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Biological and Pharmaceutical Bulletin

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Galbanic acid from *Ferula szowitsiana* enhanced the antibacterial activity of penicillin G and cephalixin against *Staphylococcus aureus*Shahverdi, A.R.^a, Fakhimi, A.^b, Zarrini, G.^c, Dehghan, G.^d, Iranshahi, M.^e^a Department of Pharmaceutical Biotechnology, Medicinal Plant Research Center, Medical Sciences/University of Tehran, Tehran 1417614411, Iran^b Biotechnology Research Center, Faculty of Pharmacy, Medical Sciences/University of Tehran, Tehran 1417614411, Iran^c Departments of Plant Sciences, Faculty of Natural Sciences, University of Tabriz, Tabriz 516614766, Iran^d Department of Animal Sciences, Faculty of Natural Sciences, University of Tabriz, Tabriz 516614766, Iran^e Department of Pharmacognosy, Faculty of Pharmacy, Mashhad University of Medical Sciences, Mashhad 917751365, Iran

Abstract

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In this study the enhancement effect of *Ferula szowitsiana* roots' acetone extract on the antibacterial activity of penicillin G and cephalixin was evaluated against *Staphylococcus aureus*. Disk diffusion and broth dilution methods were used to determine the antibacterial activity of these antibiotics in the absence and presence of plant extract and its various fractions separated by TLC plate. The active component of plant extract involved in enhancement of penicillin G's and cephalixin's activities had $R_f=0.336$ on a TLC plate. The spectral data (1H -, ^{13}C -NMR) of this compound revealed that this compound was 7-[6-(β -carboxyethyl)-5-isopropylidene-1,2-dimethylcyclo-hexylmethoxy]coumarin (galbanic acid), previously isolated from *Ferula assafoetida*. In the presence of sub-inhibitory concentration of galbanic acid (100 μ g/ml) the MIC of penicillin G for *S. aureus* decreased from 64 to 1 (a sixteen four-fold decrease) and for cephalixin from 128 to 1 μ g/ml (a one hundred twenty eight-fold decrease). The highest fold decrease in MIC was observed for cephalixin in combination of galbanic acid against test strain. These results signify that the low concentration of galbanic acid (100 μ g/ml) potentiates the antimicrobial action of penicillin G and cephalixin suggesting a possible utilization of these compounds in combination therapy against *S. aureus*. © 2007 Pharmaceutical Society of Japan.

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Author keywords

Antibacterial activity; Cephalixin; *Ferula szowitsiana*; Penicillin G; *Staphylococcus aureus*; Synergism

Indexed keywords

EMTREE drug terms: 7 [6 (beta carboxyethyl) 5 isopropylidene 1,2 dimethylcyclohexylmethoxy] coumarin; acetone; antibiotic agent; cefalexin; *Ferula szowitsiana* extract; galbanic acid; penicillin G; plant extract; unclassified drugEMTREE medical terms: antibacterial activity; article; bacterial strain; broth dilution method; carbon nuclear magnetic resonance; controlled study; disk diffusion method; drug isolation; drug potentiation; *Ferula szowitsiana*; medicinal plant; minimum inhibitory concentration; proton nuclear magnetic resonance; spectroscopy; *Staphylococcus aureus*; technique; thin layer chromatography MeSH: Acetone; Anti-Bacterial Agents; Cephalixin; Chromatography, Thin Layer; Coumarins; *Ferula*; Iran; Microbial Sensitivity Tests; Penicillin G; Plant Extracts; Plant Roots; Solvents; *Staphylococcus aureus*

Medline is the source for the MeSH terms of this document.

Chemicals and CAS Registry Numbers: acetone, 67-64-1; cefalexin, 15686-71-2, 23325-78-2; galbanic acid, 3566-55-0; penicillin G, 1406-05-9, 61-33-6; Acetone, 67-64-1; Anti-Bacterial

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