



Monday 5th May 2025 at 11:30 am in room E

Dr. Carla Araya-Cloutier

Laboratory of Food Chemistry
Wageningen University
The Netherlands

will hold the seminar entitled:

Harvesting the wisdom of plants to find novel antimicrobials

Antimicrobial resistance is one of the greatest challenges affecting modern society, impacting our healthcare, food & farm systems and environment. The urgent need for new antimicrobial agents has driven interest in natural sources, particularly plants, which produce a wide array of bioactive compounds with diverse mechanisms of action. Among these, defence-related phytochemicals are synthesized *de novo* in response to biotic or abiotic stress and can possess potent antimicrobial activity.

The Fabaceae plant family produces prenylated phenolics as main defence mechanism. Antimicrobial prenylated phenolics, bearing C5-isoprene moieties, exhibit a wide chemical diversity. These prenyl groups enhance hydrophobicity and affinity of the molecules towards biological targets. Interestingly, evidence shows that even minor structural variations can greatly influence their antimicrobial properties.

This presentation aims to provide an overview of opportunities identified in recent structure-activity relationships (SARs) studies of prenylated phenolics as antimicrobial agents and as resistance-modifying agents (specifically, as efflux pump inhibitors). Using a diverse collection of prenylated phenolics, tested against healthcare and food-associated pathogens, SARs were defined and *in-silico* quantitative SARs (QSAR) models validated to gain insights on the most important molecular properties underlying antimicrobial activity. Using *in-vitro* and MD simulation studies, their mechanism of membrane permeabilization was rationalized. To understand further the window of opportunity of prenylated phenolics as novel antimicrobials, insights into their safety (in terms of cytotoxicity), using intestinal organoid models, will be also discussed.

References

- Bombelli, A., Calligari, P., Bocchinfuso, G., Vincken, J-P., Abee, T., den Besten, H.M.W., Stella, L., **Araya-Cloutier, C.** (2025). Journal of Agriculture and Food Chemistry 73, 6668-6677.
- Van Dinteren, S., **Araya-Cloutier, C.**, Robaczewska, E., den Otter, M., Witkamp, R., Vincken, J-P., Meijerink, J. (2024) Food & Function 15, 1852-1866.; Ika Irianti, M., Vincken, JP., van Dinteren, S. ter Beest, E., Pos, K.M., **Araya-Cloutier, C.** (2023). Scientific Reports 13, 22548.; Kalli, S., **Araya-Cloutier, C.**, Hageman, J., and Vincken, J-P. (2021) Scientific Reports 11, 14180.
- Kalli, S.; **Araya-Cloutier, C.**; Bruijn, W.J.C. de; Chapman, J.; Vincken, J-P. (2020) Phytochemistry 179, 112496.

Your presence will be very welcome.

Marta De Zotti

*Il Direttore del Dipartimento
Stefano Mammi*

Bio – Dr. Carla Araya-Cloutier

**Assistant professor Plant Bioactives
Laboratory of Food Chemistry
Wageningen University & Research**



Dr. Carla Araya-Cloutier is Assistant professor at the Laboratory of Food Chemistry (FCH), Wageningen University & Research (WUR), The Netherlands. Her Plant (Bio)Actives group focusses on phytochemicals as antimicrobial agents. She completed her PhD on the quantitative structure-activity relationships and mode of action of antibacterial prenylated isoflavonoids and stilbenoids from stressed legume plants. She became Assistant professor in 2020 after successfully securing a prestigious NWO VENI grant to support a novel project on phytochemicals as efflux pump inhibitors (EPIs) against bacteria, as a novel strategy to fight antimicrobial resistance. As part of this project, in 2023, she was a visiting researcher at The Membrane Transport Machineries group, Institute of Biochemistry Goethe Frankfurt University (Germany). In her work, she integrates phytochemistry, microbiology and in-silico modelling techniques (e.g. QSAR, pharmacophore modelling, molecular docking and MD simulations) for predicting and rationalizing the structure-activity relationships and the molecular mechanism of action of plant antimicrobials.

List of publications: <https://orcid.org/0000-0002-9304-4971>