

ARISTO PROJECT NEWSLETTER

Issue 2 – November 2022



ARISTO

Academia Network for Revising and
Advancing the Assessment of the Soil
Microbial TOxicity of Pesticides.

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EDITORIAL

Dr. Carolin Schneider – PI of the ARISTO Project

"Harnessing soil microorganisms for sustainable agriculture"

It's been two months that we as a company (INOQ) decided not to use a list about compatibility of pesticides with arbuscular mycorrhizal fungi (AMF) anymore for customers. Why? *Nature* authors (Edlinger *et al.* 2022), among them ARISTO PIs, stated that land-use intensity and fungicide use are major deterrents to the functioning and natural nutrient uptake capacity of AMF in agroecosystems. The use of fungicides and subsequent decline in AMF richness in croplands reduced 33P uptake by 43 %. Have we been too careless? What was the source of our list? Re-check revealed no sign of sloppy work or dollar sign eyes, the source was quite a big literature review and own trials, but - numerous factors affecting the compatibility of a pesticide, in a given formulation, concentration, combination and a specific fungal species in a definite environment. Under exactly these conditions the compatibility is given or not, no general conclusion possible. With this addendum to the list we decided to use it again, because sharing transparently the knowledge we have is better than no consultation. This is a good example for the need to look twice as a scientist.

PS: In case you'd like to know more about the state-of-the-art of plant protection products and mycorrhiza, please read Karin Hage-Ahmed's paper, "Arbuscular mycorrhizal fungi and their response to pesticides" (Hage-Ahmed *et al.* 2019). This review describes and discusses current knowledge on the effects of inorganic and organic chemical pesticides on AMF in the conflicting area between agricultural use and environmental concerns. Variable effects have been reported following chemical pesticide use, ranging from neutral to positive and negative. Moreover, a species-specific reaction has been documented. On the other hand, look at the findings of Jan Jansa's group in Prague (Dudáš *et al.* 2022): AM fungi could supplement or fully replace the application of synthetic nitrogen inhibitors. Using various biochemical and molecular approaches they show that the fungi systematically suppress ammonia-oxidizing bacteria to an extent similar to that of some widely used synthetic nitrification inhibitors, whereas they have only a limited impact on abundance of ammonia-oxidizing archaea.



ARISTO fellows during the 2nd and 3rd training weeks in Zurich, Switzerland and in Louvain la Neuve, Belgium.

*Edlinger, A., Garland, G., Hartman, K. *et al.* Agricultural management and pesticide use reduce the functioning of beneficial plant symbionts. *Nat Ecol Evol* 6, 1145–1154 (2022). <https://doi.org/10.1038/s41559-022-01799-8>

Dudáš M, Pjevac P, Kotianová M, Gančarčíková K, Rozmoš M, Hršelová H, Bukovská P, Jansa J. Arbuscular Mycorrhiza and Nitrification: Disentangling Processes and Players by Using Synthetic Nitrification Inhibitors. *Appl Environ Microbiol.* 2022 Oct 26;88(20):e0136922. doi: 10.1128/aem.01369-22. Epub 2022 Oct 3. PMID: 36190238; PMCID: PMC9599619.

Hage-Ahmed K, Rosner K, Steinkellner S. Arbuscular mycorrhizal fungi and their response to pesticides. *Pest Manag Sci.* 2019 Mar;75(3):583-590. doi: 10.1002/ps.5220. Epub 2018 Oct 29. PMID: 30255557; PMCID: PMC6587947.

Carolin

UPDATES FROM THE FELLOWS



Eleftheria Bachtsevani

ESR1. *In vitro* assessment of the toxicity of pesticides on AOM

École Centrale de Lyon – Dr. Graeme Nicol

NCIMB Ltd – Dr. Carol Phillips

Eleftheria finished the academic part at École Centrale de Lyon where she investigated the toxicity of pesticides on different nitrifying strains *in vitro*. She will move to Scotland to perform tests for the development of a toxicity kit using nitrifiers as bioindicators in NCIMB for the industrial part of her Ph.D.



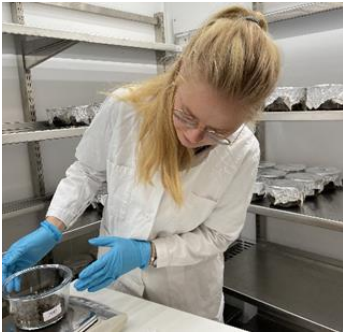
Marjan Roshanfekrrad

ESR2. *In vitro* assessment of the toxicity of pesticides on AMF

Universite Catholique de Louvain – Prof. Stéphane Declerck

Phytothreptiki – Dr. Myrto Tsiknia

Marjan has just finished her academia part (University of Louvain, Belgium) and has moved to Greece to start her industrial part in Phytothreptiki company to continue working on her project and to establish *in vitro* AMF cultivation system there.



Laura Johanna Müller

ESR3. Studying the toxicity of pesticides on AOM, and other nitrifiers in soil

Swedish University of Agricultural Sciences – Prof. Sara Hallin

SAYENS – Dr. Abdelwahad Echairi

Laura is finishing up her last microcosm experiment at the Swedish University of Agricultural Sciences in Uppsala before moving to her industrial partner SAYENS in Dijon, France. In collaboration with SAYENS, a field experiment will be performed in spring/summer 2023 to test the effect of pesticides on the nitrifying soil microorganisms under field conditions.



Anna Manukyan

ESR4. Assessing the toxicity of pesticides on natural soil and plant assemblages of AMF

University of Thessaly – Dr. Kalliope Papadopoulou

INOQ – Dr. Carolin Schneider

Anna is currently in the middle of her Ph.D's experimental part, where she is testing how different type of pesticides are affecting natural soil assemblages and also a known AMF species. She has already found some interesting results, which she will try to explain in the future experiments.



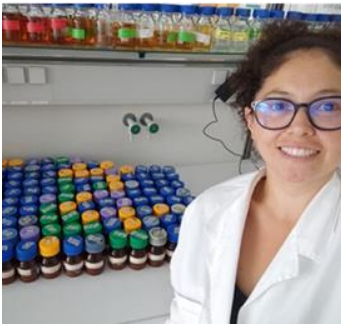
Cara I. Meyer

ESR5. Studying the toxicity of pesticides on soil microbial networks

INRAE – Dr. Laurent Philippot

SYNGENTA – Dr. Claudio Screpanti

Cara has just moved from INRAE in Dijon, France to Syngenta in Stein, Switzerland. She has finished two microcosm experiments investigating the effects of pesticides on soil microbial networks and will be starting a third experiment very soon.



Marta E. Pérez-Villanueva

ESR6. Pesticides toxicity at the soil food-web level: Defining effects on microbial predator-prey systems

UFZ, Leipzig – Prof. Antonis Chatzinotas

HYDREKA – Dr. Cedric Malandain

Marta is currently working at Helmholtz Centre for Environmental Research in Leipzig, Germany and in December she will move to her industrial partner HYDREKA in Lyon, France. Before moving, she is conducting a final microcosm experiment to study the effects of two pesticides on soil microbial communities with an increasing level of trophic complexity.



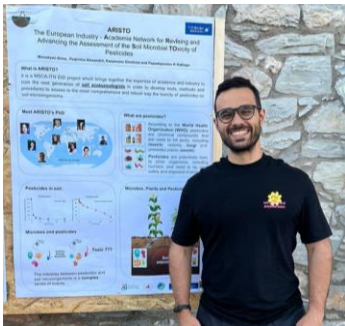
Camilla Drocco

ESR7. Assessment of the toxicity of pesticide mixtures on soil microorganisms

INRAE – Dr. Aymé Spor

ECT Oekotoxikologie GmbH – Dr. Anja Coors

Camilla is working on mixture of pesticide. She is currently at ECT Oekotoxikologie GmbH, Germany, studying the toxicity of pesticide mixture on soil nematode community. At the moment, she is analyzing the data from her first experiment and preparing the last experiment of her Ph.D. project.



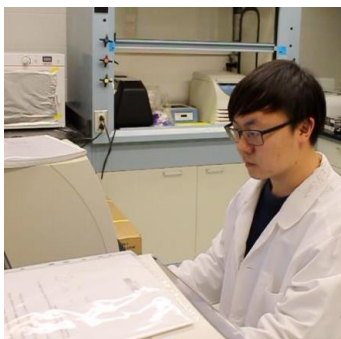
Alexandre Pedrinho

ESR8. Assessing the toxicity of bio-pesticides on soil microorganisms

University of Thessaly – Prof. Dimitrios Karpouzas

Metabolic Insights Ltd – Dr. Gal Wittenberg

Alexandre is finishing his activities at the University of Thessaly, Greece. He is enjoying his last moments in Greece helping with the dissemination of the ARISTO project to the general public and young pupils. Right now, he is packing his stuff to move to Australia for his secondment at Western Sydney University. Afterward, he is going to move to Israel for the second part of his Ph.D., where he is going to get the industrial training at Metabolic Insights.



Kunyang Zhang

ESR9. Development of tools for in silico prioritization of pesticide TPs for soil microbial ecotoxicity testing

EAWAG – Dr. Kathrin Fenner

ENVIPATH – Tim Lorshbach

Kunyang finished his one-month secondment training at ECL, Lyon, where he performed *in vitro* toxicity test of transformation products of pesticides. He will join enviPath in Germany and work on predictive models of pesticide toxicity

UPCOMING EVENTS

5th Training week – Microbial Interactions
and the soil food web

March 2023- Leipzig, Germany

6th Training week – Botanical pesticide:
Plant-derived agrochemicals arsenal

September 2023- Ness Ziona, Israel

Academic beneficiaries



Industry beneficiaries



Third-party partners



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