

Abstract

Indonesia's high ultraviolet B (UVB) exposure increases the risk of skin damage, photoaging, and keratinocyte dysfunction, creating a need for preventive agents that are effective and accessible. This study preliminarily evaluated the preventive effects of *Boswellia carterii*, also known as frankincense essential oil (FEO) and *Cistus ladanifer*, also known as labdanum cistus essential oil (LCEO) on UVB-induced damage in HaCaT keratinocytes. Safe working concentrations were first determined by trypan blue exclusion, followed by pretreatment screening using MTS, trypan blue exclusion, and scratch assays after UVB exposure. IC₂₀ screening showed that FEO was less cytotoxic than LCEO, with an estimated IC₂₀ of approximately 200 µg/mL, while LCEO had a lower IC₂₀ of about 10 µg/mL. After UVB exposure, neither oil clearly restored mitochondrial activity in the MTS assay, although LCEO at 10 µg/mL increased viable cell count in the trypan blue assay compared with the UVB-only group. In the scratch assay, wound closure increased over time in all groups, but none of the treatments showed a statistically significant improvement in wound closure compared with the UVB-only group. Overall, LCEO showed more promising preventive potential than FEO, particularly in supporting cell viability, but both oils showed limited and inconsistent protection under the tested conditions. Future studies should use a wider dose range, more biological replicates, and additional biomarkers to confirm these preliminary findings.

Keywords: Essential oils, UVB exposure, HaCaT keratinocytes, cell viability, cell migration