen