







Antibacterial activity of bacteria isolated from *Phragmites australis* against multidrug-resistant human pathogens

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Background: Rising of multidrug-resistant human pathogens demands novel antibiotics: to this aim, unexplored natural sources are investigated to find new compounds. In this context, bacteria associated to medicinal plants, including *Phragmites australis*, might represent an important source of antimicrobial compounds. **Materials & methods:** In the present work, 21 bacterial endophytes isolated from *P. australis* roots were tested, through cross-streaking, for their inhibitory activity against 36 multidrug-resistant pathogens isolated from food, clinical patients and hospitals. **Results & conclusion:** Seven endophytes, belonging to *Pseudomonas* and *Stenotrophomonas*, were able to inhibit the growth of most of target strains. In conclusion, this preliminary work could pave the way to the discovery of new antibiotics active against superbugs.

Lay abstract: In the present work, 21 bacteria associated to *Phragmites australis* roots were tested for their inhibitory activity against 36 human pathogens isolated from food, clinical patients and/or hospitals, which have the ability to escape several commonly used antibiotics. Seven out of 21 bacteria associated to *P. australis* were able to inhibit the growth of most of target pathogens. This preliminary work could pave the way to the discovery of new antimicrobial compounds active against bacterial pathogens that cannot be killed using several antibiotics.

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Antimicrobial resistance is one of the greatest threats that we face as a global community. Presently, about 700,000 people die each year due to drug-resistant diseases and 10,000 of them occur in Italy, which is above the European average [1,2]. The persistent and intensifying increase of superbugs bacteria worldwide urges to find alternative compounds with antibacterial properties, also from unexplored natural sources. To this purpose, the exploitation of phytochemical products with bioactive properties, extracted from medicinal and aromatic plants, has been established long ago to treat human diseases.

The plants have been the main source of natural antimicrobial compounds until Alexander Fleming discovered penicillin in 1928 [3]. Since then, microorganisms such as fungi and bacteria have become the new alternative sources of antimicrobial compounds, due to their capability to synthesize bioactive secondary metabolites [4]. All plants live in mutualism with microorganisms in their environment and with those living internally [5]. The organisms commonly designated with the term 'endophytes' include microorganisms belonging to prokaryotic and eukaryotic taxa [6] that, at some point of their life cycle, colonize the internal plant tissues without causing an apparent harm to the host [7]. Endophytic bacteria have been isolated from roots, leaves and stems, and, to a lesser extent, from flowers, fruits and seeds [8,9]. The entry of bacterial endophytes into plant tissues can occur through natural opening