
Title

Purification and Characterization of Ulvans from Chilean Ulva lactuca and Assessment of the Stimulation of Growth Induced by Ulvans and Oligo-Ulvans in Arabidopsis thaliana

Abstract

To study the effect of ulvans and oligo-ulvans on the stimulation of growth in *Arabidopsis thaliana*, extracts of Chilean *U. lactuca* were prepared in water at pH = 7 and pH = 4, and ulvans were purified. The yield of ulvans was 16% of dry weight in both extracts and molecular weights were 115 kDa in extract at pH = 7 and 70 kDa in extract at pH = 4. Purified ulvans were analyzed by FT-IR and ¹H RMN showing carboxyl and sulfate groups and they are constituted by rhamnose, rhamnose-3S, xylose and glucuronic acid, but not by iduronic acid. The antioxidant capacities of *U. lactuca* extracts were determined showing that ulvans are the main contributors to antioxidant capacity whereas ascorbate, glutathione, and phenolic compounds exert a minor contribution. To analyze whether ulvans and oligo-ulvans can stimulate plant growth, oligo-ulvans were prepared by acid hydrolysis and they were sprayed on *A. thaliana* leaves. Ulvans and oligo-ulvans increased *A. thaliana* biomass, fresh and dry weight, rosette diameter, number of leaves, and length of the main root, mainly oligo-ulvans. To determine whether the increase in plant growth may involve an enhanced basal metabolism and cell division, the level of transcripts encoding enzymes involved in C, N, and S assimilation, and proteins controlling cell cycle were analyzed. The expression of the latter genes was increased, mainly in response to oligo-ulvans. Thus, ulvans and oligo-ulvans stimulate growth of *A. thaliana* plants probably by increasing basal metabolism and cell division. © The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2024.

Authors

Osorio H.; Laporte D.; Romero S.; Vidal C.; Martínez F.; Espinoza D.; Romo X.; Gallegos D.; González A.; Moenne A.

Author full names

Osorio, Héctor (57771906200); Laporte, Daniel (16029167400); Romero, Stephanie (57914720700); Vidal, Constanza (57219945580); Martínez, Fabián (58794926400); Espinoza, Daniela (57217010855); Romo, Ximena (58793722100); Gallegos, David (58794200400); González, Alberto (7404585031); Moenne, Alejandra (6602113236)

Author(s) ID

57771906200; 16029167400; 57914720700; 57219945580; 58794926400;
57217010855; 58793722100; 58794200400; 7404585031; 6602113236

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Affiliations

Faculty of Chemistry and Biology, University of Santiago of Chile, Alameda 3363, Santiago, Chile; Laboratorio Interdisciplinario, Instituto de Ciencias Biomédicas, Universidad Autónoma de Chile, Talca, 3467987, Chile; Arista Biotech, Luis Durán 1840, Concepción, Chile

Authors with affiliations

Osorio H., Faculty of Chemistry and Biology, University of Santiago of Chile, Alameda 3363, Santiago, Chile; Laporte D., Laboratorio Interdisciplinario, Instituto de Ciencias Biomédicas, Universidad Autónoma de Chile, Talca, 3467987, Chile; Romero S., Faculty of Chemistry and Biology, University of Santiago of Chile, Alameda 3363, Santiago, Chile; Vidal C., Faculty of Chemistry and Biology, University of Santiago of Chile, Alameda 3363, Santiago, Chile; Martínez F., Faculty of Chemistry and Biology, University of Santiago of Chile, Alameda 3363, Santiago, Chile; Espinoza D., Faculty of Chemistry and Biology, University of Santiago of Chile, Alameda 3363, Santiago, Chile; Romo X., Arista Biotech, Luis Durán 1840, Concepción, Chile; Gallegos D., Arista Biotech, Luis Durán 1840, Concepción, Chile; González A., Faculty of Chemistry and Biology, University of Santiago of Chile, Alameda 3363, Santiago, Chile; Moenne A., Faculty of Chemistry and Biology, University of Santiago of Chile, Alameda 3363, Santiago, Chile

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Correspondence Address

A. Moenne; Faculty of Chemistry and Biology, University of Santiago of Chile, Santiago, Alameda 3363, Chile; email: alejandra.moenne@usach.cl

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