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# In vitro antimicrobial efficacy of *Cassia alata* (Linn.) leaves, stem, and root extracts against cellulitis causative agent *Staphylococcus aureus*

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## Abstract

**Background** Cellulitis is a common skin disease encountered in medical emergencies in hospitals. It can be treated using a combination of antibiotics therapy; however, the causative agent *Staphylococcus aureus* has been reported to develop resistance towards the currently used antibiotics. Therefore, the search for more alternative herbal origin antimicrobial agents is critical. Aim: In this study, maceration and Soxhlet extraction of the whole plant of *Cassia alata* Linn. (leaves, roots, and stem) were performed using four solvents with different polarities, namely n-hexane, ethyl acetate, ethanol and distilled water. The crude extracts were screened using agar well diffusion, colorimetric broth microdilution, grid culture and bacterial growth curve analysis against *Staphylococcus aureus*. The phytochemicals in the crude extracts were identified using Gas Chromatography-Mass Spectrometry (GC-MS).

**Results** Agar-well diffusion analysis revealed that extraction using ethyl acetate showed the largest inhibition zone with an average diameter of 15.30 mm (root Soxhlet extract) followed by 14.70 mm (leaf Soxhlet extract) and 13.70 mm (root maceration extract). The lowest minimum inhibitory and minimum bactericidal concentration in root Soxhlet extract using ethyl acetate was 0.313 and 0.625  $\mu\text{g } \mu\text{L}^{-1}$ , respectively. Our study proved that crude extract of the plant suppressed the growth of *S. aureus* as evidenced from a significant regression extension ( $p < 0.06$ ,  $\rho = 0.00003$ ) of lag phase for 6 h after the treatment with increased concentration. Based on the GC-MS analysis, 88 phytochemicals consist of fatty acids, esters, alkanes, phenols, fatty alcohols, sesquiterpenoids and macrocycle that possibly contributed to the antimicrobial properties were identified, 32 of which were previously characterized for their antimicrobial, antioxidant, and anti-inflammatory activities.

**Conclusion** Ethyl acetate crude extract was better than the other investigated solvents. The root and stem of *C. alata* showed significant antimicrobial efficacy against *S. aureus* in this study. The remaining 56 out of 88 phytochemicals of the plant should be intensively studied for more medicinal uses.

**Keywords** *Cassia alata*, Skin bacteria, Maceration and Soxhlet extraction, Antimicrobial, Phytochemicals, GC-MS

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