Agricultural Chemistry Winter School 2025

THE USE OF BIO-BASED MATERIALS IN THE AGROECOSYSTEM: Plant - Soil - Microbiome interaction

SCHOOL PROGRAM AND BOOK OF ABSTRACTS

10 - 13 February 2025, Perugia

A.D. 1308
unipg
DIPARTIMENTO
DI INGEGNERIA
CIVILE E AMBIENTALE

SICA

2024
ACWS
2025
Perugia - Italy

WELCOME NOTE

Dear ACWS attendees, colleagues and friends,

It is my great pleasure to host you in Perugia for the Agricultural Chemistry Winter School (ACWS2025).

This year, the ACWS focuses attention on the use of biobased materials in the agroecosystem, with particular emphasis on using biofertilizers, biostimulants, and other biobased solutions to promote sustainable agriculture. Understanding the role of plant-soil-microbiome interactions represents a key factor in achieving innovative and sustainable farming practices.

Invited and solicited speakers from Italy and foreign countries will share their scientific backgrounds and experiences on the school's topics with all participants, by promoting moments of discussion.

The ACWS represents an opportunity to improve scientific skills in the field of agricultural chemistry, but also to interact with other scientists through group activity or during poster sessions and oral presentations.

The educational excursion to Lungarotti in Torgiano (PG) will add value to the school's experience since it will teach the students the importance of the wine sector in the Umbria Region.

Finally, I hope that you enjoy your time in the "green heart" of Italy, particularly the international and friendly environment of the Winter School!

Best Regards,

Daniela Pezzolla
DICA, University of Perugia

Scientific organizing committee

Daniela Pezzolla
Monica Yorlady Alzate Zuluaga
Antonio Caporale
Silvia Celletti
Matteo Garau
Concetta Eliana Gattullo
Beatrice Giannetta
Martina Mazzon
Sofi Maria Muscarella
Laura Zanin

Local organizing committee

Daniela Pezzolla (coordinator)
Giovanni Gigliotti
Daniele Del Buono
Alberto Maria Gambelli
Nicolò Montegiove
Leonardo Bacci
Jessica Di Mario
Antonella Ranucci

Technical and administrative staff

Andrea Santoni
Laura Mosconi
Teresa Nocera
Gina Pero
Alessandro Braganti

PROGRAMME

Monday 10, February 2025	
14:00-14:30	REGISTRATION
14:30-15:00	OPENING SESSION
Session 1: BIOFERTILIZER PRODUCTION FOR CLIMATE CHANGE MITIGATION	
Moderator: Matteo Garau, University of Sassari	
15:00-16:00	Soil organic matter management in a climate change scenario ***Key lecture - Claudio Zaccone, University of Verona***
16:00-16:30	**Coffee break**
16:30-17:15	Microbial CUE in soil under N deposition: ^{13}C & ^{18}O approaches ***Yakov Kuzyakov, University of Göttingen***
17:15-18:00	Perspectives in science communication ***Massimiliano Trevisan, University of Perugia***
18:00	**Get Together**
Tuesday 11, February 2025	
Session 1: BIOFERTILIZER PRODUCTION FOR CLIMATE CHANGE MITIGATION	
Moderator: Antonio Caporale, University of Napoli	
9.00-10.00	Bio-based fertilizers: from technical to regulatory aspects ***Key lecture - Claudio Ciavatta, University of Bologna***
10.00-10.45	Beneficial bacteria as crop biofertilizers: From the lab to the field ***M.Y. Alzate Zuluaga, University of Bolzano***
10.45-11:15	**Coffee break**
11:15-13:00	Participants' presentation ***Moderator: Beatrice Giannetta, University of Foggia***
13:00-14:00	**Lunch break/Poster session** AGRITECH and VITALITY Researchers meet PhD students
14:00-19:00	**Educational and cultural excursion**

Wednesday 12, February 2025	
Session 2 : SOIL-PLANT MICROORGANISMS INTERACTION	
Moderator: Monica Yorlady Alzate Zuluaga , University of Bolzano	
9:00-10:00	Before understanding the importance of soil biodiversity, it is essential to first understand what it is! ***Key lecture - Luigimaria Borruso, University of Bolzano***
10:00-10:45	New directions for PhD students: funding and future opportunities ***Federico Cappelli, University of Perugia***
10:45-11:15	**Coffee break**
11:15-13:00	Participants' presentation ***Moderator: Silvia Celletti, University of Torino***
13:00-14:00	**Lunch break/Poster session**
Session 3: BIOSTIMULANTS: MECHANISMS AND EFFECT ON PLANT NUTRITION	
Moderator: Sofia Maria Muscarella, University of Palermo	
14:30-15:30	Unraveling the mechanisms underlying the effect of microbial and non-microbial biostimulants using untargeted metabolomics combined with biochemical assays ***Key lecture - Luigi Lucini, University of Piacenza***
15.30-16:00	**Coffee break**
16:00-16.45	Biostimulants and other biobased solutions to promote plant nutrition ***Laura Zanin, University of Udine***
16:45-18:00	Scientific writing: Common mistakes & Solution Group activities ***Yakov Kuzyakov, University of Göttingen***
20:00	***Social dinner***
Thursday 13, February 2025	
Session 4: BIOBASED SOLUTIONS AND TECHNOLOGIES FOR SUSTAINABLE AGRICULTURE	
Moderator: Martina Mazzon, University of Bologna	
9:00-10:00	Biopolymers and biopolymeric nanoparticles from agrowaste for a sustainable agriculture ***Key lecture - Debora Puglia, University of Perugia***
10:00-10:45	Bio-based products and biogas recovery from agrowaste ***Ivet Ferrer, Universitat Politècnica de Catalunya - Barcelona Tech***
10:45-11:15	**Coffee break**
11:15-12:00	The use of bioplastics in the agroecosystem: Opportunities and risks ***Concetta Eliana Gattullo, University of Bari***
12:00-13:00	**Closing session** AGRITECH and VITALITY round table discussion
13:00 - 14:00	**Light lunch**

The effect of biofertilisers on the soil microbiome in almond crop

Mandrelli L[1], Monteforte A.[2], Pascazio S.[2], Rubino R.[2], Gelsomino A.[3], Sofo A.[1]

[1]Dipartimento di Scienze Agrarie, Forestali, Alimentari e Ambientali (DAFE), Università degli Studi della Basilicata, Viale dell'Ateneo Lucano 10, Lanera, 20, 85100, Potenza (PZ)
[2]Tersan Puglia (S.P. 231 Km. 1,600, 70026 Modugno (BA)
[3]Dipartimento di Agraria, Università Mediterranea di Reggio Calabria, Feo di Vito, 89122 Reggio Calabria (RC)

Keywords: Biofertilizers; Soil microorganisms; Sustainable agriculture.

Over the years, the long-term application of mineral nitrogen fertilisers has significantly reduced soil microbial activity, resulting in a loss of biodiversity and fertility. From this point of view, biofertilisers of organic origin, rich in autoctonous microorganisms, represent an important resource capable of restoring the natural balance of agricultural soils, ensuring resistance to biotic and abiotic stresses, with a consequent increase in soil fertility.
The aim of the following work was to evaluate the effect of biofertilisers on soil microbial activity in an experimental almond orchard of the Tersan-Puglia company located in Modugno (Bari), in southern Italy, in which six different commercial biofertilisers were tested.
More specifically, the action of two biofertilisers was studied, including Biovegetal® produced by the company Tersan-Puglia and another biofertiliser product with the same organic origin (ACM).
The analyses focused on the total microbial counts of cultivable bacteria and fungi and on the main enzyme activities, such as FDA, phosphatase and β-glucosidase, indicators of functional microbial diversity and, consequently, of soil quality.
The results of the first year of monitoring showed an average increase in cultivable bacteria 53% in the soil treated with Biovegetal® and 44% with ACM compared with the control soil. The detection of β-glucosidase activity linked to the carbon cycle, which is directly related to the quality and quantity of organic matter, showed an average increase of 28% in the soils treated with biofertilisers in comparison with the control soil without any biofertiliser addition. Alkaline phosphatasic activity, which is involved in the phosphorous cycle by making the element available for plant mineral nutrition, showed an average increase of 23%. The results regarding basal soil repiration (Rbas), which is associated with the microbial activity of the soils, showed an increase of 72% in the soil treated with Biovegetal® and of 43% with ACM, compared with the control soil.
In conclusion, the results of the first experimental year showed positive effects on the soils treated with the biofertilisers, that were able to improve their microbial abundance and activity, fundamental attributes of soil health and fertility.

Acknowledgments and Funding : This study was carried out within the project "TECHNOLOGIES FOR CLIMATE CHANGE ADAPTATION AND QUALITY OF LIFE IMPROVEMENT - TECH4YOU" - SPOKE 3, Action 3.1.3, PP 3.1_veg, and received funding from the European Union Next-Generation EU