Title

N- acyl homoserine lactones (AHLs) type signal molecules produced by rhizobacteria associated with plants that growing in a metal(oids) contaminated soil: A catalyst for plant growth

Abstract

The present study explores the potential of rhizobacteria isolated from Baccharis linearis and Solidago chilensis in metal(loid)-contaminated soil for producing N-acyl-homoserine lactones (AHLs)-type signal molecules and promoting plant growth. A total of 42 strains were isolated, four demonstrating the production of AHL-type signal molecules. Based on 16S rRNA gene sequencing analyses and MALDI-TOF analyses, these four isolates were identified as belonging to the Pseudomonas genus, specifically P. brassicacearum, P. frederickberguensis, P. koreensis, and P. orientalis. The four AHL-producing strains were evaluated for metal(loid)s tolerance, their plant growth promotion traits, AHL quantification, and their impact on in vitro Lactuca sativa plant growth. The study found that four strains exhibited high tolerance to metal(loid)s, particularly As, Cu, and Zn. Additionally, plant growth-promoting traits were detected in AHL-producing bacteria, such as siderophore production, ammonia production, ACC deaminase activity, and P solubilization. Notably, AHL production varied among strains isolated from B. linearis, where C7-HSL and C9-HSL signal molecules were detected, and S. chilensis, where only C7-HSL signal molecules were observed. In the presence of copper, the production of C7-HSL and C9-HSL significantly decreased in B. linearis isolates, while in S. chilensis isolates, C7-HSL production was inhibited. Further, when these strains were inoculated on lettuce seeds and in vitro plants, a significant increase in germination and plant growth was observed. Mainly, the inoculation of P. brassicacearum and P. frederickberguensis led to extensive root hair development, significantly increasing length and root dry weight. Our results demonstrate that

rhizospheric strains produce AHL molecules and stimulate plant growth, primarily through root development. However, the presence of copper reduces the production of these molecules, potentially affecting the root development of non-metalloid tolerant plants such as S. chilensis, which would explain its low population in this hostile environment.

Authors

Ortiz J.; Dias N.; Alvarado R.; Soto J.; Sanhueza T.; Rabert C.; Jorquera M.; Arriagada C.

Author full names

Ortiz, Javier (10641874100); Dias, Nathalia (59099293600); Alvarado, Roxana (57558991200); Soto, Javiera (57211539030); Sanhueza, Tedy (57215417890); Rabert, Claudia (6505650402); Jorquera, Milko (6603389134); Arriagada, César (8221864900)

Author(s) ID

10641874100; 59099293600; 57558991200; 57211539030; 57215417890; 6505650402; 6603389134; 8221864900

Year

2024

Source title

Microbiological Research

Volume

281.0

Art. No.

127606

DOI

10.1016/j.micres.2024.127606

Link

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85184774511&doi=10.1016%2fj.micres.2024.127606&partnerID=40&md5=71c2c987263cfa61b51cb6f74a122679

Affiliations

Laboratorio de Biorremediación, Facultad de Ciencias Agropecuarias y Mediambiente, Universidad de La Frontera, Temuco, Chile; Scientific and Technological Bioresource Nucleus (BIOREN), Universidad de La Frontera, Temuco, Chile; Instituto de Ciencias Biomédicas, Facultad de Ciencias de la Salud,

Universidad Autónoma de Chile, Temuco, Chile; Laboratorio de Ecología Microbiana Aplicada (EMALAB), Departamento de Ciencias Químicas y Recursos Naturales, Universidad de La Frontera, Temuco, Chile

Authors with affiliations

Ortiz J., Laboratorio de Biorremediación, Facultad de Ciencias Agropecuarias y Mediambiente, Universidad de La Frontera, Temuco, Chile; Dias N., Scientific and Technological Bioresource Nucleus (BIOREN), Universidad de La Frontera, Temuco, Chile; Alvarado R., Laboratorio de Biorremediación, Facultad de Ciencias Agropecuarias y Mediambiente, Universidad de La Frontera, Temuco, Chile; Soto J., Laboratorio de Biorremediación, Facultad de Ciencias Agropecuarias y Mediambiente, Universidad de La Frontera, Temuco, Chile; Sanhueza T., Laboratorio de Biorremediación, Facultad de Ciencias Agropecuarias y Mediambiente, Universidad de La Frontera, Temuco, Chile; Rabert C., Instituto de Ciencias Biomédicas, Facultad de Ciencias de la Salud, Universidad Autónoma de Chile, Temuco, Chile; Jorquera M., Laboratorio de Ecología Microbiana Aplicada (EMALAB), Departamento de Ciencias Químicas y Recursos Naturales, Universidad de La Frontera, Temuco, Chile; Arriagada C., Laboratorio de Biorremediación, Facultad de Ciencias Agropecuarias y Mediambiente, Universidad de La Frontera, Temuco, Chile

Author Keywords

AHL-signal molecules; Extremophiles rhizobacteria; Metal(loid)s tolerance; Plant-growth promotion; Quorum sensing

Index Keywords

Acyl-Butyrolactones; Copper; Plants; Quorum Sensing; RNA, Ribosomal, 16S; Soil; Ammonia; Bacteria; Esters; Plants (botany); RNA; Seed; Soil pollution; copper; gamma butyrolactone derivative; RNA 16S; Acyl homoserine lactone-signal molecule; Extremophile rhizobacterium; Extremophiles; Homoserine lactones; Metal(loid)s; Metal(loid)s tolerance; Plant growth promotion; Quorum-sensing; Rhizobacteria; Signal molecules; catalyst; extremophile; growth regulator; isolated population; metalloid; molecular analysis; pollution tolerance; rhizobacterium; soil pollution; genetics; plant; quorum sensing; soil; Copper

Chemicals/CAS

copper, 15158-11-9, 7440-50-8; Acyl-Butyrolactones, ; Copper, ; RNA, Ribosomal, 16S, ; Soil,

Funding Details

Scientific and Technological Bioresources Nucleus BIOREN; Fondo Nacional de Desarrollo Científico y Tecnológico, FONDECYT, (3210501); Fondo Nacional de Desarrollo Científico y Tecnológico, FONDECYT; Universidad de La Frontera, UFRO

Funding Texts

Funding text 1: Financial support for this study was provided by Fondo Nacional de Desarrollo, Científico y Tecnológico, FONDECYT 3210501. We thank the Scientific and Technological Bioresources Nucleus BIOREN- UFRO for equipment support.; Funding text 2: Financial support for this study was provided by Fondo Nacional de

Desarrollo , Científico y Tecnológico, FONDECYT 3210501 . We thank the Scientific and Technological Bioresources Nucleus BIOREN- UFRO for equipment support.

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pp. 557-565, (2017)

Correspondence Address

C. Arriagada; Laboratorio de Biorremediación, Facultad de Ciencias Agropecuarias y Mediambiente, Universidad de La Frontera, Temuco, Chile; email: cesar.arriagada@ufrontera.cl

Publisher

Elsevier GmbH

ISSN

09445013

CODEN

MCRSE

PubMed ID

38277718.0

Language of Original Document

English

Abbreviated Source Title

Microbiol Res.

Document Type

Article

Publication Stage

Final

Source

Scopus

EID

2-s2.0-85184774511