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Wound healing activity of Centella asiatica extract via inflammatory gene regulation in zebrafish (Danio rerio)

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Abstract

Background *Centella asiatica* (L.) Urb has been recognized for its potential to accelerate wound healing and support tissue repair and regeneration. This effect may involve the regulation of pro-inflammatory genes such as Interleukin-1 Beta (IL-1 β) and Matrix Metalloproteinase-9 (MMP-9). **Objective** This study aimed to evaluate the wound healing potential of ethanolic *C. asiatica* leaf extract by assessing caudal fin regeneration and the expression levels of IL-1 β and MMP-9 in zebrafish (*Danio rerio*). **Materials and methods** Zebrafish were assigned to control, 7.5-ppm extract, and 10-ppm extract groups (n = 20 per group) and observed for 7 days post-caudal fin amputation. The caudal fin regeneration was quantified by means of a stereo microscope, and inflammatory gene expression (IL-1 β and MMP-9) was analyzed using qRT-PCR. **Results and conclusion** The average percentage of caudal fin regeneration was 40.51% in the normal group, 46.32% in the 7.5-ppm extract group, and 47.59% in the 10-ppm extract group. A significant reduction in gene expressions was observed in the 10-ppm group, with $-1.097x$ in IL-1 β expression and $-0.276x$ in MMP-9 expression compared to the control. These findings suggest that *C. asiatica* extract enhances wound healing in zebrafish by downregulating pro-inflammatory genes. © 2026 Egyptian Pharmaceutical Journal.

Author keywords

Caudal fin; *Centella asiatica*; IL-1 β ; MMP-9; wound healing

Indexed keywords

EMTREE drug terms

asiatic acid; asiaticoside; beta actin; *Centella asiatica* extract; gelatinase B; interleukin 1beta; madecassic acid; madecassoside; triterpenoid; tumor necrosis factor; unclassified drug

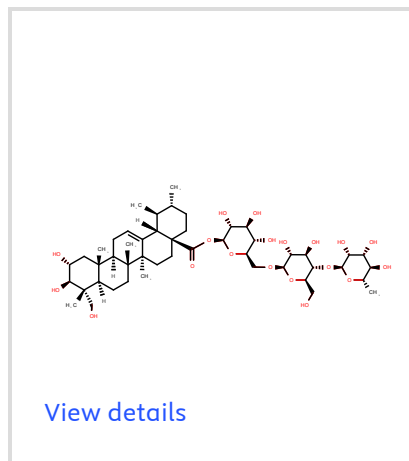
EMTREE medical terms

adult; anatomical concepts; animal experiment; Article; caudal fin; *Centella asiatica*; chromatography; controlled study; gene control; gene expression level; gene expression profiling; housekeeping gene; inflammation; nonhuman; plant leaf; real time reverse transcription polymerase chain reaction; regeneration; skin structure; wound healing; zebra fish

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asiatic acid	464-92-6
asiaticoside	16830-15-2
Centella asiatica extract	2227007-05-6

gelatinase B	146480-36-6
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madecassic acid	18449-41-7
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Funding text 1

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Funding text 2

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